ORDER U.S. DEPARTMENT OF TRANSPORTATION FEDERAL AVIATION ADMINISTRATION **1110.136**

SUBJ: FLIGHT SIMULATION DEVICE AVIATION RULEMAKING COMMITTEE

1. **PURPOSE.** This order constitutes the charter for the Flight Simulation Device (FSD) Aviation Rulemaking Committee, referred to herein as the Committee, that is designated and established pursuant to the Administrator's authority under 49 USC 106(p)(5).

2. **DISTRIBUTION.** This order is distributed at the director level in Washington headquarters and throughout the Office of the Associate Administrator for Regulation and Certification.

3. **BACKGROUND.** As the state-of-the-art in simulator technology has advanced, more effective use has been made of the airplane simulator in training, checking, and certification of flightcrew members. Using flight simulators rather than airplanes in training allows for more in-depth training, including the practice of critical emergency procedures, in a safer environment. Not only do simulators provide improvements in safety and in safer training operations, they also provide such benefits as reducing noise, air pollution, and air traffic congestion, and conserving petroleum resources.

4. **OBJECTIVES AND SCOPE.** This Committee will provide a forum for the Federal Aviation Administration (FAA) and the aviation community to discuss and resolve issues regarding FSDs.

a. The general goal of the Committee is to provide advice, guidance, and recommendations on FSD issues including but not limited to safety of flight issues; the suitability and/or the application of the simulation to flight crewmember training, testing, or checking activities; and implementation of technical changes or scientific advancements in simulation. This Committee provides a forum for the FAA and affected members of the aviation community to discuss issues and develop resolutions to facilitate the evolution of FSDs. This Committee supports the international harmonization process.

b. To achieve these objectives, the Committee's initial task is to review proposed changes to Notice of Proposed Rulemaking, Notice No. 02-11 (Docket No. FAA-2002-12461), published on September 25, 2002 (67 FR 60284). Subsequent tasks will include providing advice, guidance, and recommendations on proposed changes to the Qualification Performance Standards appendices in 14 CFR part 60.

c. The Associate Administrator for Regulation and Certification will provide definitive tasking statements and assignments to the Committee

5. PROCEDURES.

a. The Committee provides advice and recommendations to the Associate Administrator for Regulation and Certification. The Committee acts solely in an advisory capacity.

b. The Committee will discuss and present whatever input, guidance, and recommendations the members of the Committee consider relevant to disposing of issues tasked to it.

c. The Co-Chairs will determine the earliest time that the Committee members are able to convene to discuss the initial task assigned to the Committee. The Co-Chairs will conduct such meetings of the Committee as are deemed appropriate to dispose of issues tasked to it.

6. ORGANIZATION AND ADMINISTRATION.

a. The current chair of the Air Transport Association's Simulation Technical Issues Group (STIG) and the current Manager of the FAA's National Simulator Program staff will serve as Co-Chairs of the Committee.

b. The Associate Administrator for Regulation and Certification is the sponsor of the Committee and will have the sole discretion to accept or reject the members of the Committee, as proposed by the Committee co-chairs, and to increase or decrease the number of participants on the Committee. The Committee will consist of members of the aviation community representative of various viewpoints.

c. The Associate Administrator for Regulation and Certification will receive all Committee recommendations and reports. The Flight Standards Service will provide administrative support for the Committee and will provide the designated Federal official (FAA co-chair) for the Committee.

d. The Co-Chairs will:

(1) Determine, in coordination with the other members of the Committee, when a meeting is required and where it will be held.

(2) Arrange notification to all Committee members of the time and place for any meeting.

(3) Formulate an agenda for each meeting and conduct the meeting.

(4) Make requests to the Associate Administrator for Regulation and Certification for the attendance of other FAA employees at a meeting of the Committee.

c. The Committee is not required to keep minutes, but may elect to do so.

7. MEMBERSHIP.

a. Committee size will be approximately 20 members, including the co-chairs, a technical representative from the National Simulator Program, and a representative from the FAA's Office of Rulemaking. The Associate Administrator for Regulation and Certification may wish to have a representative from the FAA's Chief Counsel's office in attendance at Committee meetings to provide legal advice regarding any recommendations that may be made and a representative from the Office of Policy and Plans to provide economic advice. In addition, the Associate Administrator for Regulation and Certification may wish to have an observer from the Joint Aviation Authorities (JAA) attend Committee meetings.

b. Members of the Committee will be chosen by the Committee co-chairs, with the concurrence of the Associate Administrator for Regulation and Certification, and will form a representative cross-section of that segment of the simulation industry most closely associated with the issue at hand or most able to provide meaningful input to such deliberations.

c. Legal, economic, administrative, or contractual support provided by the FAA is not part of the Committee size. In addition, a JAA observer is not part of the Committee size.

8. COST AND COMPENSATION. The estimated cost to the Federal government of the FSD Aviation Rulemaking Committee is approximately $5,000 annually. Non-Government representatives serve without Government compensation and bear all costs related to their participation on the Committee. As non-Government representatives, the Chair and all non-FAA Committee members serve without Government compensation and bear all costs related to their participation on the Committee.

9. PUBLIC PARTICIPATION. The Committee's meetings are generally not open to the public; however, anyone in attendance other than those listed in paragraph 7.b., above, may make comments or provide input, but such comment or input must be made through one of the Committee members.

10. AVAILABILITY OF RECORDS. Subject to the conditions of the Freedom of Information Act, 5 U.S. C. Section 522, records, report, agendas, working papers, and other documents that are made available to or prepared for or by the Committee will be available for public inspection and copying at the FAA Office of Rulemaking, 800 Independence Avenue, SW., Washington, D.C. 20591. Fees will be charged for information furnished to the public in accordance with the fee schedule published in part 7 of title 49, Code of Federal Regulations.

11. PUBLIC INTEREST. The formation of the FSD Aviation Rulemaking Committee is determined to be in the public interest in connection with the performance of duties imposed on the FAA by law.

12. EFFECTIVE DATE AND DURATION. This Committee is effective on July 2, 2003. The Committee will remain in existence until July 2, 2005, unless sooner terminated or extended by the Administrator.

/s/Marion C. Blakey
Administrator

November 24, 2003

Mr. Nicholas A. Sabatini
Associate Administrator for Regulation and Certification
Federal Aviation Administration
800 Independence Ave., SW
Washington, DC 20591

Dear Mr. Sabatini:

In response to your request of the Flight Simulation Device Aviation Rulemaking Committee (FSD ARC), we have completed our review of the Part 60 Notice of Proposed Rule Making and have the attached recommendations that we believe are clarifying and are within the scope of the NPRM.

The overwhelming majority of the FSD ARC members present at the ARC meeting held October 20-24 have reached consensus that the part 60 rulemaking effort should go forward with the changes we have recommended in the attached documents. All of the representatives present, without any objection, believe it is imperative that the ARC QPS revision effort continue, including its pursuit of harmonization with the International Civil Aviation Organization (ICAO) and European regulatory authorities regarding flight simulation qualification requirements.

This same majority of FSD ARC members have reached consensus to remove Level 2/3 Flight Training Devices (FTDs) from the rule making effort. However, we believe that standards for Level 1/2/3 FTDs must be codified and it would be appropriate for the FSD ARC members to be tasked to resolve the concerns regarding these FTD levels. We believe that removing these generic simulations of aircraft from the current part 60 rulemaking effort will not pose a threat to the continued functioning of those levels of devices under current authorizations nor threaten the continued functioning of cockpit specific simulations of aircraft, represented by Level 4/5/6 FTDs under part 60. Two FSD ARC members (FlightSafety International and CAE) do not concur with the committee's recommendation to remove Level 2/3 flight training devices (FTD) from the part 60 rulemaking effort. Their objection stems largely from the fact that this action does not resolve the issue of lesser technically complex devices continuing to be granted simulation device authorizations absent structured and equally imposed standards. They would rather take the time now to resolve this issue than postpone the effort until a future rulemaking effort could be tasked to the FSD ARC and yield successful results.

Despite these two objections to the majority consensus that Level 2/3 FTDs can be removed from the part 60 requirements until such time as the disputed FTD levels can be codified, all of the FSD ARC members present October 20-24, without objection, believe it is essential that the part 60 rule language not include waiver provisions regarding Level 4/5/6 FTDs as proposed in the Aircraft Owners and Pilots Association letter to you dated September 3, 2003. We believe such waiver language would be inappropriate because failure to have consistent standards for Level 4/5/6 FTDs by which these devices are determined to be qualified to fulfill specified training, certification and experience requirements would create several problems: First, it would create uncertainty in the FTD manufacturing market. Second, it could create an unleveled playing field among manufacturers and among FTD operators. Finally, and most importantly, this failure would create uncertainty that devices that might be similarly classified in the future will actually provide greatly variant levels of safety, training, and experience. Accordingly, we recommend that the part 60 rule language not include waiver provisions regarding Level 4/5/6 FTDs. Instead, we believe the exemption process is available to examine, on a case-by-case basis, whether any specific level 4/5/6 FTD should be exempt from the part 60 requirements.

Everyone present at the ARC meeting held October 20-24 recommends that you task the FSD ARC to begin work on the first revision of the QPS appendices beginning in January 2004. In doing so, the QPS changes that will be necessary to achieve the desired level of harmonization will be ready to publish as an NPRM, the FAA can obtain public comment on these revisions, and greater harmonization may be realized in the shortest time possible after publication of the final rule.

Additionally, and similar to the above position regarding continuation of the ARC QPS revision process for harmonization, we agree that it is important to continue the FSD ARC effort to resolve the disposition of and codify those FTDs now referred to as Levels 1/2/3. Our recommendation would be that these additional tasking efforts run in parallel.

We believe the FSD ARC is a very worthwhile process for both the current effort and to meet changes that may be appropriate to make in the future. The members and participants appreciate the opportunity to participate in this innovative approach to rulemaking that affords the aviation industry an opportunity to provide advice and recommendations on regulations that affect our industry and will help ensure that our regulatory process and standards continue to occupy a preeminent position in world aviation matters.

Once again, thank you for the opportunity to participate in this innovative approach to rulemaking, and we look forward to additional tasking.

Sincerely,

/s/ Ron Shoulars	/s/ Ed Cook
Industry Co-Chair	FAA Co-Chair

Attachments
(1) FSD ARC members and participants at 10/6-10 and 10/20-24 meetings
(2) FSD ARC Recommendation on part 60 rule language and QPS appendices

Flight Simulation Device Aviation Rulemaking Committee
October 6-10, 2003

Make √ if present (and make any changes to contact information)

√	Name	Organization	Mailing Address	E-mail Address
√	Ian Bateman	Thales	Thales Training and Simulation Gatwick Road Crawley, England U.K.	ian.bateman@thales-tts.com or idbateman@aol.com
√	Mike Brown	UA	7401 MLK Blvd. Denver, CO 80207	michael.d.brown@ual.com
√	Jon Carpenter	Delta	Hartsfield Airport Dept. 215 Atlanta, GA 30320	jon.carpenter@delta.com
√	Ron Carter	Flight Safety	2700 N. Hemlock Circle Broken Arrow, OK	ronc@ssd.fsi.com
	Jose Castedo	FAA, APO-310	800 Independence Ave., SW Washington, DC 20591	jose.castedo@faa.gov
√	Patrick Cleary	NWA	2600 Lone Oak Point Eagan, MN 55121	patrick.cleary@nwa.com
√	Stephane Clement	CAE	8585 Cote de Liesse P.O. Box 1800 St. Laurent, QC Canada, H4L 4X4	stephane.clement@cae.com
√	Joe Conte	FAA, AGC-220	800 Independence Ave., SW Washington, DC 20591	joe.conte@faa.gov
√	Ed Cook	FAA, AFS-205	National Simulator Program P.O. Box 20636 Atlanta, GA 30320	edward.d.cook@faa.gov
√	Michael Dennard	FedEx	3855 Airways Memphis, TN 38116	mldennard@fedex.com

Flight Simulation Device Aviation Rulemaking Committee
October 6-10, 2003

Make √ if present (and make any changes to contact information)

√	Name	Organization	Mailing Address	E-mail Address
√	Andrew Emery	The Regulatory Group	1015 18th Street NW Suite 500 Washington, DC 20036	andrew@reg-group.com
√	Al Gleske	FSI	3425 Hidden River View Road Annapolis, MD 21403-5025	al.gleske@flightsafety.com
√	Luis Gutierrez (attended only on 10/6)	AOPA	421 Aviation Way Frederick, MD 21701	luis.gutierrez@aopa.org
√	Rob Hackman (attended only on 10/6)	AOPA	421 Aviation Way Frederick, MD 21701	robert.hackman@aopa.org
√	Ron Hancock	Co Air	17441 JFK Blvd. Houston, TX 77032	rhanco@coair.com
	Donald Irving	JAA	P.O. Box 3000 2130 KA Hoofddorf The Netherlands	donirving@btinternet.com
	Mark Johnson	Pan Am	22375 Broderick Drive Sterling, VA	mjohnson@panamacademy.com
	Carl Lapiska	Bombardier	PO Box 619011 DFW Airport, TX 75261	carl.lapiska@businessacft.bombardier.com
	Alex Marodi	US Airways	Simulator Engineering P.O. Box 12346-S100 Pittsburgh, PA 15231	amarodi@usairways.com
	Jim McKie	Air Transport Association	1301 Pennsylvania Ave., NW Suite 1100 Washington, DC 20004	jmckie@airlines.org

Flight Simulation Device Aviation Rulemaking Committee
October 6-10, 2003

Make √ if present (and make any changes to contact information)

√	Name	Organization	Mailing Address	E-mail Address
√	Ainsley Nathan	Alteon	P.O. Box 34787 MC 20-42 Seattle, WA 98124	ainsley.nathan@alteontraining.com
√	Ken Neville	Boeing	P.O. Box 3707 MC 67-62 Seattle, WA 98124-2207	kendall.w.neville@boeing.com
√	Cindy Nordlie	FAA, ARM-108	800 Independence Ave., SW Washington, DC 20591	cindy.nordlie@faa.gov
√	Lance Nuckolls (attended only on 10/6)	FAA, AFS-840	800 Independence Ave., SW Washington, DC 20591	lance.nuckolls@faa.gov
√	Ron Padgett	FAA, AFS-205	National Simulator Program P.O. Box 20636 Atlanta, GA 30320	ron.padgett@faa.gov
√	Itash Samani	CAE Simuflite	2929 W. Airfield Drive DFW Airport, TX 75261	itash.samani@cae.com
√	Scott C. Schleiffer	ALPA	426 Summit Street Algonquin, IL 60102	sardawg@attglobal.net
√	Randy Schwellinger	Atlas Air, Inc.	P.O. Box 669002 Miami Springs, FL 33266	rschwellinger@atlasair.com
√	Ron Shoulars	AA	P.O. Box 619617 MD863 DFW Airport, TX 75261-9617	ron.shoulars@aa.com
√	Stefan Sobol	Pan Am	22375 Broderick Drive Sterling, VA 20166	ssobol@panamacademy.com
√	Charlie Strickland	Alteon Training	6601 NW 36th Street Miami, FL 33166	charlie.strickland@alteontraining.com

Flight Simulation Device Aviation Rulemaking Committee
October 20-24, 2003

Make √ if present (and make any changes to contact information)

√	Name	Organization	Mailing Address	E-mail Address
√	Ian Bateman	Thales	Thales Training and Simulation Gatwick Road Crawley, England RH109RL U.K.	ian.bateman@thales-tts.com or idbateman@aol.com
√	Mike Brown	UA	7401 MLK Blvd. Denver, CO 80207	michael.d.brown@ual.com
√	Jon Carpenter	Delta	PO Box 20706 Dept. 215 Atlanta, GA 30320-6001	jon.carpenter@delta.com
√	Ron Carter	Flight Safety	2700 N. Hemlock Circle Broken Arrow, OK 74012-1159	ronc@ssd.fsi.com
	Jose Castedo	FAA, APO-310	800 Independence Ave., SW Washington, DC 20591	jose.castedo@faa.gov
√	Patrick Cleary	Northwest Airlines	Dept N7860 2600 Lone Oak Point Eagan, MN 55121	patrick.cleary@nwa.com
√	Stephane Clement	CAE	8585 Cote de Liesse P.O. Box 1800 St. Laurent, QC Canada, H4L 4X4	stephane.clement@cae.com
√	Joe Conte	FAA, AGC-220	800 Independence Ave., SW Washington, DC 20591	joe.conte@faa.gov
√	Ed Cook	FAA, AFS-205	National Simulator Program P.O. Box 20636 Atlanta, GA 30320	edward.d.cook@faa.gov
	Michael Dennard	FedEx	3855 Airways Memphis, TN 38116	mldennard@fedex.com
√	Andrew Emery	The Regulatory Group	1015 18th Street NW Suite 500 Washington, DC 20036	andrew@reg-group.com
√	Al Gleske	FSI	3425 Hidden River View Road Annapolis, MD 21403-5025	al.gleske@flightsafety.com
	Luis Gutierrez	AOPA	421 Aviation Way Frederick, MD 21701	luis.gutierrez@aopa.org
	Rob Hackman	AOPA	421 Aviation Way Frederick, MD 21701	robert.hackman@aopa.org
√	Ron Hancock	Co Air	17441 JFK Blvd. Houston, TX 77032	rhanco@coair.com

Flight Simulation Device Aviation Rulemaking Committee
October 20-24, 2003

Make √ if present (and make any changes to contact information)

	Donald Irving	JAA	P.O. Box 3000 2130 KA Hoofddorf The Netherlands	donirving@btinternet.com
	Mark Johnson	Pan Am	22375 Broderick Drive Sterling, VA	mjohnson@panamacademy.com
	Carl Lapiska	Bombardier	PO Box 619011 DFW Airport, TX 75261	carl.lapiska@businessacft.bombardier. com
√	Alex Marodi	US Airways	Simulator Engineering P.O. Box 12346-S100 Pittsburgh, PA 15231	amarodi@usairways.com
	Jim McKie	Air Transport Association	1301 Pennsylvania Ave., NW Suite 1100 Washington, DC 20004	jmckie@airlines.org

Flight Simulation Device Aviation Rulemaking Committee
October 20-24, 2003

Make √ if present (and make any changes to contact information)

√	Name	Organization	Mailing Address	E-mail Address
√	Ainsley Nathan	Alteon	P.O. Box 34787 M/C 20-92 Seattle, WA 98124-1787	ainsley.nathan@alteontraining. com
√	Ken Neville	Boeing	P.O. Box 3707 MC 67- 62 Seattle, WA 98124-2207	kendall.w.neville@boeing.com
√	Cindy Nordlie	FAA, ARM-108	800 Independence Ave., SW Washington, DC 20591	cindy.nordlie@faa.gov
	Lance Nuckolls	FAA, AFS-840	800 Independence Ave., SW Washington, DC 20591	lance.nuckolls@faa.gov
√	Ron Padgett	FAA, AFS-205	National Simulator Program P.O. Box 20636 Atlanta, GA 30320	ron.padgett@faa.gov
√	Chip Reahard	FAA, AFS-205	National Simulator Program P.O. Box 20636 Atlanta, GA 30320	
√	Itash Samani	CAE Simuflite	2929 W. Airfield Drive DFW Airport, TX 75261	itash.samani@cae.com
	Scott C. Schleiffer	ALPA	426 Summit Street Algonquin, IL 60102	sardawg@attglobal.net
√	Randy Schwellinger	Atlas Air, Inc.	P.O. Box 669002 Miami Springs, FL 33266	rschwellinger@atlasair.com

Flight Simulation Device Aviation Rulemaking Committee
October 20-24, 2003

Make √ if present (and make any changes to contact information)

√	Ron Shoulars	AA	P.O. Box 619617 MD863 DFW Airport, TX 75261-9617	ron.shoulars@aa.com
√	Stefan Sobol	Pan Am	22375 Broderick Drive Sterling, VA 20166	ssobol@panamacademy.com
√	Charlie Strickland	Alteon Training	6601 NW 36th Street Miami, FL 33166	charlie.strickland@alteontraining.com

The Amendment

The Federal Aviation Administration amends Title 14, Chapter I of the Code of Federal Regulations as follows:

PART 1 – DEFINITIONS AND ABBREVIATIONS

1. The authority citation for part 1 continues to read as follows:

Authority: 49 U.S.C. 106(g), 40113, 44701.

2. Section 1.1 is amended by adding new definitions in alphabetical order to read as follows:

§ 1.1 General definitions.

* * * * *

Flight simulation training device (FSTD) means a flight simulator or a flight training device.

Full flight simulator (FFS) means a replica of a specific type; or make, model, and series aircraft cockpit. It includes the assemblage of equipment and computer programs necessary to represent aircraft operations in ground and flight conditions, a visual system providing an out-of-the-cockpit view, a system that provides cues at least equivalent to those of a three-degree-of-freedom motion system, and has the full range of capabilities of the systems installed in the device as described in part 60 of this chapter and the qualification performance standards (QPS) for a specific FFS qualification level.

* * * * *

Flight training device (FTD) means a replica of aircraft instruments, equipment, panels, and controls in an open flight deck area or an enclosed aircraft cockpit replica. It includes the equipment and computer programs necessary to represent aircraft (or set of aircraft) operations in ground and flight conditions having the full range of capabilities of the systems installed in the device as described in part 60 of this chapter and the qualification performance standard (QPS) for a specific FTD qualification level.

* * * * *

3. Section 1.2 is amended by adding new abbreviations in alphabetical order to read as follows:

§ 1.2 Abbreviations and symbols.

* * * * *

FSTD means flight simulation training device.

FFS means full flight simulator.

FTD means flight training device.

* * * * *

4. Part 60 is added to subchapter D to read as follows:

PART 60 – FLIGHT SIMULATION TRAINING DEVICE INITIAL AND CONTINUING QUALIFICATION AND USE

Sec.

Authority: 49 U.S.C. 106(g), 40113, and 44701.

§ 60.1 Applicability.

(a) This part prescribes the rules governing the initial and continuing qualification and use of all aircraft flight simulation devices (FSTD) used for meeting training, evaluation, or flight experience requirements of this chapter for flightcrew member certification or qualification.

(b) The rules of this part apply to each person using or applying to use an FSTD to meet any requirement of this chapter.

(c) The requirements of § 60.33 regarding falsification of applications, records, or reports also apply to each person who uses an FSTD for training, evaluation, or obtaining flight experience required for flightcrew member certification or qualification under this chapter.

§ 60.2 Applicability of sponsor rules to persons who are not sponsors and who are engaged in certain unauthorized activities.

(a) The rules of this part, that are directed to a sponsor of an FSTD, also apply to any person who uses or causes the use of an FSTD when –

(1) That person knows that the FSTD does not have an FAA-approved sponsor; and

(2) The use of the FSTD by that person is nonetheless claimed for purposes of meeting any requirement of this chapter or that person knows or should have known that the person's acts or omissions would cause another person to mistakenly credit use of the FSTD for purposes of meeting any requirement of this chapter.

(b) A situation in which paragraph (a) of this section would not apply to a person would be when each of the following conditions are met:

(1) The person sold or leased the FSTD and merely represented to the purchaser or lessee that the FSTD is in a condition in which it should be able to obtain FAA approval and qualification under this part;

(2) The person does not falsely claim to be the FAA-approved sponsor for the FSTD;

(3) The person does not falsely make representations that someone else is the FAA-approved sponsor of the FSTD at a time when that other person is not the FAA-approved sponsor of the FSTD; and

(4) The person's acts or omissions do not cause another person to detrimentally rely on such acts or omissions for the mistaken conclusion that the FSTD is FAA-approved and qualified under this part at the time the FSTD is sold or leased.

§ 60.3 Definitions.

In addition to the definitions in part 1 of this chapter, for the purpose of this part, the following terms and definitions apply:

Certificate holder. A person issued a certificate under parts 119, 141, or 142 of this chapter or a person holding an approved course of training for flight engineers in accordance with part 63 of this chapter.

Evaluation. With respect to an individual, the checking, testing, or review associated with flightcrew member qualification, training, and certification under parts 61, 63, 121, or 135 of this chapter. With respect to an FSTD, the qualification activities (e.g., the objective and subjective tests, the inspections, the continuing qualification evaluations.) associated with the requirements of this part.

Flight experience. Flight experience means recency of flight experience for landing credit purposes.

Flight test data. Actual aircraft data collected by the aircraft manufacturer (or other supplier of data that are acceptable to the NSPM) during an aircraft flight test program.

FSTD Directive. A document issued by the FAA to an FSTD sponsor, requiring a modification to the FSTD due to a recognized safety-of-flight issue and amending the qualification basis for the FSTD.

FSTD Performance. The overall performance of the FSTD includes aircraft performance (e.g., thrust/drag relationships, climb, range) as well as flight and ground handling.

Master Qualification Test Guide (MQTG). The FAA-approved Qualification Test Guide with the addition of the FAA-witnessed test results, applicable to each individual FSTD.

National Simulator Program Manager (NSPM). The FAA manager responsible for the overall administration and direction of the National Simulator Program (NSP), or a person approved by the NSPM .

Objective test. A quantitative measurement and evaluation of FSTD performance..

Predicted data. Estimations or extrapolations of either existing flight test data or data from other simulation models using engineering analyses, engineering simulations, design data, and/or wind tunnel data.

Qualification level. The categorization of an FSTD established by the NSPM, based on the FSTD's demonstrated technical and operational capabilities as set out in this part.

Qualification Performance Standard (QPS). The collection of procedures and criteria published by the FAA to be used when conducting objective tests and subjective tests, including general FSTD requirements, for establishing FSTD qualification levels. . The QPS are set forth in the following FAA appendices: Appendix A, for Airplane Simulators; Appendix B, for Airplane Flight Training Devices; Appendix C, for Helicopter Simulators; Appendix D, for Helicopter Flight Training Devices; and Appendix E for Quality Management Systems for Flight Simulation Training Devices.

Qualification Test Guide (QTG). The primary reference document used for initially evaluating an aircraft FSTD. It contains test results, statements of compliance and capability, the configuration of the aircraft simulated, and other information for the evaluator to assess the FSTD against the applicable regulatory criteria. The addition of the FAA-witnessed tests, conducted during the successful initial evaluation, into the QTG converts this document into the Master Qualification Test Guide (MQTG).

Set of aircraft. Aircraft that share similar handling, performance, and operating characteristics; similar operating envelopes; and have the same number and type of propulsion systems (i.e., engines, or engine and propeller/rotor combinations).

Sponsor. A certificate holder who seeks or maintains FSTD qualification and is responsible for the prescribed actions as set out in this part and the QPS for the appropriate FSTD and qualification level.

Subjective test. A qualitative assessment of the performance and operation of the FSTD.

Training Program Approval Authority (TPAA). A person authorized by the Administrator to approve the aircraft flight training program in which the FSTD will be used.

Upgrade. The improvement or enhancement of an FSTD for the purpose of achieving a higher qualification level.

§ 60.4 Qualification Performance Standards.

The Qualification Performance Standards (QPS) are published in Appendices to this part as follows:

(a) Appendix A contains the QPS for Airplane Flight Simulators.

(b) Appendix B contains the QPS for Airplane Flight Training Devices.

(c) Appendix C contains the QPS for Helicopter Flight Simulators.

(d) Appendix D contains the QPS for Helicopter Flight Training Devices.

(e) Appendix E contains the QPS for Quality Management Systems for FSTD's.

(f) Appendix F contains the QPS for Definitions and Abbreviations for FSTD's.

§ 60.5 Quality management system.

(a) After [insert date 24 months after effective date of the final rule], no sponsor may use or allow the use of or offer the use of an FSTD for flightcrew member training or evaluation or for obtaining flight experience to meet any requirement of this chapter unless the sponsor has established and follows a quality management system (QMS), currently approved by the NSPM, for the continuing surveillance and analysis of the sponsor's performance and effectiveness in providing a satisfactory FSTD for use on a regular basis as described in QPS Appendix E.

(b) The QMS program must provide a process for identifying deficiencies in the program and for documenting how the program will be changed to address these deficiencies.

(c) Whenever the NSPM finds that the QMS program does not adequately address the procedures necessary to meet the requirements of this part, the sponsor must, after notification by the NSPM, change the program so the procedures meet the requirements of this part. Each such change must be approved by the NSPM prior to implementation.

(d) Within 30 days after the sponsor receives a notice described in § 60.5(c), the sponsor may file a petition with the Director of Flight Standards Service (the Director) for reconsideration of the NSPM finding. The sponsor must address its petition to the Director, Flight Standards Service, AFS-1, Federal Aviation Administration, 800 Independence Ave., SW., Washington, DC 20591. The filing of such a petition to reconsider stays the notice pending a decision by the Director. However, if the Director finds that there is situation that requires immediate action in the interest of safety in air commerce, he may, upon a statement of the reasons, require a change effective without stay.

§ 60.7 Sponsor qualification requirements.

(a) A person is eligible to apply to be a sponsor of an FSTD if the following conditions are met:

(1) The person holds, or is an applicant for, a certificate under part 119, 141, or 142 of this chapter; or holds, or is an applicant for, an approved flight engineer course in accordance with part 63 of this chapter.

(2) The FSTD will be used, or will be offered for use, in the sponsor's FAA-approved flight training program for the aircraft being simulated as evidenced in a request for evaluation submitted to the NSPM.

(b) A person is a sponsor if the following conditions are met:

(1) The person is a certificate holder under part 119, 141, or 142 of this chapter or has an approved flight engineer course in accordance with part 63 of this chapter.

(2) The person has –

(i) Operations specifications authorizing the use of the specific aircraft or set of aircraft and has an FAA-approved training program under which at least one FSTD, simulating the aircraft or set of aircraft and for which the person is the sponsor, is used by the sponsor as described in subparagraphs (5) or (6) of this section; or

(ii) Training specifications or an FAA-approved course of training under which at least one FSTD, simulating that aircraft or set of aircraft and for which the person is the sponsor, is used by the sponsor as described in subparagraphs (5) or (6) of this section.

(3) The person has a quality management system currently approved by the NSPM in accordance with § 60.5.

(4) The NSPM has accepted the person as the sponsor of the FSTD and that acceptance has not been withdrawn by the FAA.

(5) At least one FSTD [as referenced in § 60.7(b)(2)(i) or (ii)] that is initially qualified on or after [insert effective date of this rule], is used within the sponsor's FAA-approved flight training program for the aircraft or set of aircraft at least once within the 12-month period following the initial/upgrade evaluation, and at least once within each subsequent 12-month period thereafter.

(6) At least one FSTD [as referenced in § 60.7(b)(2)(i) or (ii)] that was qualified prior to [insert effective date of this rule], is used within the sponsor's FAA-approved flight training program for the aircraft or set of aircraft at least once within the 12-month period following the first continuing qualification evaluation conducted by the NSP after [insert the effective date of this rule] and at least once within each subsequent 12-month period thereafter.

(c) If the use requirements of paragraphs (b)(2) and either (b)(5) or (b)(6) of this section are not met, the person will forfeit the right to sponsor that FSTD and that person will not be eligible to apply to sponsor that FSTD for at least 12 calendar months following the expiration of the qualification status.

(d) In addition to the FSTD described in paragraph (b) of this section, an FSTD sponsor may sponsor any number of other FSTD's regardless of specific aircraft or set of aircraft provided either–

(1) All of the other FSTD's are used within the sponsor's or another certificate holder's FAA-approved flight training program for the aircraft or set of aircraft simulated; or

(2) The sponsor obtains a written statement at least annually from a qualified pilot who has flown the aircraft or set of aircraft (as appropriate) during the preceding 12-month period stating that the subject FSTD's performance and handling qualities, within the normal operating envelope, represent the aircraft or set of aircraft described in the FAA Type Certificate and the type data sheet, if appropriate. The sponsor must retain the two most current written statements for review by the NSPM.

§ 60.9 Additional responsibilities of the sponsor.

(a) The sponsor must allow the NSPM upon request to inspect the FSTD as soon as practicable. This inspection may include all records and documents relating to the FSTD, to determine its compliance with this part.

(b) The sponsor must, for each FSTD –

(1) Establish a mechanism to receive written comments regarding the FSTD and its operation in accordance with the QPS Appendix E.

(2) Post in or adjacent to the FSTD the Statement of Qualification issued by the NSPM. An electronic copy of the Statement of Qualification that may be accessed by an appropriate terminal or display in or adjacent to the FSTD will be satisfactory.

(c) Each sponsor of an FSTD must identify to the NSPM by name, one individual to be the management representative (MR).

(1) One person may serve as an MR for more than one FSTD, but one FSTD must not have more than one person serving in this capacity.

(2) Each MR must be an employee of the sponsor with the responsibility and authority to –

(i) Monitor the on-going qualification of assigned FSTD's to ensure that all matters regarding FSTD qualification are being carried out as provided for in this part;

(ii) Ensure that the QMS is properly established, implemented, and maintained by overseeing the structure (and modifying where necessary) of the QMS policies, practices, and procedures;

(iii) Regularly brief sponsor's management on the status of the on-going FSTD qualification program and the effectiveness and efficiency of the QMS.

(3) The MR serves as the primary contact point for all matters between the

sponsor and the NSPM regarding the qualification of that FSTD as provided for in this part.

(4) The MR may delegate the duties described in § 60.9(c)(2) and (3) to an individual at each of the sponsor's locations.

§ 60.11 FSTD use.

No person may use or allow the use of or offer the use of an FSTD for flightcrew member training or evaluation or for obtaining flight experience to meet any of the requirements under this chapter unless, in accordance with the QPS for the specific device, the FSTD –-

(a) Has a single sponsor who is qualified under § 60.7. The sponsor may arrange with another person for services of document preparation and presentation, as well as FSTD inspection, maintenance, repair, and servicing; however, the sponsor remains responsible for ensuring that these functions are conducted in a manner and with a result of continually meeting the requirements of this part.

(b) Is qualified as described in the Statement of Qualification.

(c) Remains qualified, through satisfactory inspection, continuing qualification evaluations, appropriate maintenance, and use requirements in accordance with this part and the appropriate QPS.

(d) Functions during day-to-day training, evaluation, or flight experience activities with the software and hardware that was evaluated as satisfactory by the NSPM and, if modified, modified only in accordance with the provisions of this part. However, this section does not apply to routine software or hardware changes that do not fall under the requirements of § 60.23.

(e) Is operated in accordance with the provisions and limitations of § 60.25.

§ 60.13 FSTD objective data requirements.

(a) Except as provided in paragraph (b) and (c) of this section, for the purposes of validating FSTD performance and handling qualities during evaluation for qualification, the data made available to the NSPM (the validation data package) must include the aircraft manufacturer's flight test data and all relevant data developed after the type certificate was issued (e.g., data developed in response to an airworthiness directive) if such data results from a change in performance, handling qualities, functions, or other characteristics of the aircraft that must be considered for flightcrew member training, evaluation, or for meeting experience requirements of this chapter.

(b) The validation data package may contain flight test data from a source in addition to or independent of the aircraft manufacturer's data in support of an FSTD qualification, but only if this data is gathered and developed by that source in accordance with flight test methods, including a flight test plan, as described in the appropriate QPS.

(c) The validation data package may also contain predicted data, engineering simulation data, data from pilot owner or pilot operating manuals, or data from public domain sources provided this data is acceptable to the NSPM and, if found acceptable, may then be used in particular applications for FSTD qualification.

(d) Data or other material or elements must be submitted in a form and manner acceptable to the NSPM.

(e) The NSPM may require additional objective data, which may include flight testing if necessary, if the validation data package does not support FSTD qualification requirements as described in this part and the appropriate QPS appendix.

§ 60.14 Special equipment and personnel requirements for qualification of the FSTD.

When notified by the NSPM, the sponsor must make available all special equipment and qualified personnel needed to accomplish or assist in the accomplishment of tests during initial, continuing qualification, or special evaluations.

§ 60.15 Initial qualification requirements.

(a) For each FSTD, the sponsor must submit a request to the NSPM to evaluate the FSTD for initial qualification at a specific level and simultaneously request the TPAA forward a concurring letter to the NSPM. The request must be submitted in the form and manner described in the appropriate QPS.

(b) The management representative described in § 60.9(c) must sign a statement (electronic signature is acceptable for electronic transmissions) after confirming the following:

(i) The performance and handling qualities of the FSTD represents those of the aircraft or set of aircraft within the normal operating envelope. This determination must be made by a pilot(s) meeting the requirements of paragraph (e) of this section after having flown all of the operations tasks listed in the Table of Functions and Subjective Tests set out in the FSTD subject tests attachment to the appropriate QPS appendix relevant to the qualification level of the FSTD. Exceptions, if any, must be noted. The name of the person(s) making this determination must be available to the NSPM upon request.

(ii) The FSTD systems and sub-systems (including the simulated aircraft systems) functionally represent those in the aircraft or set of aircraft. This determination must be made by the pilot(s) described in paragraph (b)(i) of this section, or by a person(s) trained on simulator systems/sub-systems and trained on the operation of the simulated aircraft systems, after having exercised the operation of the FSTD and the pertinent functions available through the Instructor Operating Station(s). Exceptions, if any, must be noted. The name of the person(s) making this determination must be available to the NSPM upon request.

(iii) The cockpit represents the configuration of the specific type; or aircraft make, model, and series aircraft being simulated, as appropriate. This determination must be made by the pilot(s) described in paragraph (b)(i) of this section, or by a person(s) trained on the configuration and operation of the aircraft simulated. Exceptions, if any, must be noted. The name of the person(s) making this determination must be available to the NSPM upon request.

(c) Except for those FSTD's previously qualified and described in § 60.17, each FSTD evaluated for initial qualification must meet the standard that is in effect at the time of the evaluation. However –

(1) If the FAA publishes a change to the existing standard or publishes a new standard for the evaluation for initial qualification, a sponsor may request that the NSPM

apply the standard that was in effect when an FSTD was ordered for delivery if the sponsor–

(i) Within 30 days of the publication of the change to the existing standard or publication of the new standard, notifies the NSPM that an FSTD has been ordered;

(ii) Within 90 days of the NSPM notification described in paragraph (c)(1)(i) of this section, requests that the standard in effect at the time the order was placed be used for the evaluation for initial qualification; and

(iii) The evaluation is conducted within 24 months following the publication of the change to the existing standard or publication of the new standard, unless circumstances beyond the control of the sponsor prevent the evaluation from occurring within that time.

(2) This notification must include a description of the FSTD; the anticipated qualification level of the FSTD; the make, model, and series of aircraft simulated; and any other pertinent information.

(3) Any tests, tolerances, or other requirements that that are current at the time of the evaluation may be used during the initial evaluation, at the request of the sponsor, if the sponsor provides acceptable updates to the required qualification test guide.

(4) The standards used for the evaluation for initial qualification will be used for all subsequent evaluations of the FSTD.

(d) The pilot(s) who contributes to the confirmation statement required by paragraph (b) of this section must --

(1) Be designated by the sponsor; and

(2) Be qualified in --

(i) The aircraft or set of aircraft being simulated; or

(ii) For aircraft not yet issued a type certificate, or aircraft not previously operated by the sponsor or not having previous FAA-approved training programs conducted by the sponsor, an aircraft similar in size and configuration.

(e) The subjective tests that form the basis for the statements described in paragraph (b) of this section and the objective tests referenced in paragraph (f) of this section must be accomplished at the sponsor's training facility except as provided for in the appropriate QPS.

(f) The person seeking to qualify the FSTD must provide the NSPM access to the FSTD for the length of time necessary for the NSPM to complete the required evaluation of the FSTD for initial qualification, which includes the conduct and evaluation of objective and subjective tests, including general FSTD requirements, as described in the appropriate QPS, to determine that the FSTD meets the standards in that QPS.

(g) When the FSTD passes an evaluation for initial qualification, the NSPM issues a Statement of Qualification that includes all of the following:

(1) Identification of the sponsor.

(2) Identification of the make, model, and series of the aircraft or set of aircraft being simulated.

(3) Identification of the configuration of the aircraft or set of aircraft being simulated (e.g., engine model or models, flight instruments, navigation or other systems, etc.).

(4) A statement that the FSTD is qualified as either a full flight simulator or a flight training device.

(5) Identification of the qualification level of the FSTD.

(6) A statement that (with the exception of the noted exclusions for which the FSTD has not been subjectively tested by the sponsor or the NSPM and for which qualification is not sought) the qualification of the FSTD includes the tasks set out in the appropriate QPS appendix relevant to the qualification level of the FSTD.

(h) After the NSPM completes the evaluation for initial qualification, the sponsor must update the QTG, with the results of the FAA-witnessed tests and demonstrations together with the results of all the objective tests and demonstrations described in the appropriate QPS.

(i) Upon issuance of the Statement of Qualification the updated QTG becomes the MQTG and must be made available to the NSPM upon request.

§ 60.16 Additional qualifications for a currently qualified FSTD.

(a) A currently qualified FSTD is required to undergo an additional qualification process if a user intends to use the FSTD for meeting training, evaluation, or flight experience requirements of this chapter beyond the qualification issued for that FSTD. This process consists of the following:

(1) The sponsor:

(i) Must submit to the NSPM all modifications to the MQTG that are required to support the additional qualification.

(ii) Must describe to the NSPM all modifications to the FSTD that are required to support the additional qualification.

(iii) Must submit to the NSPM a confirmation statement as described in § 60.15(c) that a pilot, designated by the sponsor in accordance with § 60.15(d) has subjectively evaluated the FSTD in those areas not previously evaluated.

(2) The FSTD must successfully pass an evaluation –

(i) Consisting of all the elements of an initial evaluation for qualification, in accordance with § 60.15, in those circumstances where the NSPM has determined that all the elements of an initial evaluation for qualification is necessary; or

(ii) Consisting of those elements of an initial evaluation for qualification (e.g., objective tests or subjective tests) designated as necessary by the NSPM.

(b) In making the determinations described in paragraph (a)(2) of this section, the NSPM considers factors including the existing qualification of the FSTD, any modifications to the FSTD hardware or software that are involved, and any additions or modifications to the MQTG.

(c) The FSTD is qualified for the additional uses when the NSPM issues an amended Statement of Qualification in accordance with § 60.15(h).

(d) The sponsor may not modify the FSTD except as described in § 60.23.

§ 60.17 Previously qualified FSTD's.

(a) Unless otherwise specified by an FSTD Directive, further referenced in the appropriate QPS, or as specified in paragraph (e) of this section, an FSTD qualified before [Insert effective date of final rule] will retain its qualification basis as long as it continues to meet the standards, including the objective test results recorded in the MQTG and subjective tests, under which it was originally evaluated, regardless of sponsor. The sponsor of such an FSTD must comply with the other applicable provisions of this part.

(b) For each FSTD qualified before [Insert effective date of the final rule], no sponsor may use or allow the use of or offer the use of such an FSTD after [Insert date 6 years after the effective date of the final rule] for flightcrew member training, evaluation or flight experience to meet any of the requirements of this chapter, unless that FSTD has been issued a Statement of Qualification, including the Configuration List and Restrictions to the Qualification List in accordance with the procedures set out in the appropriate QPS.

(c) If the FSTD qualification is lost under § 60.27 and –

(i) Restored under § 60.27 in less than (2) years, the qualification basis (in terms of objective tests and subjective tests) for the re-qualification will be those against which the FSTD was originally evaluated and qualified.

(ii) Not restored under § 60.27 for two (2) years or more, the qualification basis (in terms of objective tests and subjective tests) for the re-qualification will be those standards in effect and current at the time of re-qualification application.

(d) Except as provided in paragraph (e) of this section, any change in FSTD qualification level initiated on or after [Insert the effective date of this rule] requires an evaluation for initial qualification in accordance with this part.

(e) A sponsor may request that an FSTD be permanently downgraded. In such a case, the NSPM may downgrade a qualified FSTD without requiring and without conducting an initial evaluation for the new qualification level. Subsequent continuing qualification evaluations will use the existing MQTG, modified as necessary to reflect the new qualification level.

(f) When the sponsor has appropriate validation data available and receives approval from the NSPM, the sponsor may adopt tests and associated tolerances described in the current qualification standards as the tests and tolerances applicable for the continuing qualification of a previously qualified FSTD. The updated test(s) and tolerance(s) must be made a permanent part of the MQTG.

§ 60.19 Inspection, continuing qualification evaluation, and maintenance requirements.

(a) Inspection. No sponsor may use or allow the use of or offer the use of an FSTD for flightcrew member training, evaluation, or flight experience to meet any of the requirements of this chapter unless the sponsor does the following:

(1) Accomplishes all appropriate QPS Attachment 2 objective tests each year as specified in the appropriate QPS.

(2) Completes a functional preflight check within the preceding 24 hours.

(b) Continuing qualification evaluation.

(1) This evaluation consists of objective tests, and subjective tests, including general FSTD requirements, as described in the appropriate QPS or as may be amended by an FSTD Directive.

(2) The sponsor must contact the NSPM to schedule the FSTD for continuing qualification evaluations not later than 60 days before the evaluation is due.

(3) The sponsor must provide the NSPM access to the objective test results in the MQTG and access to the FSTD for the length of time necessary for the NSPM to complete the required continuing qualification evaluations.

(4) The frequency of NSPM-conducted continuing qualification evaluations for each FSTD will be established by the NSPM and specified in the MQTG.

(5) Continuing qualification evaluations conducted in the calendar month before or after the calendar month in which these continuing qualification evaluations are required will be considered to have been conducted in the calendar month in which they were required.

(6) No sponsor may use or allow the use of or offer the use of an FSTD for flightcrew member training or evaluation or for obtaining flight experience for the flightcrew member to meet any requirement of this chapter unless the FSTD has passed an NSPM-conducted continuing qualification evaluation within the timeframe specified in the MQTG or within the grace period as described in paragraph (b)(5) of this section.

(c) Maintenance. The sponsor is responsible for continuing corrective and preventive maintenance on the FSTD to ensure that it continues to meet the requirements of this part and the appropriate QPS appendix. No sponsor may use or allow the use of or offer the use of an FSTD for flightcrew member training, evaluation, or flight experience to meet any of the requirements of this chapter unless the sponsor does the following:

(1) Maintains a discrepancy log.

(2) Ensures that, when a discrepancy is discovered, the following requirements are met:

(i) A description of each discrepancy is entered in the log and remains in the log until the discrepancy is corrected as specified in § 60.25(b).

(ii) A description of the corrective action taken for each discrepancy, the identity of the individual taking the action, and the date that action is taken must be entered in the log.

(iii) The discrepancy log is kept in a form and manner acceptable to the Administrator and is kept in or adjacent to the FSTD. An electronic log that may be accessed by an appropriate terminal or display in or adjacent to the FSTD is satisfactory.

§ 60.20 Logging FSTD discrepancies.

Each instructor, check airman, or representative of the Administrator conducting training, evaluation, or flight experience, and each person conducting the preflight inspection who discovers a discrepancy, including any missing, malfunctioning, or inoperative components in the FSTD, must write or cause to be written a description of that discrepancy into the discrepancy log at the end of the FSTD preflight or FSTD use session.

§ 60.21 Interim qualification of FSTD's for new aircraft types or models.

(a) A sponsor may apply for and the NSPM may issue an interim qualification level for an FSTD for a new type or model of aircraft, even though the aircraft manufacturer's aircraft data package is preliminary, if the sponsor provides the following to the satisfaction of the NSPM—

(1) The aircraft manufacturer's data, which consists of at least predicted data, validated by a limited set of flight test data;

(2) The aircraft manufacturer's description of the prediction methodology used to develop the predicted data; and

(3) The QTG test results.

(b) An FSTD that has been issued interim qualification is deemed to have been issued initial qualification unless the NSPM rescinds the qualification. Interim qualification terminates two years after its issuance, unless the NSPM determines that specific conditions warrant otherwise.

(c) Within twelve months of the release of the final aircraft data package by the aircraft manufacturer but no later than two years after the issuance of the interim qualification status the sponsor must apply for initial qualification in accordance with § 60.15 based on the final aircraft data package approved by the aircraft manufacturer, unless the NSPM determines that specific conditions warrant otherwise.

(d) An FSTD with interim qualification may be modified only in accordance with § 60.23.

§ 60.23 Modifications to FSTD's.

(a) Description of a modification. For the purposes of this part, an FSTD is said to have been modified when:

(1) Equipment or devices intended to simulate aircraft appliances are added to or removed from the Statement of Qualification, or change the MQTG; or

(2) Changes are made to either software or hardware that are intended to impact flight or ground dynamics; changes that impact performance or handling characteristics of the FSTD (including motion, visual, control loading, or sound systems for those FSTD levels requiring sound tests and measurements); or added to or removed from the Statement of Qualification; or change the MQTG.

(b) FSTD Directive. When the FAA determines that FSTD modification is necessary for safety of flight reasons, the sponsor of each affected FSTD must ensure that the FSTD is modified according to the FSTD Directive regardless of the original qualification standards applicable to any specific FSTD.

(c) Using the modified FSTD. The sponsor may not use, or allow the use of, or offer the use of, the FSTD with the proposed modification for flightcrew member training or evaluation or for obtaining flight experience for the flightcrew member to meet any requirement of this chapter unless:

(1) The sponsor has notified the NSPM and the TPAA of their intent to incorporate the proposed modification, and one of the following has occurred;

(i) Twenty-one days have passed since the sponsor notified the NSPM and the TPAA of the proposed modification and the sponsor has not received any response from either the NSPM or the TPAA;

(ii) Twenty-one days have passed since the sponsor notified the NSPM and the TPAA of the proposed modification and one has approved the proposed modification and the other has not responded;

(iii) Fewer than twenty-one days have passed since the sponsor notified the NSPM and the TPAA of the proposed modification and the NSPM and TPAA both approve the proposed modification;

(iv) The sponsor has successfully completed any evaluation the NSPM may require in accordance with the standards for an evaluation for initial qualification or any part thereof before the modified FSTD is placed in service.

(2) The notification is submitted with the content as, and in a form and manner as, specified in the appropriate QPS.

(d) User notification. When a modification is made to an FSTD that affects the Statement of Qualification, the sponsor must post an addendum to the Statement of Qualification until such time as a permanent, updated statement is posted.

(e) MQTG update. The MQTG must be updated with current objective test results in accordance with §§60.15(h) and (i) and appropriate objective data in accordance with §60.13, each time an FSTD is modified and an objective test or other MQTG section is affected by the modification. If an FSTD Directive is the cause of this update, the direction to make the modification and the record of the modification completion must be filed in the MQTG.

§ 60.25 Operation with missing, malfunctioning, or inoperative components.

(a) No person may knowingly use or allow the use of or misrepresent the capability of an FSTD for any maneuver, procedure, or task that is to be accomplished to meet training, evaluation, or flight experience requirements of this chapter for flightcrew member certification or qualification when there is a missing, malfunctioning, or inoperative (MMI) component that is required to be present and correctly operate for the satisfactory completion of that maneuver, procedure, or task.

(b) Each MMI component as described in paragraph (a) of this section, or any MMI component installed and required to operate correctly to meet the current Statement of Qualification, must be repaired or replaced within 30 calendar days, unless otherwise required or authorized by the NSPM.

(c) A list of the current MMI components must be readily available in or adjacent to the FSTD for review by users of the device. Electronic access to this list via an appropriate terminal or display in or adjacent to the FSTD will be satisfactory. The discrepancy log may be used to satisfy this requirement provided each currently MMI component is listed in the discrepancy log.

§ 60.27 Automatic loss of qualification and procedures for restoration of qualification.

(a) An FSTD qualification is automatically lost when any of the following occurs:

(1) The FSTD is not used in the sponsor's FAA-approved flight training program in accordance with § 60.7(b)(5) or (b)(6) and the sponsor does not obtain and maintain the written statement as described in § 60.7(d)(2).

(2) The FSTD is not inspected in accordance with § 60.19.

(3) The FSTD is physically moved from one location and installed in a different location, regardless of distance.

(4) The MQTG is missing or otherwise not available and a replacement is not made within 30 days.

(b) If FSTD qualification is lost under paragraph (a) of this section, qualification is restored when either of the following provisions is met:

(1) The FSTD successfully passes an evaluation:

(i) For initial qualification, in accordance with § 60.15 and § 60.17(c) in those circumstances where the NSPM has determined that a full evaluation for initial qualification is necessary; or

(ii) For those elements of an evaluation for initial qualification , in accordance with § 60.15 and § 60.17(c), as determined to be necessary by the NSPM.

(2) The NSPM advises the sponsor that an evaluation is not necessary.

(c) In making the determinations described in paragraph (b) of this section, the NSPM considers factors including the number of continuing qualification evaluations missed, the number of sponsor-conducted quarterly inspections missed, and the care that had been taken of the device since the last evaluation.

§ 60.29 Other losses of qualification and procedures for restoration of qualification.

(a) Except as provided in paragraph (c) of this section, when the NSPM determines that the FSTD no longer meets qualification standards, the following procedure applies:

(1) The NSPM notifies the sponsor in writing that the FSTD no longer meets some or all of its qualification standards.

(2) The NSPM sets a reasonable period (but not less than 7 days) within which the sponsor may submit written information, views, and arguments on the FSTD qualification.

(3) After considering all material presented, the NSPM notifies the sponsor about the determination with regard to the qualification of the FSTD.

(4) When the NSPM notifies the sponsor that some or all of the FSTD is no longer qualified, it becomes effective not less than 30 days after the sponsor receives notice of it unless--

(i) The NSPM finds under paragraph (c) of this section that there is an emergency requiring immediate action with respect to safety in air commerce; or

(ii) The sponsor petitions the Director of Flight Standards Service for reconsideration of the NSPM finding under paragraph (b) of this section.

(b) When a sponsor seeks reconsideration of a decision from the NSPM concerning the FSTD qualification, the following procedure applies:

(1) The sponsor must petition for reconsideration of that decision within 30 days of the date that the sponsor receives a notice that some or all of the FSTD is no longer qualified.

(2) The sponsor must address its petition to the Director, Flight Standards Service, AFS-1, Federal Aviation Administration, 800 Independence Ave., SW., Washington, DC 20591.

(3) A petition for reconsideration, if filed within the 30-day period, suspends the effectiveness of the determination by the NSPM that the FSTD is no longer qualified unless the NSPM has found, under paragraph (c) of this section, that an emergency exists requiring immediate action with respect to safety in air commerce.

(c) If the NSPM find that an emergency exists requiring immediate action with respect to safety in air commerce that makes the procedures set out in this section impracticable or contrary to the public interest:

(1) The NSPM withdraws qualification of some or all of the FSTD and makes the withdrawal of qualification effective on the day the sponsor receives notice of it.

(2) In the notice to the sponsor, the NSPM articulates the reasons for its finding that an emergency exists requiring immediate action with respect to safety in air transportation or air commerce or that makes it impracticable or contrary to the public interest to stay the effectiveness of the finding.

(d) FSTD qualification lost under paragraph (a) or (c) of this section may be restored when either of the following provisions are met:

(1) The FSTD successfully passes an evaluation for initial qualification, in accordance with § 60.15 and § 60.17(c) in those circumstances where the NSPM has determined that a full evaluation for initial qualification is necessary; or

(2) The FSTD successfully passes an evaluation for those elements of an initial qualification evaluation, in accordance with § 60.15 and § 60.17(c), as determined to be necessary by the NSPM.

(e) In making the determinations described in paragraph (d) of this section, the NSPM considers factors including the reason for the loss of qualification, any repairs or replacements that may have to have been completed, the number of continuing qualification evaluations missed, the number of sponsor-conducted quarterly inspections missed, and the care that had been taken of the device since the loss of qualification.

§ 60.31 Record keeping and reporting.

(a) The FSTD sponsor must maintain the following records for each FSTD it sponsors:

(1) The MQTG and each amendment thereto.

(2) A record of all FSTD modifications affected under **§** 60.23 since the issuance of the original Statement of Qualification.

(3) A copy of all of the following:

(i) Results of the qualification evaluations (initial and each upgrade) since the issuance of the original Statement of Qualification.

(ii) Results of the objective tests conducted in accordance with § 60.19(a) for a period of 2 years.

(iii) Results of the previous three continuing qualification evaluations, or the continuing qualification evaluations from the previous 2 years, whichever covers a longer period.

(iv) Comments obtained in accordance with § 60.9(b) for a period of at least 90 days

(4) A record of all discrepancies entered in the discrepancy log over the previous 2 years, including the following:

(i) A list of the components or equipment that were or are missing, malfunctioning, or inoperative.

(ii) The action taken to correct the discrepancy.

(iii) The date the corrective action was taken.

(iv) The identity of the person determining that the discrepancy has been corrected.

(b) The records specified in this section must be maintained in plain language form or in coded form if the coded form provides for the preservation and retrieval of information in a manner acceptable to the NSPM.

§ 60.33 Applications, logbooks, reports, and records: Fraud, falsification, or incorrect statements.

(a) No person may make, or cause to be made, any of the following:

(1) A fraudulent or intentionally false statement in any application or any amendment thereto, or any other report or test result required by this part.

(2) A fraudulent or intentionally false statement in or a known omission from any record or report that is kept, made, or used to show compliance with this part, or to exercise any privileges under this chapter.

(3) Any reproduction or alteration, for fraudulent purpose, of any report, record, or test result required under this part.

(b) The commission by any person of any act prohibited under paragraph (a) of this section is a basis for any one or any combination of the following:

(1) A civil penalty.

(2) Suspension or revocation of any certificate held by that person that was issued under this chapter.

(3) The removal of FSTD qualification and approval for use in a training program.

(c) The following may serve as a basis for removal of qualification of an FSTD including the withdrawal of approval for use of an FSTD; or denying an application for a qualification:

(1) An incorrect statement, upon which the FAA relied or could have relied, made in support of an application for a qualification or a request for approval for use.

(2) An incorrect entry, upon which the FAA relied or could have relied, made in any logbook, record, or report that is kept, made, or used to show compliance with any requirement for an FSTD qualification or an approval for use.

§ 60.35 Specific FFS compliance requirements.

(a) No device will be eligible for initial or upgrade qualification to a FFS at Level C or Level D under this part unless it includes the equipment and appliances installed and operating to the extent necessary for the issuance of an airman certificate or rating.

(b) No device will be eligible for initial or upgrade qualification to a FFS at Level A or Level B under this part unless it includes the equipment and appliances installed and operating to the extent necessary for the training, testing, and/or checking that comprise the simulation portion of the requirements for issuance of an airman certificate or rating.

§ 60.37 FSTD qualification on the basis of a Bilateral Aviation Safety Agreement (BASA).

(a) The evaluation and qualification of an FSTD by a contracting State to the Convention on International Civil Aviation for the sponsor of an FSTD located in that contracting State may be used as the basis for issuing a U.S. statement of qualification (see appropriate QPS, attachment 4, figure 4) by the NSPM to the sponsor of that FSTD in accordance with —

(1) A BASA between the United States and the Contracting State that issued the original qualification; and

(2) A Simulator Implementation Procedure (SIP) established under the BASA.

(b) The SIP will contain any conditions and limitations on validation and issuance of such qualification by the U.S.

Appendix A to Part 60—Qualification Performance Standards for

Airplane Full Flight Simulators

Begin Information

This appendix establishes the standards for Airplane Full Flight Simulator (FFS) evaluation and qualification. The Flight Standards Service, National Simulator Program (NSP) staff, under the direction of the NSP Manager (NSPM), is responsible for the development, application, and interpretation of the standards contained within this appendix. The procedures and criteria specified in this appendix will be used by the NSPM, or a person or persons assigned by the NSPM (e.g., FAA pilots and/or FAA aeronautical engineers, assigned to and trained under the direction of the NSP – referred to as NSP pilots or NSP engineers, other FAA personnel, etc.) when conducting airplane FFS evaluations.

End Information

Table of Contents

Attachment 4 to Appendix A to Part 60--Sample Documents.

Attachment 5 to Appendix A to Part 60--Simulator Qualification Requirements for Windshear Training Program Use.

1. Introduction.

Begin Information

a. This appendix contains background information as well as material that is either directive or informative in nature as described later in this section. Except for this Introduction section, the directive or the informative material is presented in sections that correspond with sections of part 60. This material provides additional requirements and/or provides information regarding that subject. Some sections will have neither additional regulatory or informational material. In these instances the corresponding section in the Table of Contents will show "(No Info)."

b. To assist the reader in determining what areas are directive or required and what areas are guiding or permissive –

(1) The text in this appendix is contained within one of two sections: regulatory requirements that are in addition to the requirements in part 60 but are found only in this appendix, referred to as "QPS Requirements;" and advisory or informative material, referred to as "Information."

(a) The FAA has chosen to place into special QPS Requirements sections those requirements that are more likely to change on a more regular basis for a variety of reasons, e.g., increased knowledge about human factors, analysis of incident/accident data, and/or changes in aircraft or simulation technology. Using this capability, the FAA will be able to use information resulting from these factors to expeditiously modify the regulatory requirements without compromising the timeliness of those changes and without violating the Administrative Procedure Act (APA). In accordance with the APA, the FAA intends to treat all such QPS Requirements changes as Notices of Proposed Rule Making (NPRM), will seek input and suggestions from a representative cross-section of the affected industry through an Aviation Rulemaking Committee, will seek public comment through announcement of any proposed change in the Federal Register, and will review changes before final action on them is complete. The FAA does not expect that many changes to these QPS Requirements will justify the expenditure of time and resources at the highest levels of the agency and will therefore streamline the process for making technical changes to these QPS Requirements by delegating authority for final review and issuance from the Administrator to the Director, Flight Standards Service.

(b) Similarly, the FAA has chosen to place into special Information sections additional material regarding the adjacent regulatory requirements such as acceptable examples of practices and either additional or clarifying information that may be useful to the public in identifying the intent of the FAA.

(2) The text presented between horizontal lines beginning with the heading “Begin QPS Requirements” and ending with the heading “End QPS Requirements,” contains the regulatory requirements that are in addition to the requirements in the body of the part 60 language but found only in this appendix.

(3) The text presented between horizontal lines beginning with the heading “Begin Information” and ending with the heading “End Information,” is advisory or informative.

(4) The tables in this appendix have rows across the top of each table –

(a) The data presented in columns under the heading "QPS REQUIREMENTS” is regulatory but is found only in this appendix.

(b) The data presented in columns under the heading “INFORMATION” is advisory or informative.

c. Questions regarding the contents of this publication should be sent to the U.S. Department of Transportation, Federal Aviation Administration, Flight Standards Service, National Simulator Program Staff, AFS-205, PO Box 20636, Atlanta, Georgia, 30320. Telephone contact numbers for the NSP are: phone, 404-305-6100; fax, 404-305-6118. The NSP Internet Web Site address is: http://www.faa.gov/nsp. On this Web Site you will find an NSP personnel list with contact information, a list of qualified flight simulation devices, advisory circulars, a description of the qualification process, NSP policy, and an NSP

"In-Works" section. Also linked from this site are additional information sources, handbook bulletins, frequently asked questions, a listing and text of the Federal Aviation Regulations, Flight Standards Inspector's handbooks, and other FAA links.

d. The NSPM encourages the use of electronic media for communication and the gathering, storage, presentation, or transmission of any record, report, request, test, or statement required by this appendix provided the media used has adequate provision for security and is acceptable to the NSPM. The NSPM recommends inquiries on system compatibility prior to any such activity. Minimum System requirements may be found on the NSP Website.

e. Related Reading References.

(1) 14CFR part 60

(2) 14CFR part 61.

(3) 14CFR part 63.

(4) 14CFR part 119

(5) 14CFR part 121.

(6) 14CFR part 125

(7) 14CFR part 135.

(8) 14CFR part 141

(9) 14CFR part 142

(10) Advisory Circular (AC) 120-28C, Criteria for Approval of Category III Landing Weather Minima.

(11) AC 120-29, Criteria for Approving Category I and Category II Landing Minima for part 121 operators.

(12) AC 120-35B, Line Operational Simulations: Line-Oriented Flight Training, Special Purpose Operational Training, Line Operational Evaluation.

(13) AC 120-41, Criteria for Operational Approval of Airborne Wind Shear Alerting and Flight Guidance Systems.

(14) AC 120-57A, Surface Movement Guidance and Control System (SMGS).

(15) AC 150/5300-13, Airport Design.

(16) AC 150/5340-1G, Standards for Airport Markings.

(17) AC 150/5340-4C, Installation Details for Runway Centerline Touchdown Zone Lighting Systems.

(18) AC 150/5340-19, Taxiway Centerline Lighting System.

(19) AC 150/5340-24, Runway and Taxiway Edge Lighting System.

(20) AC 150/5345-28D, Precision Approach Path Indicator (PAPI) Systems

(21) International Air Transport Association document, "Flight Simulator Design and Performance Data Requirements," as amended.

(22) AC 25-7, as amended, Flight Test Guide for Certification of Transport Category Airplanes.

(23) AC 23-8A, as amended, Flight Test Guide for Certification of Part 23 Airplanes.

(24) International Civil Aviation Organization (ICAO) Manual of Criteria for the Qualification of Flight Simulators, as amended.

(25) Airplane Flight Simulator Evaluation Handbook, Volume I, as amended and Volume II, as amended, The Royal Aeronautical Society, London, UK.

(26) FAA Publication FAA-S-8081 series (Practical Test Standards for Airline Transport Pilot Certificate, Type Ratings, Commercial Pilot, and Instrument Ratings).

(27) The FAA Aeronautical Information Manual (AIM), FAA Handbook XXXXX

f. Background**.**

(1) In the late 1980's several regulatory authorities around the world, including the FAA, published new or revised documents stating the requirements for the qualification of FFS's as applicable under their respective country's rules, regulations, and/or policies. As a result, those who used airplane FFS's to train and/or check flightcrew members flying under more than one country's regulatory authority found themselves having to

provide unique documentation for each authority. With the encouragement of persons from several wide-ranging governmental and non-governmental interests, the Flight Simulation Group of the United Kingdom's Royal Aeronautical Society (RAeS) agreed to organize and conduct two international seminars to focus attention on this situation. The result was the formulation of an RAeS working group consisting of recognized simulation experts and regulatory authorities representatives from around the world. Utilizing the FAA's Advisory Circular (AC) 120-40B document as its practical foundation, this working group devoted over 10,000 man-hours toward the development of a set of FFS evaluation criteria that was acceptable to all parties involved.

(2) This set of evaluation criteria was presented for review and comment in an international conference hosted by RAeS in London on January 16 and 17, 1992. Following detailed explanation and considerable discussion, the conference delegates unanimously agreed to forward these criteria to the International Civil Aviation Organization (ICAO), recommending that ICAO adopt these criteria as appropriate for international FFS evaluation criteria. After reviewing this material, ICAO agreed to translate the information into the appropriate language necessary for ICAO purposes; and the resulting ICAO document, "Manual of Criteria for the Qualification of Flight Simulators," 1st Ed., 1994, is available through the Office of the Secretary General.

(3) In 2001 an international industry working group convened under the joint auspices of the FAA and JAA to develop the second edition of the ICAO Manual 9625. Two meetings were held; one in Hoofddorp, the Netherlands, at Central JAA in March 2001, and one in Atlanta, Georgia, USA, at NSP headquarters in June 2001. During both meetings there were representatives from the FAA, JAA, Transport Canada, CASA Australia (Atlanta only), airplane manufacturers, flight simulator manufacturers and flight simulator operators from the US, the JAA coverage area, and Canada. More than 500 man-days were invested during these two meetings and many more outside the

meetings. The work was shared by four subgroups (Data, Visual, Sound and Motion) and was thoroughly reviewed by the larger working group in frequent plenary sessions. An editing team, consisting of representatives of each of the four subgroups, the FAA, and Central JAA met in August 2001 to consolidate the proposals of the subgroups and ensure consistency throughout the document. A final manuscript was submitted to ICAO in January 2002. The second edition of ICAO Manual 9625 provides standards only for the highest level of flight simulator qualification equivalent to FAA Level D. The FAA, together with the other participating regulatory authorities (Australia, Canada, Finland, France, Germany, Scandinavia, Switzerland, The Netherlands, and the United Kingdom), provided letters of support to the ICAO regarding this second edition and have committed to integrating the resulting changes into their own regulation/documentation for flight simulator standards. The goal of the requirements in this appendix is to match the ICAO requirements for the evaluation and qualification of the highest level of airplane FFS addressed herein: i.e., the requirements for Level D FFS's set out in this appendix match the requirements for the ICAO simulator.

(4) For information purposes, the following is a chronological listing of the documents preceding part 60 that have addressed the qualification criteria for airplane FFS evaluation and qualification by the FAA, including the effective dates of those documents:

14 CFR part 121, appendix B	01/09/65 to 02/02/70
AC 121-14	12/19/69 to 02/09/76
AC 121-14A	02/09/76 to 10/16/78
AC 121-14B	10/16/78 to 08/29/80

14 CFR part 121, appendix H	06/30/80 to (date TBD)
AC 121-14C	08/29/80 to 01/31/83
AC 120-40	01/31/83 to 07/31/86
AC 120-40A	07/31/86 to 07/29/91
AC 120-40B	07/29/91 to (date TBD)
AC 120-40C (draft)	dates -- dates

End Information

---

2. Applicability (§§ 60.1 & 60.2)

There is no additional regulatory or informational material that applies to § 60.1, Applicability, or to § 60.2, Applicability of sponsor rules to person who are not sponsors and who are engaged in certain unauthorized activities.

---

3. Definitions (§ 60.3)

Begin Information

See Appendix F for a list of definitions and abbreviations from part 1 and part 60, including the appropriate appendices of part 60.

End Information

---

4. Qualification Performance Standards (§ 60.4)

There is no additional regulatory or informational material that applies to § 60.4, Qualification Performance Standards.

---

5. Quality Management System (§ 60.5).

Begin Information

Additional regulatory material and informational material regarding Quality Management Systems for Flight Simulation Training Devices may be found in appendix E of this part.

End Information

---

6. Sponsor Qualification Requirements (§ 60.7).

Begin Information

---

a. The intent of the language used in § 60.7(b) is to have a specific FFS, identified by the sponsor, used by the sponsor at least once in the sponsor's FAA-approved flight training program for the airplane simulated during the 12-month period described. The identification of the specific FFS may change from one 12-month period to the next 12-month period as long as that sponsor sponsors and uses at least one FFS at least once during the prescribed period. There is no minimum number of hours or minimum FFS periods required.

b. To assist in avoiding confusion regarding the requirements for use of a qualified FFS the following examples/descriptions are provided to describe acceptable operational practices:

(1) Example One.

(a) A sponsor is sponsoring a single, specific FFS for their own use, in their own facility or elsewhere – this single FFS forms the basis for the sponsorship. The sponsor uses that FFS at least once in each 12-month period in that sponsor's

FAA-approved flight training program for the airplane simulated. This 12-month period is established according to the following:

(i) If the FFS was qualified prior to [insert the effective date of this rule] the 12-month period begins on the date of the first NSPM-conducted continuing qualification after [insert the effective date of this rule] and continues for each subsequent 12-month period;

(ii) If the FFS satisfactorily completes an initial or upgrade evaluation on or after [insert the effective date of this rule] the 12-month period begins on the date of that completed initial or upgrade evaluation and continues for each subsequent 12-month period.

(b) There is no minimum number of hours or minimum FFS periods required.

(c) The identification of the specific FFS may change from one 12-month period to the next 12-month period as long as that sponsor sponsors and uses at least one FFS at least once during the prescribed period.

(2) Example Two.

(a) A sponsor sponsors an additional number of FFS's, in their facility or elsewhere. Each such additionally sponsored FFS must be –

(i) Used by the sponsor in the sponsor's FAA-approved flight training program for the airplane simulated [as described in § 60.7(d)(1)] at least once in each 12-month period in that sponsor's FAA-approved flight training program for the airplane simulated (this 12-month period is established in the same manner as in example one);

OR

(ii) Used by another FAA certificate holder in that other certificate holder's FAA-approved flight training program for the airplane simulated [as described in § 60.7(d)(1)] at least once in each 12-month period in that certificate holder's FAA-approved flight training program for the airplane simulated (this 12-month period is established in the same manner as in example one);

OR

(iii) Provided a statement each year from a qualified pilot, (after having flown the airplane, not the subject FFS or another FFS, during the preceding 12-month period) stating that the subject FFS's performance and handling qualities represent the airplane [as described in § 60.7(d)(2)]. This statement is provided at least once in each 12-month period established in the same manner as in example one.

(b) There is no minimum number of hours or minimum FFS periods required.

(3) Example Three.

(a) A sponsor (in this example, a Part 142 certificate holder) in "New York" (having at least one FFS used at least once per year in the sponsor's FAA-approved flight training program) establishes a "satellite" training center in "Chicago" and/or a satellite center in "Moscow."

(b) The satellite function means that the "Chicago" and/or "Moscow" center(s) must operate under the "New York" center's certificate (in accordance with all of the "New York" center's practices, procedures, and policies; e.g., instructor and/or technician training/checking requirements, record keeping, QMS program, etc.).

(c) All of the FFS's in the "Chicago" center and/or the "Moscow" center could be dry-leased (i.e., the certificate holder does not have and utilize FAA-approved flight training programs for the FFS's in the "Chicago" and/or the "Moscow" center) because –

(i) Each FFS in the "Chicago" center and/or each FFS in the "Moscow" center is used at least once each 12-month period by another FAA certificate holder in that other certificate holder's FAA-approved flight training program for the airplane [as described in § 60.7(d)(1)];or

(ii) A statement is obtained from a qualified pilot (having flown the airplane, not the subject FFS or another FFS during the preceding 12-month period) stating that the performance and handling qualities of each FFS in the "Chicago" center and/or each FFS in the "Moscow" center represent the airplane [as described in § 60.7(d)(2)].

End Information

---

7. Additional Responsibilities of the Sponsor (§ 60.9).

Begin Information

The phrase "…as soon as practicable…" as found in § 60.9(a), means without unnecessarily disrupting or delaying beyond a reasonable time the training, evaluation, or experience being conducted in the FSTD.

End Information

---

8. Simulator Use (§ 60.11).

There is no additional regulatory or informational material that applies to § 60.11, Simulator Use.

---

9. Simulator Objective Data Requirements (§ 60.13).

Begin QPS Requirements

a. The FFS sponsor must maintain a liaison with the manufacturer of the aircraft being simulated (or with the holder of the aircraft type certificate for the aircraft being simulated if the manufacturer is no longer in business), and/or, if appropriate, with the person having supplied the aircraft data package for the FFS in order to facilitate the notification described in this paragraph. The sponsor must immediately notify the NSPM when an addition to or a revision of the flight related data or airplane systems related data is available if this data is used to program and/or operate a qualified FFS. The data referred to in this sub-section are those data that are used to validate the performance, handling qualities, or other characteristics of the aircraft, including data related to any relevant changes occurring after the type certification is issued. The notification must also provide technical information about this data to the NSPM relative to the data's significance for training, evaluation, or flight experience activities in the FFS.

b. Flight test data used to validate FFS performance and handling qualities must have been gathered in accordance with a flight test program containing the following:

(1) A flight test plan, that contains:

(a) The required maneuvers and procedures.

(b) For each maneuver or procedure --

(i) The procedures and control input the flight test pilot and/or engineer are to use.

(ii) The atmospheric and environmental conditions.

(iii) The initial flight conditions.

(iv) The airplane configuration, including weight and center of gravity.

(v) The data that is to be gathered.

(vi) Any other appropriate factors.

(2) Appropriately qualified flight test personnel.

(3) An understanding of the accuracy of the data to be gathered.

(4) Appropriate and sufficient data acquisition equipment or system(s), including appropriate data reduction and analysis methods and techniques, as would be acceptable to the FAA's Aircraft Certification Service.

(5) Calibration of data acquisition equipment and airplane performance instrumentation must be current and traceable to a recognized standard.

c. The data, regardless of source, must be presented:

(1) in a format that supports the flight FFS validation process;

(2) in a manner that is clearly readable and annotated correctly and completely;

(3) with resolution sufficient to determine compliance with the tolerances set forth in attachment 2 of this appendix.

(4) with any necessary guidance information provided; and

(5) without alteration, adjustments, or bias; however the data may be re-scaled, digitized, or otherwise manipulated to fit the desired presentation.

d. After completion of any additional flight test, a flight test report must be submitted in support of the validation data. The report must contain sufficient data and rationale to support qualification of the FFS at the level requested.

End QPS Requirements

Begin Information

e. It is the intent of the NSPM that for new aircraft entering service, at a point well in advance of preparation of the Qualification Test Guide (QTG), the sponsor should submit to the NSPM for approval, a descriptive document (a validation data roadmap) containing the plan for acquiring the validation data, including data sources. This document should clearly identify sources of data for all required tests, a description of the validity of these data for a specific engine type and thrust rating configuration, and the revision levels of all avionics affecting the performance or flying qualities of the aircraft. Additionally, this document should provide rationale or explanations for cases where data or data parameters are missing, where engineering simulation data are used, where flight test methods require further explanations, etc. and provide a brief narrative describing the cause and effect of any deviation from data requirements. This document may be provided by the aircraft manufacturer.

f. There is no requirement for any flight test data supplier to submit a flight test plan/program prior to gathering flight test data. However, the NSP staff has experience that indicates at least some data gatherers, primarily those that do not have a satisfactory "history" of supplying such data, often provide data that is irrelevant, not properly marked, without adequate justification for selection, without adequate information regarding initial conditions, without adequate information regarding the test maneuver, etc. The NSP staff has been forced to not accept such data submissions as validation data for FFS evaluation. It is for this reason that the NSP staff recommends that any data supplier not previously experienced in this area review the data necessary for programming and for validating the performance of the FFS and discuss the flight test plan anticipated for acquiring such data with the NSP staff well in advance of commencing the flight tests.

g. The NSPM will consider, on a case-by-case basis, whether or not to approve supplemental validation data derived from flight data recording systems such as a Quick Access Recorder or Flight Data Recorder.

End Information

---

10. Special Equipment and Personnel Requirements for Qualification of the Simulator (§ 60.14).

Begin Information

a. In the event that the NSPM determines that special equipment or (a) specifically qualified person(s) will be required for the conduct of any evaluation, the NSPM will make every attempt to notify the sponsor at least one (1) week, but in no case less than 72 hours, in advance of the evaluation. Examples of special equipment include spot photometers, flight control measurement devices, sound analyzer, etc. Examples of specially qualified personnel would be those specifically qualified to install or use any special equipment when its use is required.

b. Examples of a special evaluation would be an evaluation conducted after the move of a FFS; at the request of the TPAA; as a result of comments received from users of the FFS that, upon analysis and confirmation, might cause a question as to the continued qualification or use of the FFS; etc.

End Information

---

11. Initial (and Upgrade) Qualification Requirements (§ 60.15).

Begin QPS Requirements

a. The request described in § 60.15(a) must include all of the following:

(1) A statement that the FSTD meets all of the applicable provisions of this part and all applicable provisions of the QPS.

(2) A confirmation that the sponsor will forward to the NSPM the statement described in § 60.15(b) in such time as to be received no later than 5 business days prior to the scheduled evaluation and may be forwarded to the NSPM via traditional or electronic means.

(3) A qualification test guide (QTG), acceptable to the NSPM, that includes all of the following:

(i) Objective data obtained from aircraft testing or another approved source.

(ii) Correlating objective test results obtained from the performance of the FSTD as prescribed in the appropriate QPS.

(iii) The result of FSTD subjective tests prescribed in the appropriate QPS.

(iv) A description of the equipment necessary to perform the evaluation for initial qualification and the continuing qualification evaluations.

b. The QTG described in paragraph a(3) of this section, must provide the documented proof of compliance with the simulator objective tests in attachment 2 of this appendix.

c. The QTG is prepared and submitted by the sponsor, or the sponsor's agent on behalf of the sponsor, to the NSPM for review and approval, and must include, for each objective test:

(1) Parameters, tolerances, and flight conditions;

(2) Pertinent and complete instructions for the conduct of automatically and manually conducted tests;

(3) A means of comparing the FFS's test results to the objective data;

(4) Any other information as necessary, to assist in the evaluation of the test results;

(5) Other information appropriate to the qualification level of the FFS.

d. The QTG described in paragraphs a(3) and b of this section, must include the following:

(1) A QTG cover page with sponsor and FAA approval signature blocks (see Attachment 4, Figure 2, for a sample QTG cover page).

(2) A continuing qualification evaluation schedule requirements page – to be used by the NSPM to establish and record the frequency with which continuing qualification evaluations must be conducted and any subsequent changes that may be determined by the NSPM. See Attachment 4, Figure 4, for a sample Continuing Qualification Evaluation Schedule Requirements page.

(3) A FFS information page that provides the information listed in this paragraph (see Attachment 4, Figure 3, for a sample FFS information page). For convertible FFS's, a separate page is submitted for each configuration of the FFS.

(a) The sponsor's FFS identification number or code.

(b) The airplane model and series being simulated.

(c) The aerodynamic data revision number or reference.

(d) The engine model(s) and its data revision number or reference.

(e) The flight control data revision number or reference.

(f) The flight management system identification and revision level.

(g) The FFS model and manufacturer.

(h) The date of FFS manufacture.

(i) The FFS computer identification.

(j) The visual system model and manufacturer, including display type.

(k) The motion system type and manufacturer, including degrees of freedom.

(4) A Table of Contents.

(5) A log of revisions and a list of effective pages.

(6) List of all relevant data references.

(7) A glossary of terms and symbols used (including sign conventions and units).

(8) Statements of compliance and capability (SOC's) with certain requirements. SOC's must provide references to the sources of information for showing the capability of the FFS to comply with the requirement, a rationale explaining how the referenced material is used, mathematical equations and parameter values used, and the conclusions reached; i.e. that the FFS complies with the requirement. Refer to the "Additional Details" column in attachment 1, "Simulator Standards," or in the “Test Details” column in attachment 2, “Simulator Objective Tests,” to see when SOC's are required.

(9) Recording procedures or equipment required to accomplish the objective tests.

(10) The following information for each objective test designated in attachment 2, as applicable to the qualification level sought:

(a) Name of the test.

(b) Objective of the test.

(c) Initial conditions.

(d) Manual test procedures.

(e) Automatic test procedures (if applicable).

(f) Method for evaluating FFS objective test results.

(g) List of all relevant parameters driven or constrained during the automatically conducted test(s).

(h) List of all relevant parameters driven or constrained during the manually conducted test(s).

(i) Tolerances for relevant parameters.

(j) Source of Validation Data (document and page number).

(k) Copy of the Validation Data (if located in a separate binder, a cross reference for the identification and page number for pertinent data location must be provided).

(l) Simulator Objective Test Results as obtained by the sponsor. Each test result must reflect the date completed and must be clearly labeled as a product of the device being tested.

e. Form and manner of presentation of objective test results in the QTG:

(1) The sponsor's FFS test results must be recorded in a manner, acceptable to the NSPM, that will allow easy comparison of the FFS test results to the validation data (e.g., use of a multi-channel recorder, line printer, cross plotting, overlays, transparencies, etc.).

(2) FFS results must be labeled using terminology common to airplane parameters as opposed to computer software identifications.

(3) Validation data documents included in a QTG may be photographically reduced only if such reduction will not alter the graphic scaling or cause difficulties in scale interpretation or resolution.

(4) Scaling on graphical presentations must provide the resolution necessary to evaluate the parameters shown in attachment 2 of this appendix.

(5) For tests involving time histories, data sheets (or transparencies thereof) and FFS test results must be clearly marked with appropriate reference points to ensure an accurate comparison between FFS and airplane with respect to time. Time histories recorded via a line printer are to be clearly identified for cross-plotting on the airplane data. Over-plots must not obscure the reference data.

f. The sponsor may elect to complete the QTG objective tests at the manufacturer's facility. Tests performed at this location must be conducted after assembly of the FFS has been essentially completed, the systems and sub-systems are functional and operate in an interactive manner, and prior to the initiation of disassembly for shipment. The sponsor must substantiate FFS performance at the sponsor's training facility by repeating a representative sampling of all the objective tests in the QTG and submitting these repeated test results to the NSPM. This sample must consist of at least one-third of the

QTG objective tests. The QTG must be clearly annotated to indicate when and where each test was accomplished.

g. While the subjective tests are normally accomplished at the sponsor's training facility, the sponsor may elect to complete the subjective tests at the manufacturer's facility. Tests performed at this location will be conducted after assembly of the FFS has been essentially completed, the systems and sub-systems are functional and operate in an interactive manner, and prior to the initiation of disassembly for shipment. The sponsor must substantiate FFS performance at the sponsor's training facility by having the pilot(s) who performed these tests originally (or similarly qualified pilot(s)), repeat a representative sampling of these subjective tests (need not take more than one normal FFS period – e.g., 4 hours) and submit a statement to the NSPM that the FFS has not changed from the original determination. This statement must clearly indicate when and where these repeated tests were completed.

h. The sponsor must maintain a copy of the MQTG at the FFS location. j. All FFS's for which the initial qualification is conducted after [insert 6 years after effective date of this rule] must have an electronic MQTG (eMQTG) including all objective data obtained from airplane testing, or another approved source (reformatted or digitized), together with correlating objective test results obtained from the performance of the FFS (reformatted or digitized) as prescribed in this appendix, the general FFS performance or demonstration results (reformatted or digitized) prescribed in this appendix, and a description of the equipment necessary to perform the evaluation for initial qualification and the continuing qualification evaluations for continuing qualification. This eMQTG must include the original validation data used to validate FFS performance and handling qualities in either the original digitized format from the data supplier or an electronic scan of the original time-history plots that were provided by the data supplier. An eMQTG must be provided to the NSPM.

i. All other FFS's (not covered in subparagraph "i") must have an electronic copy of the MQTG by and after [insert 6 years after effective date of this rule], a copy of which must be provided to the NSPM. This may be provided by an electronic scan presented in a Portable Document File (PDF), or similar format, acceptable to the NSPM.

End QPS Requirements

Begin Information

j. Only those FFS's that are sponsored by a certificate holder (as defined for use in part 60 and this QPS appendix) will be evaluated by the NSPM. However, other FFS evaluations may be conducted on a case-by-case basis as the Administrator deems appropriate, but only in accordance with applicable agreements.

k. Each FFS must be evaluated as completely as possible. To ensure a thorough and uniform evaluation, each FFS is subjected to the general simulator requirements and performance demonstrations in attachment 1, the objective tests listed in attachment 2, and the subjective tests listed in attachment 3 of this appendix. The evaluation(s) described herein will include, but not necessarily be limited to the following, as appropriate, for the qualification level of the FFS:

(1) Airplane responses, including longitudinal and lateral-directional control responses (see attachment 2 of this appendix);

(2) Performance in authorized portions of the simulated airplane's operating envelope, to include tasks evaluated by the NSPM in the areas of ground operations, takeoff, climb, cruise, descent, approach, and

landing as well as abnormal and emergency operations (see paragraph [check reference] and attachment 2 of this appendix);

(3) Control checks (see attachment 1 and attachment 2 of this appendix);

(4) Cockpit configuration (see attachment 1 of this appendix);

(5) Pilot, flight engineer, and instructor station functions checks (see attachment 1 and attachment 3 of this appendix);

(6) Airplane systems and sub-systems (as appropriate) as compared to the airplane simulated (see attachment 1 and attachment 3 of this appendix);

(7) FFS systems and sub-systems, including force cueing (motion), visual, and aural (sound) systems, as appropriate (see attachment 1 and attachment 2 of this appendix); and

(8) Certain additional requirements, depending upon the complexity of the FFS qualification level sought, including equipment or circumstances that may become hazardous to the occupants. The sponsor may be subject to Occupational Safety and Health Administration requirements.

l. The NSPM administers the objective and subjective tests, which includes an examination of functions. The tests include a qualitative assessment of the FFS by an NSP pilot. The NSP evaluation team leader may assign other qualified personnel to assist in accomplishing the functions examination and/or the objective and subjective tests performed during an evaluation when required.

(1) Objective tests provide a basis for measuring and evaluating FFS performance and determining compliance with the requirements of this part.

(2) Subjective tests provide a basis for:

(a) Evaluating the capability of the FFS to perform over a typical utilization period;

(b) Determining that the FFS satisfactorily simulates each required task;

(c) Verifying correct operation of the FFS controls, instruments, and systems; and

(d) Demonstrating compliance with the requirements of this part.

m. The tolerances for the test parameters listed in attachment 2 of this appendix are the maximum acceptable to the NSPM for FFS validation and are not to be confused with design tolerances specified for FFS manufacture. In making decisions regarding tests and test results, the NSPM relies on the use of operational and engineering judgment in the application of data (including consideration of the way in which the flight test was flown and way the data was gathered and applied) data presentations, and the applicable tolerances for each test.

n. In addition to the scheduled continuing qualification evaluation (see paragraph [check reference]), each FFS is subject to evaluations conducted by the NSPM at any time with no prior notification to the sponsor. Such evaluations would be accomplished in a normal manner (i.e., requiring exclusive use of the FFS for the conduct of objective and subjective tests and an examination of functions) if the FFS is not being used for flightcrew member training, testing, or checking. However, if the FFS were being used, the evaluation would be conducted in a non-exclusive manner. This non-exclusive evaluation will be conducted by the FFS evaluator accompanying the check airman, instructor, Aircrew Program Designee (APD), or FAA inspector aboard the FFS along with the student(s) and observing the operation of the FFS during the training, testing, or checking activities.

o. Problems with objective test results are handled according to the following:

(1) If a problem with an objective test result is detected by the NSP evaluation team during an evaluation, the test may be repeated and/or the QTG may be amended.

(2) If it is determined that the results of an objective test do not support the level requested but do support a lower level, the NSPM may qualify the FFS at that lower level. For example, if a Level D evaluation is requested and the FFS fails to meet sound test tolerances, it could be qualified at Level C.

p. After the NSPM issues a statement of qualification to the sponsor when a FFS is successfully evaluated, the FFS is recommended to the TPAA, who will exercise authority on behalf of the Administrator in approving the FFS in the appropriate airplane flight training program.

q. Under normal circumstances, the NSPM establishes a date for the initial or upgrade evaluation within ten (10) working days after determining that a complete QTG is acceptable. Unusual circumstances may warrant establishing an evaluation date before this determination is made; however, once a schedule is agreed to, any slippage of the evaluation date at the sponsor's request may result in a significant delay, perhaps 45 days or more, in rescheduling and completing the evaluation. A sponsor may commit to an initial evaluation date under this early process, in coordination with and the agreement of the NSPM, but the request must be in writing and must include an acknowledgment of the potential schedule impact if the sponsor slips the evaluation from this early-committed date. See Attachment 4, figure 5, Sample Request for Initial Evaluation Date.

r. A convertible FFS is addressed as a separate FFS for each model and series airplane to which it will be converted and for the FAA qualification level sought. An NSP evaluation is required for each configuration. For example, if a sponsor seeks qualification for two models of an airplane type using a convertible FFS, two QTG's, or a supplemented QTG, and two evaluations are required.

s. The numbering system used for objective test results in the QTG should closely follow the numbering system set out in attachment 2, Simulator Objective Tests.

t. If additional information is needed regarding the preferred qualifications of pilots used to meet the requirements of §60.15(e), the reader should contact the NSPM or visit the NSPM website.

u. Examples of the exclusions for which the FFS might not have been subjectively tested by the sponsor or the NSPM and for which qualification might not be sought or granted, as described in §60.15(h)(6), include windshear training, circling approaches, etc.

End Information

---

12. Additional Qualifications for a Currently Qualified Simulator (§ 60.16).

There is no additional regulatory or informational material that applies to § 60.16, Additional Qualifications for a Currently Qualified FFS.

---

13. Previously Qualified Simulators (§ 60.17).

Begin QPS Requirements

a. In instances where a sponsor plans to remove a FFS from active status for prolonged periods, the following procedures will apply:

(1) The NSPM must be advised in writing and the advisement must include an estimate of the period that the FFS will be inactive;

(2) Continuing Qualification evaluations would not be scheduled during the inactive period;

(3) The NSPM will remove the FFS from the list of qualified FSTD's on a mutually established date not later than the date on which the first missed continuing qualification evaluation would have been scheduled;

(4) Before the FFS may be restored to qualified status, it will require an evaluation by the NSPM. The evaluation content and time required for accomplishment will be based on the number of continuing qualification evaluations and sponsor-conducted quarterly inspections missed during the period of inactivity. For example, if the FFS were out of service for a 1 year period, it would be necessary to complete the entire QTG, since all of the quarterly evaluations would have been missed;

(5) The sponsor must notify the NSPM of any changes to the original scheduled time out of service;

(6) The FFS will normally be re-qualified using the FAA-approved MQTG and the criteria that was in effect prior to its removal from qualification; however, inactive periods of 2 years or more will require a review of the qualification basis and will likely result in the re-qualification to be against the standards in effect and current at the time of re-qualification.

End QPS Requirements

Begin Information

b. Other certificate holders or persons desiring to use a FFS may contract with FFS sponsors to use those FFS's already qualified at a particular level for an airplane type and approved for use within an FAA-approved flight training program. Such FFS's are not required to undergo an additional qualification process, except as described in § 60.16.

c. Each FFS user must obtain approval from the appropriate TPAA to use any FFS in an FAA-approved flight training program.

d. The intent of the requirement listed in § 60.17(b), for each FFS to have a Statement of Qualification within 6 years, is to have the availability of that statement (including the configuration list and the limitations to authorizations) to provide a complete picture of the FFS inventory regulated by the FAA. The issuance of the statement will not require any additional evaluation or require any adjustment to the evaluation basis for the FFS.

e. Downgrading of a FFS is a permanent change in qualification level. If a temporary restriction is placed on a FFS because of a missing, malfunctioning, or inoperative component or some repair is in progress, the restriction is not a permanent change in qualification level and such a temporary restriction can, and is, removed when the reason for the restriction has been resolved. It would be inappropriate to permanently downgrade a FFS and, at some undetermined time in the future, allow that FFS to be returned to its original status (i.e., accomplish an "upgrade") using the original qualification standards.

End Information

---

14. Inspection, Continuing Qualification Evaluation, and Maintenance Requirements (§ 60.19).

Begin QPS Requirements

a. The sponsor must conduct a minimum of four evenly spaced inspections throughout the year. The objective test sequence and content of each inspection in this sequence will be developed by the sponsor and will be acceptable to the NSPM.

b. The description of what constitutes the functional preflight inspection will be contained in the sponsor's QMS.

(c) Record "functional preflight" in the FFS discrepancy log book or other acceptable location, including any item found to be missing, malfunctioning, or inoperative.

End QPS Requirements

Begin Information

d. In determining the acceptability of the sponsor's test sequence and the content of each quarterly inspection required in § 60.19(a)(1), the NSPM looks for a balance and a mix from the performance demonstrations and objective test requirement areas listed as follows:

(1) Performance.

(2) Handling qualities.

(3) Motion system (where appropriate).

(4) Visual system (where appropriate).

(5) Sound system (where appropriate).

(6) Other FFS systems.

e. If the NSP evaluator plans to accomplish specific tests during a normal continuing qualification evaluation that requires the use of special equipment or technicians, the sponsor will be notified as far in advance of the evaluation as practical; but not less than 72 hours. These tests include latencies, control dynamics, sounds and vibrations, motion, and/or some visual system tests.

f. The continuing qualification evaluations, described in § 60.19(b), normally will require 4 hours of FFS time. Flexibility is necessary to address those situations that are not normal or those that involve aircraft with additional levels of complexity (e.g. computer controlled aircraft) and may require additional time. The continuing qualification evaluations will consist of the following:

(1) Review of the results of the objective tests and all the designated FFS performance demonstrations (quarterly inspections) conducted by the sponsor since the last scheduled continuing qualification evaluation.

(2) At the discretion of the evaluator, a selection of approximately 8 to 15 objective tests from the MQTG, that will, in the opinion of the evaluator, provide an adequate opportunity to evaluate, first hand, the performance of the FFS. The tests chosen will be performed either automatically or manually, at the discretion of the evaluator and should be able to be conducted within approximately one-third (1/3) of the allotted FFS time.

(3) A subjective evaluation of the FFS to perform a representative sampling of the tasks set out in attachment 3 of this appendix, selected at the discretion of the evaluator. This portion of the evaluation should take approximately two-thirds (2/3) of the allotted FFS time.

(4) An examination of the functions of the FFS, to include, but not necessarily limited to, the motion system, visual system, sound system, instructor operating station, and the normal functions and simulated malfunctions of the simulated airplane systems. This examination is normally accomplished simultaneously with the subjective evaluation requirements noted in subparagraph d(3).

g. The requirement established in § 60.19(b)(4) regarding the frequency of NSPM-conducted continuing qualification evaluations for each FFS is typically 12 months. However, the establishment and satisfactory operation of an approved quality management system for a sponsor will provide a basis for adjusting the interval between evaluations on some FFS's at a given sponsor's location to exceed this 12-month interval.

End Information

---

15. Logging Simulator Discrepancies (§ 60.20).

There is no additional regulatory or informational material that applies to § 60.20. Logging FFS Discrepancies.

---

16. Interim Qualification of Simulators for New Airplane Types or Models (§ 60.21).

There is no additional regulatory or informational material that applies to § 60.21, Interim Qualification of FFSs for New Airplane Types or Models.

---

17. Modifications to Simulators (§ 60.23).

Begin QPS Requirements

a. The notification described in § 60.23(c)(2) must include a complete description of the planned modification, with a description of the operational and engineering effect the proposed modification will have on the operation of the FFS and the results that are expected with the modification incorporated.

b. Prior to using the modified FFS:

(1) All the applicable objective tests that have been run with the modification incorporated, including any necessary updates to the MQTG must be acceptable to the NSPM; and

(2) The sponsor must provide the NSPM with a statement signed by the MR that the factors cited in § 60.15(b) are addressed by the appropriate personnel as described in that section.

End QPS Requirements

Begin Information

See Attachment 4 for a sample Index of Effective FSTD Directives.

End Information

---

18. Operation with Missing, Malfunctioning, or Inoperative Components (§ 60.25).

Begin Information

a. Once the sponsor fairly and accurately advises the user of a FFS's current status, including any missing, malfunctioning, or inoperative (MMI) component(s), the sponsor's responsibility with respect to § 60.25(a) will have been satisfied.

b. If the 29th or 30th day of the 30-day period described in § 60.25(b) is on a Saturday, a Sunday, or a holiday, the intent of the FAA is to automatically extend the deadline until the next business day.

c. In accordance with the authorization described in § 60.25(b)**,** the NSPM may find as acceptable a discrepancy prioritizing system wherein the length of time authorized to repair or replace any given MMI component is based on the level of impact on the capability of the FFS to provide the required training, evaluation, or flight experience, with the larger impact on this capability associated with a higher priority for repair or replacement.

End Information

---

19. Automatic Loss of Qualification and Procedures for Restoration of Qualification (§ 60.27).

Begin Information

If the sponsor provides a plan for how the FFS is to be maintained during its out-of-service period (e.g., periodic exercise of mechanical, hydraulic, and electrical systems;

routine replacement of hydraulic fluid; control of the environmental factors in which the FFS is to be maintained, etc.) there is a greater likelihood of being able to determine the amount of testing that would be required for re-qualification.

End Information

---

20. Other Losses of Qualification and Procedures for Restoration of Qualification (§ 60.29).

Begin Information

If the sponsor provides a plan for how the FFS is to be maintained during its out-of-service period (e.g., periodic exercise of mechanical, hydraulic, and electrical systems; routine replacement of hydraulic fluid; control of the environmental factors in which the FFS is to be maintained, etc.) there is a greater likelihood of being able to determine the amount of testing that would be required for re-qualification.

End Information

---

21. Recordkeeping and Reporting (§ 60.31).

Begin QPS Requirements

a. The minimally acceptable record of programming changes, as described in § 60.31(a)(2), must consist of the name of the aircraft system software, aerodynamic model, or engine model change, the date of the change, a summary of the change, and the reason for the change.

b. If a coded form for record keeping is used, it must provide for the preservation and retrieval of information with appropriate security or controls to prevent the illegal or inappropriate alteration of such records after the fact.

End QPS Requirements

---

22. Applications, Logbooks, Reports, and Records: Fraud, Falsification, or Incorrect Statements (§ 60.33).

There are no additional QPS requirements or informational material that apply to § 60.33, Applications, Logbooks, Reports, and Records: Fraud, Falsification, or Incorrect Statements.

---

23. Specific Simulator Compliance Requirements (§ 60.35).

There are no additional QPS requirements or informational material that apply to § 60.35, Specific FFS Compliance Requirements.

---

24. [Reserved].

25. Simulator Qualification on the Basis of a Bilateral Aviation Safety Agreement (BASA) (§ 60.37).

There are no additional QPS requirements or informational material that apply to § 60.37, FFS Qualification on the Basis of a Bilateral Aviation Safety Agreement (BASA).

Attachment 1 to Appendix A to Part 60--

GENERAL SIMULATOR REQUIREMENTS

Begin QPS Requirements

1. Requirements.

Certain requirements included in this appendix must be supported with a Statement of Compliance and Capability (SOC) and/or, in some designated cases, an Objective Test. The SOC will describe how the requirement was met, such as gear modeling approach, coefficient of friction sources, etc. The test results must show that the requirement has been attained. Other requirements are satisfied by either a Subjective Test or a Subjective Test. In the following tabular listing, requirements for SOCs and tests are indicated in the "Additional Details" column.

End QPS Requirements

Begin Information

2. Discussion.

a. This attachment describes the minimum general simulator requirements for qualifying airplane full flight simulators (FFS). To determine the complete requirements for a specific level simulator the objective tests in attachment 2 and the examination of functions and subjective tests listed in attachment 3 must also be consulted.

b. The material contained in this attachment is divided into the following categories:

(1) General cockpit configuration.

(2) Simulator programming.

(3) Equipment operation.

(4) Equipment and facilities for instructor/evaluator functions.

(5) Motion system.

(6) Visual system.

(7) Sound system.

End Information

1. General Cockpit Configuration.							
a. The simulator must have a cockpit that is a full-scale replica of the airplane simulated with controls, equipment, observable cockpit indicators, circuit breakers, and bulkheads properly located, functionally accurate and replicating the airplane. The direction of movement of controls and switches must be identical to that in the airplane.	X	X	X	X	An SOC is required. Pilot seats must afford the capability for the occupant to be able to achieve the design "eye position" established for the airplane being simulated. Equipment for the operation of the cockpit windows must be included, but the actual windows need not be operable. Fire axes, extinguishers, spare light bulbs, etc., must be available in the flight simulator but may be relocated to a suitable location as near as practical to the original position. Fire axes, landing gear pins, and any similar purpose instruments need only be represented in silhouette.		For simulator purposes, the cockpit consists of all that space forward of a cross section of the fuselage at the most extreme aft setting of the pilots' seats including additional, required crewmember duty stations and those required bulkheads aft of the pilot seats. For clarification, bulkheads containing only items such as landing gear pin storage compartments, fire axes or extinguishers, spare light bulbs, aircraft documents pouches etc., are not considered essential and may be omitted.
b. Those circuit breakers that affect procedures and/or result in observable cockpit indications must be properly located and functionally accurate.	X	X	X	X	An SOC is required.		

2. Programming.							
a. A flight dynamics model that accounts for various combinations of drag and thrust normally encountered in flight must correspond to actual flight conditions, including the effect of change in airplane attitude, thrust, drag, altitude, temperature, gross weight, moments of inertia, center of gravity location, and configuration.	X	X	X	X	An SOC is required.		
b. The simulator must have the computer capacity, accuracy, resolution, and dynamic response needed to meet the qualification level sought.	X	X	X	X	An SOC is required.		
c. Ground operations must be represented to the extent that allows turns within the confines of the	X				A subjective test is required.		

runway and adequate controls on the landing and roll-out from a crosswind approach to a landing.							
d. Ground handling and aerodynamic programming must include the following:					An SOC is required.		
(1) Ground effect.		X	X	X			Applicable areas include: roundout, flare, and touchdown and necessarily requires modeling of lift, drag, pitching moment, trim, and power while in ground effect..
(2) Ground reaction.		X	X	X			This necessarily requires modeling that accounts for strut deflections, tire friction, side forces, etc. and is the reaction of the airplane upon contact with the runway during landing, and may differ with changes in gross weight, airspeed, rate of descent on touchdown, etc.
(3) Ground handling characteristics, including aerodynamic and ground reaction modeling including steering inputs, operations with crosswind, braking, thrust reversing, deceleration, and turning radius.		X	X	X			
e. The simulator must employ windshear models that provide training for recognition of windshear phenomena and the execution of recovery procedures. Models must be available to the instructor/evaluator for the following critical phases of flight: (1) Prior to takeoff rotation. (2) At liftoff. (3) During initial climb. (4) On final approach, below 500 ft AGL.			X	X	Objective tests are required for qualification; see Attachment 2 and Attachment 6 of this appendix. The QTG must reference the FAA Windshear Training Aid or present alternate airplane related data, including the implementation method(s) used. If the alternate method is selected, wind models from the Royal Aerospace Establishment (RAE), the Joint Airport Weather Studies (JAWS) Project and other recognized sources may be implemented, but must be supported		If desired, Level A and B simulators may qualify for windshear training by meeting these standards; see Attachment 6 of this appendix. Windshear models may consist of independent variable winds in multiple simultaneous components. The FAA Windshear Training Aid presents one acceptable

					and properly referenced in the QTG. Only those simulators meeting these requirements may be used to satisfy the training requirements of part 121 pertaining to a certificate holder's approved low-altitude windshear flight training program as described in §121.409.		means of compliance with simulator wind model requirements.
f. The simulator must provide for manual and automatic testing of simulator hardware and software programming to determine compliance with simulator objective tests as prescribed in Attachment 2.			**X**	**X**	An SOC is required.		Automatic "flagging" of out-of-tolerance situations is encouraged.
g. Relative responses of the motion system, visual system, and cockpit	**X**	**X**			Response must be within 300 milliseconds of the airplane response. Objective Tests are required.		
instruments must be coupled closely to provide integrated sensory cues.			**X**	**X**	Response must be within 150 milliseconds of the airplane response. Objective Tests are required.		
Visual change may start before motion response, but motion acceleration must be initiated before completion of the visual scan of the first video field containing different information.					Visual scene changes from steady state disturbance (i.e., the start of the scan of the first video field containing different information) and motion system onset must occur within the system dynamic response limit of 150/300 milliseconds.		
(1) Latency: These systems must respond to abrupt input at the pilot's position. The response must not be prior to that time when the airplane responds and may respond up to 150/300 milliseconds after that time under the same conditions.					Simultaneously record: 1) the output from the pilot's controller(s); 2) the output from an accelerometer attached to the motion system platform located at an acceptable location near the pilots' seats; 3) the output signal to the visual system display (including visual system analog delays); and 4) the output signal to the pilot's attitude indicator or an equivalent test approved by the Administrator.		The intent is to verify that the simulator provides instrument, motion, and visual cues that are, within the stated time delays, like the airplane responses. For airplane response, acceleration in the appropriate, corresponding rotational axis is preferred. Simulator Latency is measured from the start of a

							control input to the appropriate perceivable change in flight instrument indication; visual system response; or motion system response (this does not include airplane response time as per the manufacturer's data).
(2) Transport Delay: (As an alternative to the Latency requirement, above, a transport delay objective test may be used to demonstrate that the simulator system does not exceed the specified limit. The sponsor must measure all the delay encountered by a step signal migrating from the pilot's control through the control loading electronics and interfacing through all the simulation software modules in the correct order, using a handshaking protocol, finally through the normal output interfaces to the instrument displays, the motion system, and the visual system.)					An SOC is required. A recordable start time for the test must be provided with the pilot flight control input. The migration of the signal must permit normal computation time to be consumed and must not alter the flow of information through the hardware/software system.		The transport delay is the time between the control input and the individual hardware (i.e., instruments, motion system, visual system) responses. If Transport Delay is the chosen method to demonstrate relative responses, it is expected that, when reviewing those existing tests where latency can be identified (e.g., short period, roll response, rudder response, etc.) the sponsor and the NSPM will apply additional scrutiny to ensure proper simulator response.
h. The simulator must accurately reproduce the following runway conditions: (1) Dry; (2) Wet; (3) Icy; (4) Patchy Wet. (5) Patchy Icy. (6) Wet on Rubber Residue in Touchdown Zone.			**X**	**X**	An SOC is required. Objective tests are required only for dry, wet, and icy runway conditions; see Attachment 2.		
i. The simulator must simulate: 1) brake and tire failure dynamics (including antiskid failure).			**X**	**X**	An SOC is required.		Simulator pitch, side loading, and directional control characteristics should be

2) decreased brake efficiency due to high brake temperatures, if applicable.							representative of the airplane.
j. The simulator must replicate the effects of airframe icing.			X	X	A Subjective Test is required.		
k. The aerodynamic modeling in the simulator must include: (1) Low-altitude level-flight ground effect; (2) Mach effect at high altitude; (3) Normal and reverse dynamic thrust effect on control surfaces; (4) Aeroelastic representations; and (5) Nonlinearities due to sideslip.			X	X	An SOC is required and must include references to computations of aeroelastic representations and of nonlinearities due to sideslip.		See Attachment 2, paragraph 4, for further information on ground effect.
l. The simulator must have aerodynamic and ground reaction modeling for the effects of reverse thrust on directional control, if applicable.		X	X	X	An SOC is required.		
3. Equipment Operation.							
a. All relevant instrument indications involved in the simulation of the airplane must automatically respond to control movement or external disturbances to the simulated airplane; e.g., turbulence or windshear.	X	X	X	X	Numerical values must be presented in the appropriate units. A subjective test is required.		
b. Communications, navigation, caution, and warning equipment must be installed and operate within the tolerances applicable for the airplane.	X	X	X	X	A subjective test is required.		See Attachment 3, paragraph 1d for further information regarding long-range navigation equipment.
c. Simulator systems must operate as the airplane systems would operate under normal, abnormal, and emergency operating conditions on the ground and in flight.	X	X	X	X	A subjective test is required.		
d. The simulator must provide pilot controls with control forces and control travel that correspond to the simulated airplane. The simulator must also react in the same manner as in the airplane under the same flight conditions.	X	X	X	X	An objective test is required.		
4. Instructor or Evaluator Facilities.							
a. In addition to the flight crew member stations,	X	X	X	X	All seats other than flight crew seats need not		The NSPM will consider

the simulator must have at least two suitable seats for the instructor/check airman and FAA inspector. These seats must provide adequate vision to the pilot's panel and forward windows.					represent those found in the airplane but must be adequately secured to the floor and equipped with similar positive restraint devices. A subjective test is required.		alternatives to this standard for additional seats based on unique cockpit configurations.
b. The simulator must have controls that enable the instructor/evaluator to control all required system variables and insert all abnormal or emergency conditions into the simulated airplane systems as described in the sponsor's FAA-approved training program; or as described in the relevant operating manual as appropriate.	**X**	**X**	**X**	**X**	A subjective test is required.		
c. The simulator must have instructor controls for environmental conditions including wind speed and direction.	**X**	**X**	**X**	**X**	A subjective test is required.		
d. The simulator must provide the instructor or evaluator the ability to present ground and air hazards.			**X**	**X**	A subjective test is required.		For example, another airplane crossing the active runway and converging airborne traffic; etc.
5. Motion System.							
a. The simulator must have motion (force) cues perceptible to the pilot that are representative of the motion in an airplane.	**X**	**X**	**X**	**X**	A subjective test is required.		For example, touchdown cues should be a function of the rate of descent (RoD) of the simulated airplane.
b. The simulator must have a motion (force cueing) system with a minimum of three degrees of freedom (at least pitch, roll, and heave).	**X**	**X**			An SOC is required.		
c. The simulator must have a motion (force cueing) system that produces cues at least equivalent to those of a six-degrees-of-freedom, synergistic platform motion system (i.e., pitch, roll, yaw, heave, sway, and surge).			**X**	**X**	An SOC is required.		
d. The simulator must provide for the recording of the motion system response time.	**X**	**X**	**X**	**X**	An SOC is required.		
e. The simulator must provide motion effects programing to include: (1) Thrust effect with brakes set.		**X**	**X**	**X**	A subjective test is required.		

(2) Runway rumble, oleo deflections, effects of ground speed, uneven runway, centerline lights, and taxiway characteristics. (3) Buffets on the ground due to spoiler/speedbrake extension and thrust reversal. (4) Bumps associated with the landing gear. (5) Buffet during extension and retraction of landing gear. (6) Buffet in the air due to flap and spoiler/speedbrake extension. (7) Approach-to-Stall buffet. (8) Representative touchdown cues for main and nose gear. (9) Nosewheel scuffing, if applicable. (10) Mach and maneuver buffet.							
f. The simulator must provide characteristic motion vibrations that result from operation of the airplane, in so far as vibration marks an event or airplane state, which can be sensed in the cockpit.				**X**	An objective test is required.		The simulator should be programmed and instrumented in such a manner that the characteristic buffet modes can be measured and compared to airplane data.
6. Visual System.							
a. The simulator must have a visual system providing an out-of-the-cockpit view.	**X**	**X**	**X**	**X**	A subjective test is required.		
b. The simulator must provide a continuous minimum collimated field of view of 45° horizontally and 30° vertically per pilot seat. Both pilot seat visual systems must be operable simultaneously.	**X**	**X**			An SOC is required.		
c. The simulator must provide a continuous minimum collimated visual field of view of 75° horizontally and 30° vertically per pilot seat. Both pilot seat visual systems must be operable simultaneously.			**X**	**X**	An SOC is required. Wide angle systems providing cross cockpit viewing (for both pilots simultaneously) must provide a minimum field of view of 150° horizontally.		Optimization of the vertical field of view may be considered with respect to the specific airplane cockpit cut-off

							angle.
d. The simulator must have operational landing lights for night scenes.	**X**	**X**	**X**	**X**	A subjective test is required Where used, dusk (or twilight) scenes require operational landing lights.		
e. The simulator must have instructor controls for the following: (1) Cloudbase. (2) Visibility in statute miles (km) and runway visual range (RVR) in ft. (m). (3) Airport selection. (4) Airport lighting.	**X**	**X**	**X**	**X**	A subjective test is required.		
f. Each airport scene displayed must include the following: (1) Airport runways and taxiways. (2) Runway definition. (i) Runway surface and markings. (ii) Lighting for the runway in use, including runway threshold, edge, centerline, touchdown zone, VASI (or PAPI), and approach lighting of appropriate colors, as appropriate. (iii) Taxiway lights.	**X**	**X**	**X**	**X**	A subjective test is required.		
g. The distances at which runway features are visible, as measured from runway threshold to an airplane aligned with the runway on an extended 3° glide slope must not be less than listed below: (1) Runway definition, strobe lights, approach lights, runway edge white lights and Visual Approach Slope Indicator (VASI) or Precision Approach Path Indicator (PAPI) system lights from 5 statute miles (8 kilometers (km)) of the runway threshold. (2) Runway centerline lights and taxiway definition from 3 statute miles (4.8 km). (3) Threshold lights and touchdown zone lights from 2 statute miles (3.2 km). (4) Runway markings within range of landing	**X**	**X**	**X**	**X**	A funtional test is required.		

lights for night scenes and as required by three (3) arc-minutes resolution on day scenes.							
h. The simulator must provide visual system compatibility with dynamic response programming.	**X**	**X**	**X**	**X**	A Subjective Test is required.		
i. The simulator must be verified for visual ground segment and visual scene content for the airplane in landing configuration and a main wheel height of 100 feet (30 meters) above the touchdown zone. Data submitted must include at least the following: (1) Static airplane dimensions as follows: (i) Horizontal and vertical distance from main landing gear (MLG) to glideslope reception antenna. (ii) Horizontal and vertical distance from MLG to pilot's eyepoint. (iii) Static cockpit cutoff angle. (2) Approach data as follows: (i) Identification of runway. (ii) Horizontal distance from runway threshold to glideslope intercept with runway. (iii) Glideslope angle. (iv) Airplane pitch angle on approach. (3) Airplane data for manual testing: (i) Gross weight. (ii) Airplane configuration. (iii) Approach airspeed.	**X**	**X**	**X**	**X**	An SOC is required. The QTG must contain appropriate calculations and a drawing showing the pertinent data used to establish the airplane location and the segment of the ground that is visible considering the airplane attitude (cockpit cut-off angle) and a runway visual range of 1,200 feet or 350 meters. Simulator performance must be measured against the QTG calculations. Sponsors must provide this data for each simulator (regardless of previous qualification standards) to qualify the simulator for all precision instrument approaches.		
j. The simulator must provide visual cues necessary to assess sink rates (provide depth perception) during landings, to include: (1) Surface on runways, taxiways, and ramps. (2) Terrain features.		**X**	**X**	**X**	A subjective test is required.		
k. The simulator must have night and dusk (or twilight) visual scene capability, including general terrain characteristics and significant landmarks, free from apparent quantization.			**X**	**X**	A subjective test is required. Dusk (or twilight) scene must enable identification of a visible horizon and general terrain characteristics.		Examples of general terrain characteristics are fields, roads, and bodies of water.
l. The simulator must provide for	**X**	**X**	**X**	**X**	A subjective test is required.		Visual attitude vs. simulator

(1) accurate portrayal of the environment relating to the simulator attitude.							attitude is a comparison of pitch and roll of the horizon as displayed in the visual scene compared to the display on the attitude indicator.
(2) quick confirmation of visual system color, RVR, focus, and intensity.			**X**	**X**	An SOC is required. A subjective test is required.		
m. The simulator must provide a minimum of three airport scenes including: (1) Surfaces on runways, taxiways, and ramps. (2) Lighting of appropriate color for all runways, including runway threshold, edge, centerline, VASI (or PAPI), and approach lighting for the runway in use. (3) Airport taxiway lighting. (4) Ramps and buildings that correspond to the sponsor's Line Oriented scenarios, as appropriate.			**X**	**X**	A subjective test is required.		
n. The simulator must be capable of producing at least 10 levels of occulting.			**X**	**X**	A subjective test is required.		
o. The simulator must be able to provide weather representations including the following: (1) Variable cloud density. (2) Partial obscuration of ground scenes; i.e., the effect of a scattered to broken cloud deck. (3) Gradual break out. (4) Patchy fog. (5) The effect of fog on airport lighting.			**X**	**X**	A subjective test is required. The weather representations must be provided at and below an altitude of 2,000 ft (610 m) height above the airport and within a radius of 10 miles (16 km) from the airport.		
p. The simulator must have daylight, night, and either dusk or twilight visual scenes with sufficient scene content to recognize the airport, the terrain, and major landmarks around the airport. The scene content must allow a pilot to successfully accomplish a visual landing.				**X**	An SOC is required. A subjective test is required. Any ambient lighting must not "washout" the displayed visual scene. These requirements are applicable to any level of simulator equipped with a "daylight" visual system.		Brightness capability may be demonstrated with a test pattern of white light using a spot photometer. Daylight visual system is defined as a visual system capable of producing, at a minimum, full color presentations, scene content comparable in detail to that produced by 4,000

							edges or 1,000 surfaces for daylight and 4,000 lightpoints for night and dusk scenes, 6 foot-lamberts (20 cd/m^2) of light measured at the pilot's eye position (highlight brightness) and a display which is free of apparent quantization and other distracting visual effects while the simulator is in motion.
q. The simulator must provide operational visual scenes that portray physical relationships known to cause landing illusions to pilots.				**X**	A subjective test is required.		For example: short runways, landing approaches over water, uphill or downhill runways, rising terrain on the approach path, unique topographic features, etc.
r. The simulator must provide special weather representations of light, medium, and heavy precipitation near a thunderstorm on takeoff and during approach and landing.				**X**	A subjective test is required. Representations need only be presented at and below an altitude of 2,000 ft. (610 m) above the airport surface and within 10 miles (16 km) of the airport.		
s. The simulator must present visual scenes of wet and snow-covered runways, including runway lighting reflections for wet conditions, partially obscured lights for snow conditions, or suitable alternative effects.				**X**	A subjective test is required.		
t. The simulator must present realistic color and directionality of all airport lighting.				**X**	A subjective test is required.		
7. Sound System.							
a. The simulator must provide cockpit sounds that result from pilot actions that correspond to those that occur in the airplane.	**X**	**X**	**X**	**X**			
b. The simulator must accurately simulate the sound of precipitation, windshield wipers, and			**X**	**X**	An SOC is required. A subjective test is required.		

other significant airplane noises perceptible to the pilot during normal and abnormal operations, and include the sound of a crash (when the simulator is landed in an unusual attitude or in excess of the structural gear limitations); normal engine and thrust reversal sounds; and the sounds of flap, gear, and spoiler extension and retraction.							
c. The simulator must provide realistic amplitude and frequency of cockpit noises and sounds.				**X**	Simulator performance must be recorded, compared to amplitude and frequency of the same sounds recorded in the airplane, and be made a part of the QTG. .		

Flight Simulation Device Aviation Rulemaking Committee
October 6-10, 2003

Make √ if present (and make any changes to contact information)

Attachment 2 to Appendix A to Part 60--

FULL FLIGHT SIMULATOR (FFS) OBJECTIVE EVALUATION

1. General

Begin QPS Requirements

a. Test requirements.

(1) The ground and flight tests required for qualification are listed in the following Table of Objective Tests. Computer generated simulator test results must be provided for each test except where specifically authorized an alternate means by the NSPM. If a flight condition or operating condition is required for the test but which does not apply to the airplane being simulated or to the qualification level sought, it may be disregarded (for example: an engine out missed approach for a single-engine airplane; a maneuver using reverse thrust for an airplane without reverse thrust capability; a landing test for a Level A simulator; etc.). Each test result is compared against the validation data described in § 60.13, and Paragraph 9 in the main body of this appendix. Although use of a driver program designed to automatically accomplish the tests is encouraged for all simulators and required for Level C and Level D simulators, each test must be able to be accomplished manually while recording all appropriate parameters. The results must be produced on an appropriate recording device acceptable to the NSPM and must include simulator number, date, time, conditions, tolerances, and appropriate dependent variables portrayed in comparison to the validation data. Time histories are required unless otherwise indicated in the Table of Objective Tests. All results must be labeled using the tolerances and units given.

(2) The Table of Objective Tests in this attachment sets out the test results required, including the parameters, tolerances, and flight conditions for simulator validation. Tolerances are provided for the listed tests because mathematical modeling and acquisition/development of reference data are often inexact. All tolerances

listed in the following tables are applied to simulator performance. When two tolerance values are given for a parameter, the less restrictive may be used unless otherwise indicated.

(3) Certain tests included in this attachment must be supported with a Statement of Compliance and Capability (SOC). In the following tabular listing of simulator tests, requirements for SOC's are indicated in the "Test Details" column.

(4) When operational or engineering judgment is used in making assessments for flight test data applications for simulator validity, such judgment must not be limited to a single parameter. For example, data that exhibit rapid variations of the measured parameters may require interpolations or a "best fit" data selection. All relevant parameters related to a given maneuver or flight condition must be provided to allow overall interpretation. When it is difficult or impossible to match simulator to airplane data throughout a time history, differences must be justified by providing a comparison of other related variables for the condition being assessed.

(5) Unless noted otherwise, simulator tests must represent airplane performance and handling qualities at operating weights and centers of gravity (CG) typical of normal operation. If a test is supported by airplane data at one extreme weight or CG, another test supported by airplane data at mid-conditions or as close as possible to the other extreme must be included, except as may be authorized by the NSPM. Tests of handling qualities must include validation of augmentation devices.

(6) When comparing the parameters listed to those of the airplane, sufficient data must also be provided to verify the correct flight condition and airplane configuration changes. For example: to show that control force is within ±5 pounds (2.2 daN) in a static stability test, data to show the correct airspeed, power, thrust or torque, airplane configuration, altitude, and other appropriate datum identification parameters must also be given. If comparing short period dynamics, normal acceleration may be used to establish a match to the airplane, but airspeed, altitude, control input, airplane configuration, and other appropriate data must also be given. If comparing landing gear change dynamics, pitch, airspeed, and altitude may be used to establish a match to the airplane, but landing gear position must also be provided. All airspeed values must be clearly annotated as to indicated, calibrated, etc., and like values used for comparison.

(7) The QTG provided by the sponsor must describe clearly and distinctly how the simulator will be set up and operated for each test. Overall integrated testing of the simulator must be accomplished to assure that the total simulator system meets the prescribed standards; i.e., it is not acceptable to test only each simulator subsystem

independently. A manual test procedure with explicit and detailed steps for completion of each test must also be provided.

(8) In those cases where the objective test results authorize a "snapshot test" or "a series of snapshot test" results in lieu of a time-history result, the sponsor or other data provider must ensure that a steady state condition exists from at least 5 seconds prior to, through at least 2 seconds after, the instant of time captured by the "snapshot."

(9) For previously qualified simulators, the tests and tolerances of this attachment may be used in subsequent continuing qualification evaluations for any given test providing the sponsor has submitted a proposed MQTG revision to the NSPM and has received NSPM approval.

(10) Simulators are evaluated and qualified with an engine model simulating the airplane data supplier's flight test engine. For qualification of alternative engine models (either variations of the flight test engines or other manufacturer's engines) additional tests with the alternative engine models may be required. Where thrust is more than 5% greater or more than 15% less than that of the flight test engine, flight test data from an airplane equipped with the alternative engine is required. However, if the validation data supplier shows that a thrust increase greater than 5% will not significantly change the airplane's flight characteristics, then flight validation data are not needed. Where the airplane data supplier certifies that the only impact on the simulator model is thrust, and that other variables related to the alternative engine (such as drag and thrust vector) are unchanged or are insignificantly changed, additional simulator tests may be run with the same initial conditions using the thrust from the flight test data as a driven parameter for the alternative engine model.

(11) For testing Computer Controlled Airplane (CCA) simulators, or other highly augmented airplane simulators, flight test data may be required for the Normal (N) and/or Non-normal (NN) control states, as indicated in this attachment.Where test results are independent of control state, Normal or Non-normal control data may be used. All tests in the Table of Objective Tests require test results in the Normal control state unless specifically noted otherwise in the additional requirements section following the CCA designation. Tests for other levels of control state degradation may be required as detailed by the NSPM at the time of definition of a set of specific airplane tests for simulator data. Where Non-normal control states are required, test data must be provided for one or more Non-normal control states, and must include the least augmented state. Where applicable, flight test data must record Normal and Non-normal states for:

(a) Pilot controller deflections or electronically generated inputs, including location of input; and

(b) Flight control surface positions unless test results are not affected by, or are independent of, surface positions.

(12) For computer controlled airplanes using airplane hardware (e.g., "side stick controller") in the simulator cockpit, some tests will not be required. Those tests are annotated in the "Additional Requirements" column with the Computer Controlled Airplane (CCA) note – "test not required if cockpit controller is installed in the simulator." However, in these cases the sponsor must supply a statement that the airplane hardware meets and will continue to meet the appropriate manufacturer's specifications and the sponsor must have supporting information to that fact available for NSPM review.

End QPS Requirements

---

b. Discussion.

Begin Information

(1) If relevant winds are present in the objective data, the wind vector should be clearly noted as part of the data presentation, expressed in conventional terminology, and related to the runway being used for the test.

(2) In the following Table of Objective Tests, the last column is titled "Paragraph 12." A "yes" indication in that column directs the reader to paragraph 12 of this attachment for additional information relative to sources of data, procedures used to acquire the data, and instrumentation that may be used, as an alternative to those expected under normal flight test procedures and that may be used for that particular test for Level A or Level B simulators. Paragraph 12 also contains notes, reminders, and information applicable to that particular test for

those simulator levels. These data sources, procedures, and instrumentation, if used, would be submitted in accordance with the alternative data provisions of § 60.13 of Part 60 and Section 9 of this QPS attachment.

(3) The reader is encouraged to review the Airplane Flight Simulator Evaluation Handbook, Volumes I and II, published by the Royal Aeronautical Society, London, UK, and FAA Advisory Circulars (AC) 25-7, as may be amended, Flight Test Guide for Certification of Transport Category Airplanes, and (AC) 23-8, as may be amended, Flight Test Guide for Certification of Part 23 Airplanes, for references and examples regarding flight testing requirements and techniques.

End Information

TABLE OF OBJECTIVE TESTS									
QPS REQUIREMENTS								INFORMATION	PARA 12
TEST	TOLERANCE	FLIGHT CONDITIONS	SIMULATOR LEVEL				TEST DETAILS	NOTES	
			A	B	C	D			
1. Performance									
a. Taxi									
(1) Minimum Radius Turn	±3 ft (0.9m) or 20% of airplane turn radius	Ground		X	X	X	Record both Main and Nosegear loci. This test is to be accomplished without the use of brakes and only minimum thrust required to maintain a steady turn, except for airplanes requiring asymmetric thrust or braking to turn.	The term "loci" describes the sequential points that make up the path that the respective landing gear follow during a turn.	Yes
(2) Rate of Turn vs. Nosewheel Steering Angle (NWA)	±10% or ±2°/sec. turn rate	Ground		X	X	X	Record a minimum of two speeds, greater than minimum turning radius speed, with a spread of at least 5 knots groundspeed.		Yes
b. Takeoff							All commonly used takeoff flap settings are to be demonstrated at least once in the tests for minimum unstick (1b3), normal takeoff (1b4), critical engine failure on takeoff (1b5), or crosswind takeoff (1b6).		
(1) Ground Acceleration Time and Distance	±5% time and distance or ±5% time and ±200 ft (61 m) of distance	Takeoff	X	X	X	X	Record acceleration time and distance for a minimum of 80% of the total time from brake release to V_R.	May be combined with normal takeoff (1b4) or rejected takeoff (1b7). Plotted data must be shown using appropriate scales for each portion of the maneuver. Preliminary aircraft certification data	Yes

TABLE OF OBJECTIVE TESTS									
QPS REQUIREMENTS								INFORMATION	
TEST	TOLERANCE	FLIGHT CONDITIONS	SIMULATOR LEVEL				TEST DETAILS	NOTES	PARA 12
			A	B	C	D			
								may be used.	
(2) Minimum Control Speed - ground (V_{mcg}) using aerodynamic controls only (per applicable airworthiness standard or alternative) or engine inoperative test to demonstrate ground control characteristics	±25% of maximum airplane lateral deviation or ±5 ft (1.5 m). Additionally, for those simulators of airplanes with reversible flight control systems: Rudder pedal force; ±10% or ± 5 lb (2.2 daN).	Takeoff	X	X	X	X	Engine failure speed must be within ±1 knot of airplane engine failure speed. Engine thrust decay must be that resulting from the mathematical model for the engine variant applicable to the flight simulator under test. If the modeled engine variant is not the same as the airplane manufacturer's flight test engine, then a further test may be run with the same initial conditions using the thrust from the flight test data as the driving parameter.	If a V_{mcg} test is not available an acceptable alternative is a flight test snap engine deceleration to idle at a speed between V_1 and V_1 –10 knots, followed by control of heading using aerodynamic control only. Recovery should be achieved with the main gear on the ground. To ensure only aerodynamic control is used, nosewheel steering should be disabled (i.e., castored) or the nosewheel held slightly off the ground.	Yes
(3) Minimum Unstick Speed (V_{mu}) or equivalent test to demonstrate early rotation takeoff characteristics.	±3 Kts airspeed ±1.5° pitch angle	Takeoff	X	X	X	X	Record main landing gear strut compression or equivalent air/ground signal. Time history data must be recorded from 10 knots before the start of the rotation until at least 5 seconds after the occurrence of main gear lift off.	V_{mu} is the minimum speed at which the last main landing gear leaves the ground. If a V_{mu} test is not available, alternative acceptable flight	Yes

TABLE OF OBJECTIVE TESTS									
QPS REQUIREMENTS								INFORMATION	
TEST	TOLERANCE	FLIGHT CONDITIONS	SIMULATOR LEVEL				TEST DETAILS	NOTES	PARA 12
			A	B	C	D			
								tests are a constant high-attitude takeoff recorded through main gear lift off or an early rotation takeoff.	
(4) Normal Takeoff	±3 Kts airspeed ±1.5° pitch ±1.5° angle of attack ±20 ft (6 m) altitude. Additionally, for those simulators of airplanes with reversible flight control systems: Stick/Column Force; ± 10% or ± 5 lb (2.2 daN).	Takeoff	X	X	X	X	Data are required for a takeoff weight at near maximum takeoff weight with a mid-center of gravity and for a light takeoff weight with an aft center of gravity. If the airplane has more than one certificated takeoff configurations, a different configuration must be used for each weight. Record takeoff profile from brake release to at least 200 ft (61 m) above ground level (AGL). Plotted data must be shown using appropriate scales for each portion of the maneuver. This test may be used for ground acceleration time and distance (1b1).	.	Yes
(5) Critical Engine Failure on Takeoff	±3 kts airspeed ±1.5° pitch, ±1.5° angle of attack, ±20 ft (6 m) altitude, ±3° heading, ±2° bank and sideslip	Takeoff	X	X	X	X	Record takeoff profile at near maximum takeoff weight from prior to engine failure to at least 200 ft (61 m) AGL. Engine failure speed must be within ±3 kts of airplane data.		Yes

TABLE OF OBJECTIVE TESTS									
QPS REQUIREMENTS								INFORMATION	PARA 12
TEST	TOLERANCE	FLIGHT CONDITIONS	SIMULATOR LEVEL				TEST DETAILS	NOTES	
			A	B	C	D			
	angle. Additionally, for those simulators of airplanes with reversible flight control systems: Stick/ Column Force; ±10% or ±5 lb (2.2 daN)); Wheel Force; ±10% or ±1.3 daN (3 lb)); and Rudder Pedal Force; ±10% or ±5 lb (2.2 daN).								
(6) Crosswind Takeoff	±3 kts airspeed, ±1.5° pitch, ±1.5° angle of attack, ±20 ft (6 m) altitude, ±2° bank and sideslip angle; ±3° heading. Additionally, for those simulators of airplanes with reversible flight control systems: Stick/Column Force; ±10% or ±5 lb (2.2 daN); Wheel Force; ±10% or ±3 lb (1.3daN); and Rudder Pedal Force; ±10% or ±5 lb (2.2 daN).	Takeoff	X	X	X	X	Record takeoff profile from brake release to at least 200 ft (61 m) AGL. Requires test data, including information on wind profile for a crosswind component of at least 60% of the maximum described in the Airplane Flight Manual, as measured at 33 ft (10m) above the runway.	In those situations where a maximum crosswind or a maximum demonstrated crosswind is not included in the AFM, contact the NSPM.	Yes
(7) Rejected Takeoff	±5% time or ±1.5 sec ±7.5% distance or ±250 ft (±76 m	Takeoff	X	X	X	X	Record time and distance from brake release to full stop. Speed for initiation of the reject must be at least 80% of V_1 speed. The weight must be at or near the maximum takeoff	Autobrakes will be used where applicable.	Yes

TABLE OF OBJECTIVE TESTS									
QPS REQUIREMENTS								INFORMATION	
TEST	TOLERANCE	FLIGHT CONDITIONS	SIMULATOR LEVEL				TEST DETAILS	NOTES	PARA 12
			A	B	C	D			
							gross weight. Use maximum braking effort, auto or manual.		
(8) Dynamic Engine Failure After Takeoff	±20% or ±2°/sec body angular rates	Takeoff			X	X	Engine failure speed must be within ±3 Kts of airplane data. Record Hands Off from 5 secs. before to at least 5 secs. after engine failure or 30º Bank, whichever occurs first. Engine failure may be a snap deceleration to idle. (**CCA**: Test in Normal and Non-normal control state.)	For safety considerations, airplane flight test may be performed out of ground effect at a safe altitude, but with correct airplane configuration and airspeed.	
c. Climb									
(1) Normal Climb, all engines operating.	±3 kts airspeed, ±5% or ±100 FPM (0.5 m/Sec.) climb rate	Clean configuration.	X	X	X	X	Record results at nominal climb speed and at mid-initial climb altitude. Flight test data or airplane performance manual data may be used. Flight simulator performance must be recorded over an interval of at least 1,000 ft. (300m).		Yes
(2) One engine Inoperative Second Segment Climb	±3 kts airspeed, ±5% or ±100 FPM (0.5 m/Sec.) climb rate, but not less than the FAA-Approved Airplane Flight Manual (AFM) values.	Second Segment Climb	X	X	X	X	Record results at airplane limiting conditions of weight, altitude, & temperature. Flight test data or airplane performance manual data may be used. Record at nominal climb speed. Flight simulator performance must be recorded over an interval of at least 1,000 ft. (300m).		Yes
(3) One Engine Inoperative En route	±10% time, ±10% distance, ±10% fuel used	Clean configuration			X	X	Record results for at least a 5000 ft (1550 m) climb		

TABLE OF OBJECTIVE TESTS									
QPS REQUIREMENTS								INFORMATION	PARA 12
TEST	TOLERANCE	FLIGHT CONDITIONS	SIMULATOR LEVEL				TEST DETAILS	NOTES	
			A	B	C	D			
Climb							segment. Flight test data or airplane performance manual data may be used.		
(4) One Engine Inoperative Approach Climb (if the approved AFM requires specific performance in icing conditions)	±3 kts airspeed, ±5% or ±100 FPM (0.5 m/Sec.) climb rate, but not less than the Approved AFM values.	Approach	X	X	X	X	Record results at near maximum landing weight. Flight test data or airplane performance manual data may be used Flight simulator performance must be recorded over an interval of at least 1,000 ft. (300m)..	The airplane should be configured with all anti-ice and de-ice systems operating normally, with the gear up and go-around flaps set. All icing accountability considerations should be applied in accordance with the AFM for an approach in icing conditions.	Yes
d. Cruise / Descent									
(1) Level flight acceleration	±5% Time	Cruise	X	X	X	X	Record results for a minimum of 50 kts speed increase using maximum continuous thrust rating or equivalent.		
(2) Level flight deceleration.	±5% Time	Cruise	X	X	X	X	Record results for a minimum of 50 kts. speed decrease using idle power.		
(3) Cruise performance	±0.05 EPR or ±5% of N_1, or ±5% of Torque, ±5% of fuel flow	Cruise			X	X	May be a single snapshot showing instantaneous fuel flow or a minimum of 2 consecutive snapshots with a spread of at least 3 minutes in steady flight.		
e. Stopping									

TABLE OF OBJECTIVE TESTS									
QPS REQUIREMENTS								INFORMATION	PARA 12
TEST	TOLERANCE	FLIGHT CONDITIONS	SIMULATOR LEVEL				TEST DETAILS	NOTES	
			A	B	C	D			
(1) Deceleration time and distance, using manual application of wheel brakes and no reverse thrust on a dry runway.	±5% of time. For distance up to 4000 ft (1220 m): ±200 ft (61 m) or ±10%, whichever is smaller. For distance greater than 4000 ft (1220 m): ±5% of distance.	Landing,	X	X	X	X	Record time and distance for at least 80% of the total time from touch down to full stop. Data is required for weights at medium and near maximum landing weights. Data for brake system pressure and position of ground spoilers (including method of deployment, if used) must be provided. Engineering data may be used for the medium gross weight condition.		Yes
(2) Deceleration time and distance, using reverse thrust and no wheel brakes on a dry runway.	±5% time and the smaller of ±10% or ±200 ft (61 m) of distance	Landing,	X	X	X	X	Record time and distance for at least 80% of the total time from initiation of reverse thrust to the minimum operating speed with full reverse thrust. Data is required for medium, and near maximum landing gross weights. Data on the position of ground spoilers, (including method of deployment, if used) must be provided. Engineering data may be used for the medium gross weight condition.		Yes
(3) Deceleration distance, using wheel brakes and no reverse thrust on a wet runway.	±10% of distance or ±200 ft (61 m)	Landing,			X	X	Either flight test data or manufacturer's performance manual data must be used where available. Engineering data, based on dry runway flight test stopping distance modified by the effects of		

TEST	TOLERANCE	FLIGHT CONDITIONS	SIMULATOR LEVEL A	B	C	D	TEST DETAILS	NOTES	PARA 12
							contaminated runway braking coefficients are an acceptable alternative.		
(4) Deceleration distance, using wheel brakes and no reverse thrust on an icy runway.	±10% of distance or ±200 ft (61 m)	Landing,			X	X	Either flight test data or manufacturer's performance manual data must be used where available. Engineering data, based on dry runway flight test stopping distance modified by the effects of contaminated runway braking coefficients are an acceptable alternative.		
f. Engines									
(1) Acceleration	±10% $T_{i,}$ or ±0.25 sec. ±10% T_t	Approach or landing	X	X	X	X	Record engine power (N_1, N_2, EPR, Torque, etc.) from flight idle to go-around power for a rapid (slam) throttle movement.	$T_{i,}$ is the total time from initial throttle movement until reaching a 10% response of engine power. T_t is the total time from initial throttle movement to reaching 90% of go around power.	Yes
(2) Deceleration	±10% $T_{i,}$ or ±0.25 sec. ±10% T_t	Ground					Record engine power (N_1, N_2, EPR, Torque, etc.) from Max T/O power to 90% decay of Max T/O power for a rapid (slam) throttle movement.	$T_{i,}$ is the total time from initial throttle movement until reaching a 10% response of engine power. T_t is the total time from initial throttle	Yes

TABLE OF OBJECTIVE TESTS									
QPS REQUIREMENTS								INFORMATION	
TEST	TOLERANCE	FLIGHT CONDITIONS	SIMULATOR LEVEL				TEST DETAILS	NOTES	PARA 12
			A	B	C	D			
								movement to reaching 90% decay of maximum takeoff power.	
2. Handling Qualities									
For simulators requiring Static or Dynamic tests at the controls (i.e., column, wheel, rudder pedal), special test fixtures will not be required during initial or upgrade evaluations if the sponsor's QTG/MQTG shows both test fixture results **and** the results of an alternative approach, such as computer plots produced concurrently, that show satisfactory agreement. Repeat of the alternative method during the initial or upgrade evaluation would then satisfy this test requirement. For initial and upgrade evaluations, the control dynamic characteristics must be measured at and recorded directly from the cockpit controls, and must be accomplished in takeoff, cruise, and landing flight conditions and configurations. Testing of position versus force is not applicable if forces are generated solely by use of airplane hardware in the flight simulator. Contact the NSPM for clarification of any issue regarding airplanes with reversible controls.									
a. Static Control Checks									
(1) Pitch Controller Position vs. Force and Surface Position Calibration	Breakout: ±2 lb (0.9 daN). Force: ±10% or±5 lb (2.2 daN) and ±2° Elevator	Ground	**X**	**X**	**X**	**X**	Record results for an uninterrupted control sweep to the stops. (	Test results should be validated (where possible) with in-flight data from tests such as longitudinal static stability, stalls, etc. Static and dynamic flight control tests should be accomplished at the same feel or impact pressures.	Yes
(2) Roll Controller Position vs. Force and Surface Position Calibration	Breakout: ±2 lb (0.9 daN). Force: ±10% or ±3 lb (1.3 daN) and ±2° Aileron, ±3° Spoiler Angle	Ground	**X**	**X**	**X**	**X**	Record results for an uninterrupted control sweep to the stops.	Test results should be validated with in-flight data from tests such as engine out trims, steady state sideslips, etc. Static and dynamic flight	Yes

TABLE OF OBJECTIVE TESTS									
QPS REQUIREMENTS								INFORMATION	P A R A 12
TEST	TOLERANCE	FLIGHT CONDITIONS	SIMULATOR LEVEL				TEST DETAILS	NOTES	
			A	B	C	D			
								control tests should be accomplished at the same feel or impact pressures.	
(3) Rudder Pedal Position vs. Force and Surface Position Calibration	Breakout: ±5 lb (2.2 daN). Force ±10% or ±5 lb (2.2 daN) and ±2° Rudder Angle	Ground	X	X	X	X	Record results for an uninterrupted control sweep to the stops.	Test results should be validated with in-flight data from tests such as engine out trims, steady state sideslips, etc. Static and dynamic flight control tests should be accomplished at the same feel or impact pressures.	Yes
(4) Nosewheel Steering Controller Force & Position	Breakout: ±2 lb (0.9 daN). Force: ±10% or ±3 lb (1.3 daN) and ±2° Nosewheel Angle	Ground	X	X	X	X	Record results of an uninterrupted control sweep to the stops.		Yes
(5) Rudder Pedal Steering Calibration	±2° Nosewheel Angle	Ground	X	X	X	X	Record results of an uninterrupted control sweep to the stops.		Yes
(6) Pitch Trim Indicator vs. Surface Position Calibration.	±0.5° of Computed Trim Angle,	Ground	X	X	X	X		The purpose of the test is to compare flight simulator against design data or equivalent.	Yes
(7) Alignment of Cockpit Throttle Lever vs. Selected Engine Parameter.	±5° of Throttle Lever Angle, or ±3% N1, or ±.03 EPR, or ±3% torque. For propeller-driven	Ground	X	X	X	X	Requires simultaneous recording for all engines. The tolerances apply against airplane data and between engines. In the case of propeller powered airplanes, if		Yes

TABLE OF OBJECTIVE TESTS									
QPS REQUIREMENTS								INFORMATION	PARA 12
TEST	TOLERANCE	FLIGHT CONDITIONS	SIMULATOR LEVEL				TEST DETAILS	NOTES	
			A	B	C	D			
	airplanes where the propeller control levers do not have angular travel, a tolerance of ±0.8 inch (±2 cm.) applies.						a propeller lever is present, it must also be checked. For airplanes with throttle "detents," all detents must be presented. May be a series of snapshot test results		
(8) Brake Pedal Position vs. Force and Brake System Pressure Calibration.	±5 lb (2.2 daN) or 10% Force, ±150 psi (1.0 MPa) or ±10% brake system pressure	Ground	X	X	X	X	Hydraulic system pressure must be related to pedal position through a ground static test. Flight simulator computer output results may be used to show compliance.		Yes
b. Dynamic Control Checks								Tests 2b1, 2b2, and 2b3 are not applicable if dynamic response is generated solely by use of airplane hardware in the flight simulator. Power setting may be that required for level flight unless otherwise specified.	
(1) Pitch Control	For Underdamped systems: ±10% of time from 90% of initial displacement (A_d) to first zero crossing and ±10 (n+1)% of period thereafter. ±10% amplitude of first	Takeoff, Cruise, and Landing			X	X	Data must show normal control displacement in both directions. Tolerances apply against the absolute values of each period (considered independently). Normal control displacement for this test is 25% to 50% of full throw or approximately 25% to 50% of the maximum allowable	"n" is the sequential period of a full cycle of oscillation. Refer to paragraph 6 of this attachment for more information.	

TABLE OF OBJECTIVE TESTS									
QPS REQUIREMENTS								INFORMATION	P A R A 12
TEST	TOLERANCE	FLIGHT CONDITIONS	SIMULATOR LEVEL				TEST DETAILS	NOTES	
			A	B	C	D			
	overshoot applied to all overshoots greater than 5% of initial displacement (A_d). ±1 overshoot (first significant overshoot must be matched). For overdamped systems: ±10% of time from 90% of initial displacement (A_d) to 10% of initial displacement (0.1 A_d)						pitch controller deflection for flight conditions limited by the maneuvering load envelope.		
(2) Roll Control	For underdamped systems: ±10% of time from 90% of initial displacement (A_d) to first zero crossing, and ±10 (n±1)% of period thereafter. ±10% amplitude of first overshoot, applied to all overshoots greater than 5% of initial displacement (A_d), ±1 overshoot (first significant overshoot must be matched). For overdamped systems: ±10% of time from 90% of initial displacement	Takeoff, Cruise, and Landing			X	X	Data must show normal control displacement in both directions. Tolerances apply against the absolute values of each period (considered independently). Normal control displacement for this test is 25% to 50% of full throw or approximately 25% to 50% of maximum allowable roll controller deflection for flight conditions limited by the maneuvering load envelope..	"n" is the sequential period of a full cycle of oscillation. Refer to paragraph 6 of this attachment for more information.	

TABLE OF OBJECTIVE TESTS									
QPS REQUIREMENTS								INFORMATION	
TEST	TOLERANCE	FLIGHT CONDITIONS	SIMULATOR LEVEL				TEST DETAILS	NOTES	PARA 12
			A	B	C	D			
	(A_d) to 10% of initial displacement ($0.1A_d$).								
(3) Yaw Control	For underdamped systems: ±10% of time from 90% of initial displacement (A_d) to first zero crossing, and ±10 (n±1)% of period thereafter. ±10% amplitude of first overshoot applied to all overshoots greater than 5% of initial displacement (A_d). ±1 overshoot (first significant overshoot must be matched). For overdamped systems: ±10% of time from 90% of initial displacement (A_d) to 10% of initial displacement ($0.1A_d$).	Takeoff, Cruise, and Landing			X	X	Data must show normal control displacement in both directions. Tolerances apply against the absolute values of each period (considered independently). Normal control displacement for this test is 25% to 50% of full throw.	"n" is the sequential period of a full cycle of oscillation. Refer to paragraph 6 of this attachment for more information.	
(4) Small Control Inputs - Pitch	±0.15°/sec body pitch rate or ±20% of peak body pitch rate applied throughout the time history.	Approach or Landing			X	X	Control inputs must be typical of minor corrections made while established on an ILS approach course (approximately 0.5°/sec to 2°/sec pitch rate). The test must be in both directions, showing time history data from 5 seconds before until at least 5 seconds after initiation of		

TABLE OF OBJECTIVE TESTS										
QPS REQUIREMENTS									INFORMATION	
TEST	TOLERANCE	FLIGHT CONDITIONS	SIMULATOR LEVEL				TEST DETAILS		NOTES	PARA 12
			A	B	C	D				
							control input. **CCA**: Test in normal and non-normal control states.			
(5) Small Control Inputs - Roll	±0.15°/sec body roll rate or ±20% of peak body roll rate applied throughout the time history	Approach or landing			X	X	Control inputs must be typical of minor corrections made while established on an ILS approach course (approximately 0.5°/sec to 2°/sec roll rate). The test may be run in only one direction; however, for airplanes that exhibit non-symmetrical behavior, the test must include both directions. Time history data must be recorded from 5 seconds before until at least 5 seconds after initiation of control input. **CCA**: Test in normal and non-normal control states			
(6) Small Control Inputs - Yaw	±0.15°/sec body yaw rate or ±20% of peak body yaw rate applied throughout the time history	Approach or landing			X	X	Control inputs must be typical of minor corrections made while established on an ILS approach course (approximately 0.5°/sec to 2°/sec yaw rate). The test may be run in only one direction; however, for airplanes that exhibit non-symmetrical behavior, the test must include both directions. Time history data must be recorded from 5 seconds before until at least 5			

TABLE OF OBJECTIVE TESTS										
QPS REQUIREMENTS									INFORMATION	P A R A 12
TEST	TOLERANCE	FLIGHT CONDITIONS	SIMULATOR LEVEL				TEST DETAILS		NOTES	
			A	B	C	D				
							seconds after initiation of control input. **CCA**: Test in normal and non-normal control states			
c. Longitudinal							Note: Power setting may be that required for level flight unless otherwise specified.			
(1) Power Change Dynamics	±3 kts airspeed, ±100 ft (30 m) altitude, ±20% or ±1.5° pitch angle	Approach	**X**	**X**	**X**	**X**	Power is changed from the thrust setting required for approach or level flight to maximum continuous thrust or go-around power setting. Record the uncontrolled free response from at least 5 seconds before the power change is initiated to 15 seconds after the power change is completed. (**CCA:** Test in Normal and Non-normal control state.)			Yes
(2) Flap/Slat Change Dynamics	±3 kts airspeed, ±100 ft (30 m) altitude, ±20% or ±1.5° pitch angle	Takeoff through initial flap retraction, and approach to landing.	**X**	**X**	**X**	**X**	Record the uncontrolled free response from at least 5 seconds before the configuration change is initiated to 15 seconds after the configuration change is completed. (**CCA:** Test in Normal and Non-normal control state.)			Yes
(3) Spoiler/Speedbrake Change Dynamics	±3 kts airspeed, ±100 ft (30 m) altitude, ±20% or ±1.5° pitch angle	Cruise	**X**	**X**	**X**	**X**	Record the uncontrolled free response from at least 5 seconds before the configuration change is initiated to 15 seconds after the			Yes

TABLE OF OBJECTIVE TESTS									
QPS REQUIREMENTS								INFORMATION	PARA 12
TEST	TOLERANCE	FLIGHT CONDITIONS	SIMULATOR LEVEL				TEST DETAILS	NOTES	
			A	B	C	D			
							configuration change is completed. Record results for both extension and retraction. (**CCA:** Test in Normal and Non-normal control state.)		
(4) Gear Change Dynamics	±3 kts airspeed, ±100 ft (30 m) altitude, ±20% or ±1.5° pitch angle	Takeoff (retraction), and Approach (extension).	X	X	X	X	Record the time history of uncontrolled free response for a time increment from at least 5 seconds before the configuration change is initiated to 15 seconds after the configuration change is completed. (**CCA:** Test in Normal and Non-normal control state.)		Yes
(5) Longitudinal Trim	±0.5° stabilizer; ±1°elevator; ±1° pitch angle; ±5% net thrust or equivalent	Cruise, Approach, and Landing	X	X	X	X	Record steady-state condition with wings level and thrust set for level flight. May be a series of snapshot tests. (**CCA:** Test in Normal or Non-normal control state.)		Yes
(6) Longitudinal Maneuvering Stability (Stick Force/g)	±5 lb (±2.2 daN) or ±10% pitch controller force. Alternative method; ±1° or ±10% change of elevator.	Cruise, Approach, and Landing	X	X	X	X	Continuous time history data or a series of snapshot tests may be used. Record results up to approximately 30° of bank for approach and landing configurations. Record results for up to approximately 45° of bank for the cruise configuration. The force tolerance is not applicable if forces are generated solely by the use of airplane hardware in the flight simulator.		Yes

TABLE OF OBJECTIVE TESTS									
QPS REQUIREMENTS								INFORMATION	
TEST	TOLERANCE	FLIGHT CONDITIONS	SIMULATOR LEVEL				TEST DETAILS	NOTES	PARA 12
			A	B	C	D			
							The alternative method applies to airplanes that do not exhibit "stick-force-per-g" characteristics. (**CCA:** Test in Normal and Non-normal control state as applicable.)		
(7) Longitudinal Static Stability	±5 lb (±2.2 daN) or ±10% pitch controller force. Alternative method: ±1° or ±10% change of elevator.	Approach	**X**	**X**	**X**	**X**	Record results for at least 2 speeds above and 2 speeds below trim speed. May be a series of snapshot test results. The force tolerance is not applicable if forces are generated solely by the use of airplane hardware in the flight simulator. The alternative method applies to airplanes that do not exhibit speed stability characteristics. (**CCA:** Test in Normal or Non-normal control state, as applicable.)		Yes
(8) Stall Characteristics	±3 kts airspeed for initial buffet, stall warning, and stall speeds. The tolerances for airplanes with reversible flight control systems are: ±10% or ±5 lb (2.2 daN)) Stick/Column force (prior to “g break” only).	Second Segment Climb, and Approach or Landing	**X**	**X**	**X**	**X**	The stall maneuver must be entered with thrust at or near idle power and wings level (1g). Record the stall warning signal and initial buffet, if applicable. The stall warning signal must occur in the proper relation to buffet/stall. Airplanes exhibiting a sudden pitch attitude change or “g break” must demonstrate this characteristic. (**CCA:** Test in Normal and		Yes

TABLE OF OBJECTIVE TESTS									
QPS REQUIREMENTS								INFORMATION	PARA 12
TEST	TOLERANCE	FLIGHT CONDITIONS	SIMULATOR LEVEL				TEST DETAILS	NOTES	
			A	B	C	D			
							Non-normal control state.)		
(9) Phugoid Dynamics	±10% of period, ±10% of time to ½ or double amplitude or ±.02 of Damping Ratio.	Cruise	X	X	X	X	The test must include whichever is less of the following: Three full cycles (six overshoots after the input is completed), or the number of cycles sufficient to determine time to ½ or double amplitude. (**CCA:** Test in Non-normal control state.		Yes
(10) Short Period Dynamics	±1.5° pitch angle or ±2°/sec. pitch rate, ±0.10g acceleration.	Cruise		X	X	X	(**CCA:** Test in Normal and Non-normal control state.)		Yes
d. Lateral Directional								Power setting may be that required for level flight unless otherwise specified	
(1) Minimum Control Speed, Air (V_{mca} or V_{mcl}), per Applicable Airworthiness Standard or Low Speed Engine Inoperative Handling Characteristics in the Air	±3 kts airspeed	Takeoff or Landing (Whichever is most critical in the airplane)	X	X	X	X	Takeoff thrust must be used on the operating engine(s). A time history or a series of snapshot tests may be used. (**CCA:** Test in Normal or Non-normal control state.)	Low Speed Engine Inoperative Handling may be governed by a performance or control limit that prevents demonstration of V_{mca} in the conventional manner.	Yes
(2) Roll Response (Rate)	±10% or ±2°/sec roll rate Additionally, for those simulators of airplanes with reversible flight control systems:	Cruise, and Approach or Landing	X	X	X	X	Record results for normal roll controller deflection (about 30%). May be combined with step input of flight deck roll controller test (2d3)		

TABLE OF OBJECTIVE TESTS									
QPS REQUIREMENTS								INFORMATION	
TEST	TOLERANCE	FLIGHT CONDITIONS	SIMULATOR LEVEL				TEST DETAILS	NOTES	PARA 12
			A	B	C	D			
	wheel force ±10% or ±3lb (1.3 daN)								
(3) Roll Response to Cockpit Roll Controller Step Input	±10% or ±2° bank angle	Approach or Landing	X	X	X	X	Record from initiation of roll through 10 seconds after control is returned to neutral and released. May be combined with roll response (rate) test (2d2). (**CCA:** Test in Normal and Non-normal control state.)	With wings level, apply a step roll control input using approximately one-third of the roll controller travel. When reaching approximately 20° to 30° of bank, abruptly return the roll controller to neutral and allow approximately 10 seconds of airplane free response.	Yes
(4) Spiral Stability	Correct trend and ±2° or ±10% bank angle in 20 seconds. Alternate test requires correct trend and ±2° aileron.	Cruise	X	X	X	X	Record results for both directions. Airplane data averaged from multiple tests may be used. As an alternate test, demonstrate the lateral control required to maintain a steady turn with a bank angle of approximately 30°. (**CCA:** Test in Non-normal control state.)		Yes
(5) Engine Inoperative Trim	±1° rudder angle or ±1° tab angle or equivalent pedal, ±2° Sideslip angle.	Second Segment Climb, and Approach or Landing	X	X	X	X	May be a series of snapshot tests.	The test should be performed in a manner similar to that for which a pilot is trained to trim an engine	Yes

TABLE OF OBJECTIVE TESTS									
QPS REQUIREMENTS								INFORMATION	
TEST	TOLERANCE	FLIGHT CONDITIONS	SIMULATOR LEVEL				TEST DETAILS	NOTES	PARA 12
			A	B	C	D			
								failure condition. Second segment climb test should be at takeoff thrust. Approach or landing test should be at thrust for level flight.	
(6) Rudder Response	±2°/sec. or ±10% yaw rate	Approach or Landing	X	X	X	X	Record results for stability augmentation system ON and OFF. A rudder step input of 20%-30% rudder pedal throw is used. (**CCA:** Test in Normal and Non-normal control state.)		Yes
(7) Dutch Roll, (Yaw Damper OFF)	±0.5 sec. or ±10% of period; ±10% of time to ½ or double amplitude or ±.02 of damping ratio; ±20% or ±1 sec. of time difference between peaks of bank and sideslip.	Cruise, and Approach or Landing		X	X	X	Record results for at least 6 complete cycles with stability augmentation OFF. (**CCA:** Test in Non-normal control state.)		Yes
(8) Steady State Sideslip	For given rudder position – ±2° bank angle, ±1° sideslip angle, ±10% or ±2° aileron, ±10% or ±5° Spoiler or equivalent roll controller position or force. Additionally, for those simulators of airplanes with reversible flight	Approach or Landing	X	X	X	X	Propeller driven airplanes must test in each direction. May be a series of snapshot test results using at least two rudder positions.		Yes

TABLE OF OBJECTIVE TESTS									
QPS REQUIREMENTS								INFORMATION	PARA 12
TEST	TOLERANCE	FLIGHT CONDITIONS	SIMULATOR LEVEL				TEST DETAILS	NOTES	
			A	B	C	D			
	control systems: wheel force, ±10% or ±3 lb (1.3 daN), and rudder pedal force, ±10% or ±5 lb (2.2 daN).								
e. Landings									
(1) Normal Landing	±3 kts airspeed, ±1.5° pitch, ±1.5° angle of attack, ±10% or ±10 ft (3 m) altitude. Additionally, for those simulators of airplanes with reversible flight control systems: stick/column force ±10% or ±5 lbs (±2.2 daN).	Landing		X	X	X	Record results from a minimum of 200 ft (61 m) AGL to nose-wheel touchdown (**CCA:** Test in Normal and Non-normal control state if applicable.)		Yes
(2) Minimum Flap Landing	±3 kts airspeed, ±1.5° pitch, ±1.5° angle of attack, ±10% or ±10 ft (3 m) altitude. Additionally, for those simulators of airplanes with reversible flight control systems: stick/column force, ±10% or ±5 lbs (2.2 daN).	Minimum Certified Landing Flap Configuration			X	X	Record results from a minimum of 200 ft (61 m) AGL to nosewheel touchdown with airplane at near Maximum Landing Weight.		
(3) Crosswind Landing	±3 kts airspeed, ±1.5° pitch, ±1.5° angle of attack, ±10% or ±10 ft (3 m) altitude, ±2° bank angle, ±2° sideslip angle**;** ±3° heading. Additionally, for those	Landing		X	X	X	Record results from a minimum of 200 ft (61 m) AGL, through nosewheel touch down, to 50% decrease in main landing gear touchdown speed. Requires test data, including information on wind profile for a crosswind		Yes

TABLE OF OBJECTIVE TESTS										
QPS REQUIREMENTS									INFORMATION	
TEST	TOLERANCE	FLIGHT CONDITIONS	SIMULATOR LEVEL				TEST DETAILS		NOTES	PARA 12
			A	B	C	D				
	simulators of airplanes with reversible flight control systems: wheel force, ±10% or ±3 lb (1.3 daN) and rudder pedal force, ±10% or ±5 lb (2.2 daN).						component of at least 60% of the maximum described in the Airplane Flight Manual, as measured at 33 ft (10m) above the runway.			
(4) One Engine Inoperative Landing (Not required for Single-engine airplanes.)	±3 kts airspeed, ±1.5° pitch, ±1.5° angle of attack, ±10% altitude or ±10 ft (3 m), ±2° bank angle, ±2° sideslip angle, ±3° heading.	Landing		X	X	X	Record results from a minimum of 200 ft (61 m) AGL, through nosewheel touch down, to 50% decrease in main landing gear touchdown speed or less.			Yes
(5) Autopilot landing (if applicable)	±5 ft (1.5 m) flare height, ±0.5 sec T_f, ±140 ft/min (.7 m/sec) rate of descent at touch-down, ±10 ft (3 m) lateral deviation during rollout.	Landing		X	X	X	If autopilot provides rollout guidance, record lateral deviation from touchdown to a 50% decrease in main landing gear touchdown speed or less. Time of autopilot flare mode engage and main gear touchdown must be noted.		T_f = duration of flare.	
(6) All engines operating, autopilot, go around	±3 kts airspeed, ±1.5° pitch, ±1.5° angle of attack	As per AFM		X	X	X	Normal, all-engines-operating, Go Around with the autopilot engaged (if applicable) at medium landing weight. (**CCA:** Test in Normal and Non-normal control state.)			
(7) One engine inoperative go around	±3 kts airspeed, ±1.5° pitch, ±1.5° angle of attack, ±2° bank angle, ±2° sideslip angle	As per AFM		X	X	X	The one engine inoperative go around is required at near maximum certificated landing weight with the critical engine inoperative using manual			

TABLE OF OBJECTIVE TESTS									
QPS REQUIREMENTS								INFORMATION	P A R A 12
TEST	TOLERANCE	FLIGHT CONDITIONS	SIMULATOR LEVEL				TEST DETAILS	NOTES	
			A	B	C	D			
							controls. If applicable, an additional engine inoperative go around test must be accomplished with the autopilot engaged. (CCA: Non-autopilot test in non-normal control state.)		
(8) Directional control (rudder effectiveness) with symmetric reverse thrust	±5 kts airspeed ±2°/sec. yaw rate	Landing		X	X	X	Record results from a speed approximating touchdown speed to the minimum thrust reverser operation speed. With full reverse thrust, apply yaw control in both directions until reaching minimum thrust reverser operation speed.		
(9) Directional control (rudder effectiveness) with asymmetric reverse thrust	±5 kts airspeed ±3° heading angle.	Landing		X	X	X	Maintain heading with yaw control with full reverse thrust on the operating engine(s). Record results from a speed approximating touchdown speed to a speed at which control of yaw cannot be maintained or until reaching minimum thrust reverser operation speed, whichever is higher. The tolerance applies to the low speed end of the data recording.		
f. Ground Effect									
Test to demonstrate Ground Effect	±1° elevator; ±0.5° stabilizer angle; and ±5% net thrust or equivalent; ±1° angle of attack; ±10%	Landing		X	X	X	The Ground Effect model must be validated by the test selected and a rationale must be provided for selecting the	See paragraph 7, Ground Effect, in this attachment for additional	Yes

TABLE OF OBJECTIVE TESTS									
QPS REQUIREMENTS								INFORMATION	
TEST	TOLERANCE	FLIGHT CONDITIONS	SIMULATOR LEVEL				TEST DETAILS	NOTES	PARA 12
			A	B	C	D			
	height or ±5 ft (1.5 m); ±3 kts airspeed, and ±1° pitch angle						particular test.	information.	
g. Windshear.									
Four tests, two takeoff and two landing, with one of each conducted in still air and the other with windshear active to demonstrate windshear models.	See Attachment 6	Takeoff and Landing			X	X	Requires windshear models that provide training in the specific skills needed to recognize windshear phenomena and to execute recovery procedures. See Attachment 6 for tests, tolerances, and procedures.	See Attachment 6 for information related to Level A and B simulators.	
h. Flight Maneuver and Envelope Protection Functions									
The requirements of tests h (1) through (6) of this attachment, are applicable to computer controlled airplanes only. Time history results are required for simulator response to control inputs during entry into envelope protection limits including both normal and degraded control states if the function is different. Set thrust as required to reach the envelope protection function.									
(1) Overspeed	±5 Kts Airspeed	Cruise		X	X	X			
(2) Minimum Speed	±3 Kts Airspeed	Takeoff, Cruise, and Approach or Landing		X	X	X			
(3) Load Factor	±0.1g	Takeoff and Cruise		X	X	X			
(4) Pitch Angle	±1.5° pitch angle	Cruise, and Approach		X	X	X			
(5) Bank Angle	±2° or ±10% bank angle	Approach		X	X	X			
(6) Angle of Attack	±1.5° AOA	Second Segment Climb, and Approach or Landing		X	X	X			
3. Motion System									
a. Frequency Response	As specified by the	N/A	X	X	X	X	The test must demonstrate		

TABLE OF OBJECTIVE TESTS										
QPS REQUIREMENTS									INFORMATION	P A R A 12
TEST	TOLERANCE	FLIGHT CONDITIONS	SIMULATOR LEVEL				TEST DETAILS		NOTES	
			A	B	C	D				
	applicant for flight simulator qualification.						frequency response of the motion system.			
b. Motion system repeatability.	±0.05g actual platform linear acceleration	None	**X**	**X**	**X**	**X**	A demonstration is required and must be made part of the MQTG. The assessment procedures must be designed to ensure that the motion system hardware and software (in normal flight simulator operating mode) continue to perform as originally qualified.			
a. Field of View										
(1) Continuous collimated visual field of view	Minimum continuous collimated field of view providing 45° horizontal and 30° vertical field of view for each pilot simultaneously.	N/A	**X**	**X**					A vertical field of view of 30° may be insufficient to meet visual ground segment requirements.	
b. Surface contrast ratio.	Not less than 5:1	N/A			**X**	**X**	The ratio is calculated by dividing the brightness level of the center, bright square (providing at least 2 foot-lamberts or 7 cd/m2) by the brightness level of any adjacent dark square.		Measurements should be made using a 1° spot photometer and a raster drawn test pattern filling the entire visual scene (all channels) with a test pattern of black and white squares, 5 per square, with a white square in the center of each channel. During contrast ratio	

TABLE OF OBJECTIVE TESTS									
QPS REQUIREMENTS								INFORMATION	PARA 12
TEST	TOLERANCE	FLIGHT CONDITIONS	SIMULATOR LEVEL				TEST DETAILS	NOTES	
			A	B	C	D			
								testing, simulator aft-cab and flight deck ambient light levels should be zero.	
c. Highlight brightness	Not less than six (6) foot-lamberts (20 cd/m^2)	N/A			X	X	Measure the brightness of the center, white square while superimposing a highlight on that white square. The use of calligraphic capabilities to enhance the raster brightness is acceptable; however, measuring lightpoints is not acceptable.	Measurements should be made using a 1° spot photometer and a raster drawn test pattern filling the entire visual scene (all channels) with a test pattern of black and white squares, 5 per square, with a white square in the center of each channel.	
d. Vernier resolution (surface resolution)	Not greater than three (3) arc minutes	N/A			X	X	An SOC is required and must include the appropriate calculations and an explanation of those calculations.	The eye will subtend two arc minutes when positioned on a 3° glide slope, 6,876 ft slant range from the centrally located threshold of a black runway surface painted with white threshold bars that are 16 ft wide with 4-foot gaps between the bars.	
f. Lightpoint size	Not greater than six (6)	N/A			X	X	An SOC is required and must	Lightpoint size	

TABLE OF OBJECTIVE TESTS									
QPS REQUIREMENTS								INFORMATION	PARA 12
TEST	TOLERANCE	FLIGHT CONDITIONS	SIMULATOR LEVEL				TEST DETAILS	NOTES	
			A	B	C	D			
	arc-minutes.						include the relevant calculations and an explanation of those calculations.	should be measured using a test pattern consisting of a centrally located single row of lightpoints reduced in length until modulation is just discernible in each visual channel. A row of 48 lights will form a 4° angle or less.	
g. Lightpoint contrast ratio:									
(1) Level C and D simulators.	Not less than 25:1	N/A			X	X	An SOC is required and must include the relevant calculations.	A 1° spot photometer is used to measure a square of at least 1° filled with lightpoints (where lightpoint modulation is just discernible) and compare the results to the measured adjacent background. During contrast ratio testing, simulator aft-cab and flight deck ambient light levels should be zero.	

TABLE OF OBJECTIVE TESTS									
QPS REQUIREMENTS								INFORMATION	
TEST	TOLERANCE	FLIGHT CONDITIONS	SIMULATOR LEVEL				TEST DETAILS	NOTES	PARA 12
			A	B	C	D			
5. Sound System	(TBD)								

Begin Information

2. Control Dynamics.

a. The characteristics of an airplane flight control system have a major effect on the handling qualities. A significant consideration in pilot acceptability of an airplane is the "feel" provided through the cockpit controls. Considerable effort is expended on airplane feel system design in order to deliver a system with which pilots will be comfortable and consider the airplane desirable to fly. In order for a simulator to be representative, it too must present the pilot with the proper feel; that of the respective airplane. Aircraft control feel dynamics shall duplicate the airplane simulated. This shall be determined by comparing a recording of the control feel dynamics of the simulator to airplane measurements in the takeoff, cruise, and landing configuration.

b. Recordings such as free response to an impulse or step function are classically used to estimate the dynamic properties of electromechanical systems. In any case, it is only possible to estimate the dynamic properties as a result of only being able to estimate true inputs and responses. Therefore, it is imperative that the best possible data be collected since close matching of the simulator control loading system to the airplane systems is essential. The required control feel dynamic tests are described in this attachment. This is usually accomplished by measuring the free response of the controls using a step or pulse input to excite the system.

c. For airplanes with irreversible control systems, measurements may be obtained on the ground if proper pitot-static inputs are provided to represent airspeeds typical of those encountered in flight. Likewise, it may be shown that for some airplanes, takeoff, cruise, and landing configurations have like effects. Thus, one may suffice for another. If either or both considerations apply, engineering validation or airplane manufacturer rationale must be submitted as justification for ground tests or for eliminating a configuration.

(1) Control Dynamics Evaluations. The dynamic properties of control systems are often stated in terms of frequency, damping, and a number of other measurements, which can be found in texts on control systems. In order to establish a consistent means of validating test results for simulator control loading, criteria are needed that will clearly define the interpretation of the measurements and the tolerances to be applied. Criteria are needed for both the underdamped system and the overdamped system, including the critically damped case. In the case of an underdamped system with very light damping, the system may be quantified in terms of frequency and damping. In critically damped or overdamped systems, the frequency and damping is not readily measured from a response time history. Therefore, some other measurement must be used.

(2) For Levels C and D Simulators. Tests to verify that control feel dynamics represent the airplane show that the dynamic damping cycles (free response of the control) match that of the airplane within the specified tolerances. An acceptable method of evaluating the response and the tolerance to be applied are described below for the underdamped and critically damped cases.

d. Tolerances.

(1) Underdamped Response.

(a) Two measurements are required for the period, the time to first zero crossing (in case a rate limit is present) and the subsequent frequency of oscillation. It is necessary to measure cycles on an individual basis in case there are non-uniform periods in the response. Each period will be independently compared to the respective period of the airplane control system and, consequently, will enjoy the full tolerance specified for that period.

(b) The damping tolerance will be applied to overshoots on an individual basis. Care must be taken when applying the tolerance to small overshoots since the significance of such overshoots becomes questionable. Only those overshoots larger than 5 percent of the total initial displacement will be considered significant. The residual band, labeled $T(A_d)$ on Figure 1 is ±5 percent of the initial displacement amplitude A_d from the steady state value of the oscillation. Oscillations within the residual band are considered insignificant. When comparing simulator data to airplane data, the process would begin by overlaying or aligning the simulator and airplane steady state values and then comparing amplitudes of oscillation peaks, the time of the first zero crossing, and individual periods of oscillation. To be satisfactory, the simulator would show the same number of significant overshoots to within one when compared against the airplane data. This procedure for evaluating the response is illustrated in Figure 1 of this attachment.

(2) Critically Damped and Overdamped Response. Due to the nature of critically damped responses (no overshoots), the time to reach 90 percent of the steady state (neutral point) value would be the same as the airplane within ±10 percent. The simulator response must be critically damped also. Figure 2 illustrates the procedure.

(3)(a) The following summarizes the tolerances, T, for an illustration of the referenced measurements (See Figures 1 and 2 of this attachment):

$T(P_0)$ ±10% of P_0

$T(P_1)$ ±20% of P_1

$T(A)$ ±10% of A_1,

$T(A_d)$ ±5% of A_d = Residual Band

Significant Overshoots: First overshoot and ±1 subsequent overshoots

(b) In the event the number of cycles completed outside of the residual band, and thereby significant, exceeds the number depicted in figure 1 of this attachment, the following tolerances (T) will apply:

$T(P_n)$ ±10(n+1)% of P_n, where "n" is the next in sequence.

e. Alternative Method for Control Dynamics.

(1) An alternative means for dealing with control dynamics applies to airplanes with hydraulically powered flight controls and artificial feel systems. Instead of free response

measurements, the system would be validated by measurements of control force and rate of movement.

(2) For each axis of pitch, roll, and yaw, the control shall be forced to its maximum extreme position for the following distinct rates. These tests would be conducted at typical taxi, takeoff, cruise, and landing conditions.

(a) Static Test - Slowly move the control such that approximately 100 seconds are required to achieve a full sweep. A full sweep is defined as movement of the controller from neutral to the stop, usually aft or right stop, then through the neutral position to the opposite stop, then to the neutral position.

(b) Slow Dynamic Test - Achieve a full sweep in approximately 10 seconds.

(c) Fast Dynamic Test - Achieve a full sweep in approximately 4 seconds.

(NOTE: Dynamic sweeps may be limited to forces not exceeding 100 lb.)

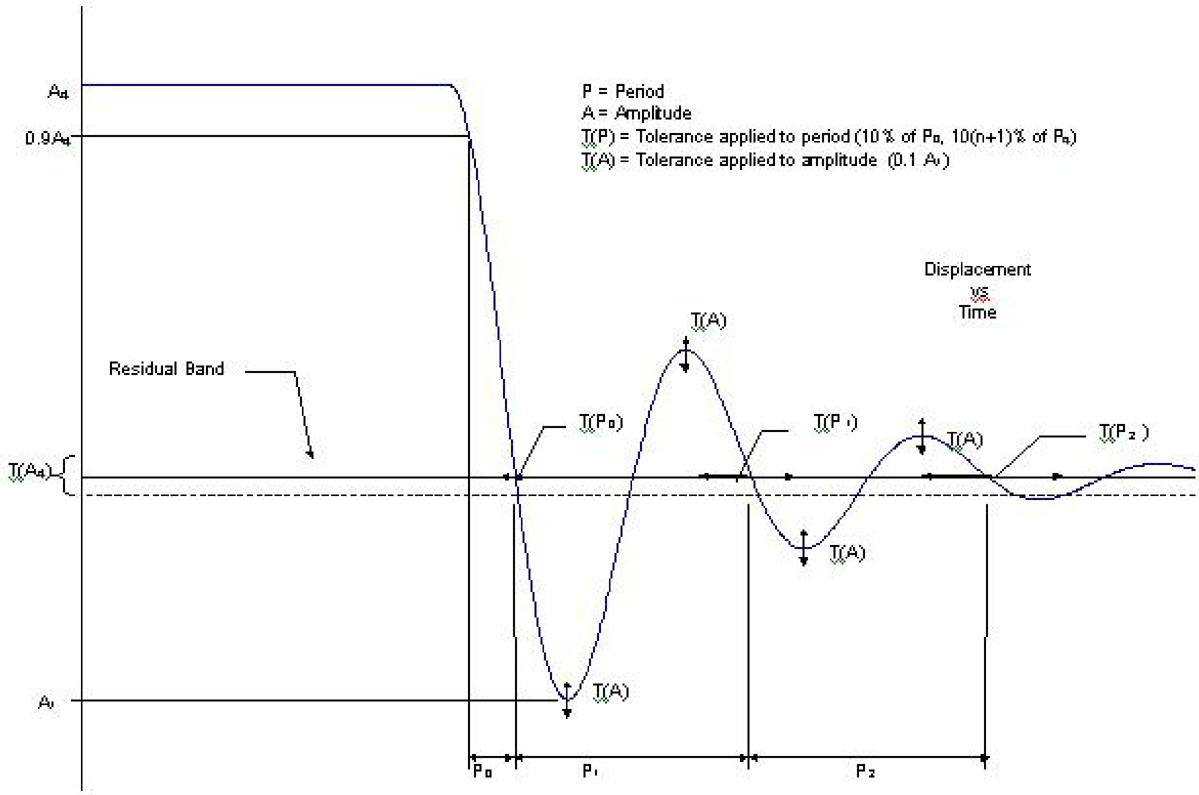
(3) Tolerances.

(a) Static Test - Items 2.a.(1) (2) and (3) of this attachment.

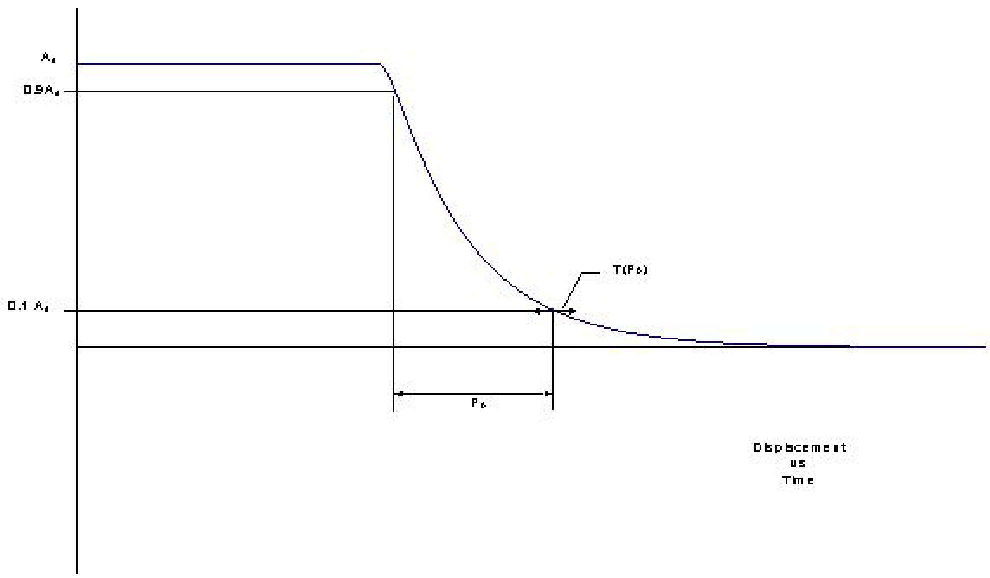
(b) Dynamic Test - 2 lb. or 10 percent on dynamic increment above static test.

f. The NSPM is open to alternative means such as the one described above. Such alternatives, however, would have to be justified and found appropriate to the application. For example, the method described here may not apply to all manufacturers' systems and certainly not to airplanes with reversible control systems. Hence, each case must be considered on its own merit on an ad hoc basis. If the NSPM finds that alternative methods do not result in satisfactory simulator performance, then more conventionally accepted methods must be used.

End Information



"ATTACHMENT 2 TO APPENDIX A TO PART 60—
FIGURE 1. UNDER-DAMPED STEP RESPONSE"



**"ATTACHMENT 2 TO APPENDIX A TO PART 60—
FIGURE 2. CRITICALLY-DAMPED STEP RESPONSE"**

3. Ground Effect.

Begin Information

a. For a flight simulator to be used for take-off and landing it should faithfully reproduce the aerodynamic changes, which occur in ground effect. The parameters chosen for flight simulator validation should be indicative of these changes.

(1) A dedicated test should be provided which will validate the aerodynamic ground effect characteristics.

(2) The selection of the test method and procedures to validate ground effect is at the option of the organization performing the flight tests; however, the flight test should be performed with enough duration near the ground to validate sufficiently the ground-effect model.

b. Acceptable tests for validation of ground effect include:

(1) Level fly-bys. The level fly-bys should be conducted at a minimum of three altitudes within the ground effect, including one at no more than 10% of the wingspan above the ground, one each at approximately 30% and 50% of the wingspan where height refers to main gear tire above the ground. In addition, one level-flight trim condition should be conducted out of ground effect, e.g. at 150% of wingspan.

(2) Shallow approach landing. The shallow approach landing should be performed at a glide slope of approximately one degree with negligible pilot activity until flare.

Note: If other methods are proposed, rationale should be provided to conclude that the tests performed validate the ground-effect model.

c. The lateral-directional characteristics are also altered by ground effect. For example, because of changes in lift, roll damping is affected. The change in roll damping will affect other dynamic modes usually evaluated for flight simulator validation. In fact, Dutch roll dynamics, spiral stability, and roll-rate for a given lateral control input are altered by ground effect. Steady heading sideslips will also be affected. These effects should be accounted for in the flight simulator modeling. Several tests such as ‘crosswind landing’, ‘one engine inoperative landing’, and 'engine failure on take-off' serve to validate lateral-directional ground effect since portions of them are accomplished while transiting heights at which ground effect is an important factor.

End Information

---

4. Alternative Data Sources, Procedures, and Instrumentation: Level A and Level B Simulators Only

---

Begin Information

a. In recent years, considerable progress has been made by highly experienced aircraft and simulator manufacturers in improvement of aerodynamic modeling techniques. In conjunction with increased accessibility to very high powered computer technology, these techniques have become quite sophisticated. Additionally, those who have demonstrated success in combining these modeling techniques with minimal flight testing have incorporated the use of highly mature flight controls models and have had extensive experience in comparing the output of their effort with actual flight test data - and they have been able to do so on an iterative basis over a period of years.

b. It has become standard practice for experienced simulator manufacturers to use such techniques as a means of establishing data bases for new simulator configurations while awaiting the availability of actual flight test data; and then comparing this new data with the newly available flight test data. The results of such comparisons have, as reported by some recognized and experienced simulation experts, become increasingly consistent and indicate that these techniques, applied with appropriate experience, are becoming dependably accurate for the development of aerodynamic models for use in Level A and Level B simulators.

c. In reviewing this history, the NSPM has concluded that, with proper care, those who are experienced in the development of aerodynamic models for simulator application can successfully use these modeling techniques to acceptably alter the method by which flight test data may be acquired and, when applied to Level A or Level B simulators, does not compromise the quality of that simulation.

d. The information in the table that follows (Table of Alternative Data Sources, Procedures, and Information) is presented to describe an acceptable alternative to data sources for simulator modeling and validation and as an acceptable alternative to the procedures and instrumentation found in the traditionally accepted flight test methods used to gather such modeling and validation data.

(1) Alternative data sources which may be used for part or all of a data requirement are the Airplane Maintenance Manual, the Airplane Flight Manual (AFM), Airplane Design Data, the Type Inspection Report (TIR), Certification Data or acceptable supplemental flight test data.

(2) The NSPM recommends that use of the alternative instrumentation noted in the following Table be coordinated with the NSPM prior to employment in a flight test or data gathering effort.

e. The NSPM position regarding the use of these alternative data sources, procedures, and instrumentation is based on three primary preconditions and presumptions regarding the objective data and simulator aerodynamic program modeling.

(1) While the data gathered through the alternative means does not require angle of attack (AOA) measurements or control surface position measurements for any flight test, AOA can be sufficiently derived if the flight test program insures the collection of acceptable level, unaccelerated, trimmed flight data. All of the simulator time history tests that begin in level, unaccelerated, and trimmed flight, including the three basic trim tests and "fly-by" trims, can be a successful validation of angle of attack by comparison with flight test pitch angle. (Note: Due to the criticality of angle of attack in the development of the ground effects model, particularly critical for normal

landings and landings involving cross-control input applicable to Level B simulators, stable "fly-by" trim data will be the acceptable norm for normal and cross-control input landing objective data for these applications.)

(2) A rigorously defined and fully mature simulation controls system model that includes accurate gearing and cable stretch characteristics (where applicable), determined from actual aircraft measurements, will be used. Such a model does not require control surface position measurements in the flight test objective data in these limited applications.

(3) The authorized uses of Level A and Level B simulators (as listed in the appropriate Commercial, Instrument, or Airline Transport Pilot and/or Type Rating Practical Test Standards) for "initial," "transition," or "upgrade" training, still requires additional flight training and/or flight testing/checking in the airplane or in a Level C or Level D simulator.

f. The sponsor is urged to contact the NSPM for clarification of any issue regarding airplanes with reversible control systems. This table is <u>not</u> applicable to Computer Controlled Aircraft flight simulators.

g. Utilization of these alternate data sources, procedures, and instrumentation does not relieve the sponsor from compliance with the balance of the information contained in this document relative to Level A or Level B flight simulators.

End Information

Table of Alternative Data Sources, Procedures, and Instrumentation Information				
--Table of Objective Tests -- Test Reference Number and Title	**Sim Level A**	**Sim Level B**	**Alternative Data Sources, Procedures, and Instrumentation**	**Notes and Reminders**
1.a.(1) Performance. Taxi. Minimum Radius turn	X	X	TIR, AFM, or Design data may be used.	
1.a.(2) Performance. Taxi Rate of Turn vs. Nosewheel Steering Angle		X	Data may be acquired by using a constant tiller position, measured with a protractor or full rudder pedal application for steady state turn, and synchronized video of heading indicator. If less than full rudder pedal is used, pedal position must be recorded.	A single procedure may not be adequate for all airplane steering systems, therefore appropriate measurement procedures must be devised and proposed for NSPM concurrence.
1.b.(1) Performance. Takeoff. Ground Acceleration Time and Distance	X	X	Preliminary certification data may be used. Data may be acquired by using a stop watch, calibrated airspeed, and runway markers during a takeoff with power set before brake release. Power settings may be hand recorded. If an inertial measurement system is installed, speed and distance may be derived from acceleration measurements.	
1.b.(2) Performance. Takeoff. Minimum Control Speed - ground (V_{mcg}) using aerodynamic controls only (per applicable airworthiness standard) or low speed, engine inoperative ground control characteristics	X	X	Data may be acquired by using an inertial measurement system and a synchronized video of: the calibrated airplane instruments and the force/position measurements of cockpit controls.	Rapid throttle reductions at speeds near V_{mcg} may be used while recording appropriate parameters. The nose wheel must be free to caster, or equivalently freed of sideforce generation.
1.b.(3) Performance. Takeoff. Minimum Unstick Speed (V_{mu}) or equivalent test to demonstrate early rotation takeoff characteristics.	X	X	Data may be acquired by using an inertial measurement system and a synchronized video of: the calibrated airplane instruments and the force/position measurements of cockpit controls.	
1.b.(4) Performance. Takeoff. Normal Takeoff	X	X	Data may be acquired by using an inertial measurement system and a synchronized video of: the calibrated airplane instruments and the force/position measurements of cockpit controls. AOA can be calculated from pitch attitude and flight path.	
1.b.(5) Performance. Takeoff. Critical Engine Failure during Takeoff	X	X	Data may be acquired by using an inertial measurement system and a synchronized video of: the calibrated airplane instruments and the force/position measurements of cockpit controls.	Record airplane dynamic response to engine failure and control inputs required to correct flight path.
1.b.(6) Performance. Takeoff. Crosswind Takeoff	X	X	Data may be acquired by using an inertial measurement system and a synchronized video of: the calibrated airplane instruments and the force/position measurements of cockpit controls.	The “1:7 law” to 100 feet (30 meters) is an acceptable wind profile.
1.b.(7)	X	X	Data may be acquired with a synchronized	

Table of Alternative Data Sources, Procedures, and Instrumentation Information				
--Table of Objective Tests -- Test Reference Number and Title	**Sim Level A**	**Sim Level B**	**Alternative Data Sources, Procedures, and Instrumentation**	**Notes and Reminders**
Performance. Takeoff. Rejected Takeoff			video of: calibrated airplane instruments, thrust lever position, engine parameters, and distance (e.g., runway markers). A stop watch is required.	
1.c.(1) Performance. Climb. Normal Climb	**X**	**X**	Data may be acquired with a synchronized video of: calibrated airplane instruments and engine power throughout the climb range.	
1.c.(2) Performance. Climb. One engine Inoperative Second Segment Climb	**X**	**X**	Data may be acquired with a synchronized video of: calibrated airplane instruments and engine power throughout the climb range.	
1.c.(4) Performance. Climb. One Engine Inoperative Approach Climb (if approved AFM requires specific performance in icing conditions)	**X**	**X**	Data may be acquired with a synchronized video of: calibrated airplane instruments and engine power throughout the climb range.	
1.e.(1) Performance. Stopping. Deceleration time and distance, using manual application of wheel brakes and no reverse thrust on a dry runway.	**X**	**X**	Data may be acquired during landing tests using a stop watch, runway markers, and a synchronized video of: calibrated airplane instruments, thrust lever position and the pertinent parameters of engine power.	
1.e.(2) Performance. Ground. Deceleration Time and Distance, using reverse thrust and no wheel brakes.	**X**	**X**	Data may be acquired during landing tests using a stop watch, runway markers, and a synchronized video of: calibrated airplane instruments, thrust lever position and the pertinent parameters of engine power.	
1.f.(1) Performance. Engines. Acceleration	**X**	**X**	Data may be acquired with a synchronized video recording of: engine instruments and throttle position.	
1.f.(2) Performance. Engines. Deceleration	**X**	**X**	Data may be acquired with a synchronized video recording of: engine instruments and throttle position.	
2.a.(1) Handling Qualities. Static Control Checks. Pitch Controller Position vs. Force and Surface Position Calibration	**X**	**X**	Surface position data may be acquired from flight data recorder (FDR) sensor or, if no FDR sensor, at selected, significant column positions (encompassing significant column position data points), acceptable to the NSPM, using a control surface protractor on the ground with winds less than 5 kts. Force data may be acquired by using a hand held force gauge at the same column position data points.	
2.a.(2) Handling Qualities. Static Control Checks. Roll Controller Position vs. Force and Surface Position Calibration	**X**	**X**	Surface position data may be acquired from flight data recorder (FDR) sensor or, if no FDR sensor, at selected, significant wheel positions (encompassing significant wheel position data points), acceptable to the NSPM, using a control surface protractor on	

Table of Alternative Data Sources, Procedures, and Instrumentation Information				
--Table of Objective Tests -- Test Reference Number and Title	**Sim Level A**	**Sim Level B**	**Alternative Data Sources, Procedures, and Instrumentation**	**Notes and Reminders**
			the ground with winds less than 5 kts. Force data may be acquired by using a hand held force gauge at the same wheel position data points.	
2.a.(3) Handling Qualities. Static Control Checks. Rudder Pedal Position vs. Force and Surface Position Calibration	X	X	Surface position data may be acquired from flight data recorder (FDR) sensor or, if no FDR sensor, at selected, significant rudder pedal positions (encompassing significant rudder pedal position data points), acceptable to the NSPM, using a control surface protractor on the ground with winds less than 5 kts. Force data may be acquired by using a hand held force gauge at the same rudder pedal position data points.	
2.a.(4) Handling Qualities. Static Control Checks. Nosewheel Steering Controller Force & Position	X	X	Breakout data may be acquired with a hand held force gauge. The remainder of the force to the stops may be calculated if the force gauge and a protractor are used to measure force after breakout for at least 25% of the total displacement capability.	
2.a.(5) Handling Qualities. Static Control Checks. Rudder Pedal Steering Calibration	X	X	Data may be acquired through the use of force pads on the rudder pedals and a pedal position measurement device, together with design data for nose wheel position.	
2.a.(6) Handling Qualities. Static Control Checks. Pitch Trim Indicator vs. Surface Position Calibration.	X	X	Data may be acquired through calculations.	
2.a.(7) Handling Qualities. Static Control Checks. Alignment of Cockpit Throttle Lever Angle vs. Selected Engine Parameter .	X	X	Data may be acquired through the use of a temporary throttle quadrant scale to document throttle position. Use a synchronized video to record steady state instrument readings or hand-record steady state engine performance readings.	
2.a.(8) Handling Qualities. Static Control Checks. Break Pedal Position vs. Force and Brake System Pressure Calibration.	X	X	Use of design or predicted data is acceptable. Data may be acquired by measuring deflection at “zero” and “maximum” and calculating deflections between the extremes using the airplane design data curve.	
2.c.(1) Handling Qualities. Longitudinal. Power Change Dynamics	X	X	Data may be acquired by using an inertial measurement system and a synchronized video of: the calibrated airplane instruments and throttle position.	
2.c.(2) Handling Qualities. Longitudinal. Flap/Slat Change Dynamics	X	X	Data may be acquired by using an inertial measurement system and a synchronized video of: calibrated airplane instruments and flap/slat position.	
2.c.(3) Handling Qualities. Longitudinal. Spoiler/Speedbrake Change	X	X	Data may be acquired by using an inertial measurement system and a synchronized video of: the calibrated airplane	

Table of Alternative Data Sources, Procedures, and Instrumentation Information				
--Table of Objective Tests -- Test Reference Number and Title	**Sim Level A**	**Sim Level B**	**Alternative Data Sources, Procedures, and Instrumentation**	**Notes and Reminders**
Dynamics			instruments and spoiler/speedbrake position.	
2.c.(4) Handling Qualities. Longitudinal. Gear Change Dynamics	X	X	Data may be acquired by using an inertial measurement system and a synchronized video of: the calibrated airplane instruments and gear position.	
2.c.(5) Handling Qualities. Longitudinal. Longitudinal Trim	X	X	Data may be acquired through use of an inertial measurement system and a synchronized video of: the cockpit controls position (previously calibrated to show related surface position) and the engine instrument readings.	
2.c.(6) Handling Qualities. Longitudinal. Longitudinal Maneuvering Stability (Stick Force/g)	X	X	Data may be acquired through the use of an inertial measurement system and a synchronized video of: the calibrated airplane instruments; a temporary, high resolution bank angle scale affixed to the attitude indicator; and a wheel and column force measurement indication.	
2.c.(7) Handling Qualities. Longitudinal. Longitudinal Static Stability	X	X	Data may be acquired through the use of a synchronized video of: the airplane flight instruments and a hand held force gauge.	
2.c.(8) Handling Qualities. Longitudinal. Stall Characteristics	X	X	Data may be acquired through a synchronized video recording of: a stop watch and the calibrated airplane airspeed indicator. Hand-record the flight conditions and airplane configuration.	Airspeeds may be cross checked with those in the TIR and AFM.
2.c.(9) Handling Qualities. Longitudinal. Phugoid Dynamics	X	X	Data may be acquired by using an inertial measurement system and a synchronized video of: the calibrated airplane instruments and the force/position measurements of cockpit controls.	
2.c.(10) Handling Qualities. Longitudinal. Short Period Dynamics	X	X	Data may be acquired by using an inertial measurement system and a synchronized video of: the calibrated airplane instruments and the force/position measurements of cockpit controls.	
2.d.(1) Handling Qualities. Lateral Directional. Minimum Control Speed, Air (V_{mca} or V_{mci}), per Applicable Airworthiness Standard or Low Speed Engine Inoperative Handling Characteristics in the Air	X	X	Data may be acquired by using an inertial measurement system and a synchronized video of: the calibrated airplane instruments and the force/position measurements of cockpit controls.	
2.d.(3) Handling Qualities. Lateral Directional. Roll Response to Cockpit Roll Controller Step Input	X	X	Data may be acquired by using an inertial measurement system and a synchronized video of: the calibrated airplane instruments and the force/position measurements of cockpit lateral controls.	
2.d.(4)	X	X	Data may be acquired by using an inertial	

Table of Alternative Data Sources, Procedures, and Instrumentation Information				
--Table of Objective Tests -- Test Reference Number and Title	**Sim Level A**	**Sim Level B**	**Alternative Data Sources, Procedures, and Instrumentation**	**Notes and Reminders**
Handling Qualities. Lateral Directional. Spiral Stability			measurement system and a synchronized video of: the calibrated airplane instruments; the force/position measurements of cockpit controls; and a stop watch.	
2.d.(5) Handling Qualities. Lateral Directional. Engine Inoperative Trim	X	X	Data may be hand recorded in-flight using high resolution scales affixed to trim controls that have been calibrated on the ground using protractors on the control / trim surfaces with winds less than 5 kts.. OR Data may be acquired during second segment climb (with proper pilot control input for an engine-out condition) by using a synchronized video of: the calibrated airplane instruments; and the force/position measurements of cockpit controls.	Trimming during second segment climb is not a certification task and should not be conducted until a safe altitude is reached.
2.d.(6) Handling Qualities. Lateral Directional. Rudder Response	X	X	Data may be acquired by using an inertial measurement system and a synchronized video of: the calibrated airplane instruments; the force/position measurements of rudder pedals.	
2.d.(7) Handling Qualities. Lateral Directional. Dutch Roll, (Yaw Damper OFF)	X	X	Data may be acquired by using an inertial measurement system and a synchronized video of: the calibrated airplane instruments; the force/position measurements of cockpit controls.	
2.d.(8) Handling Qualities. Lateral Directional. Steady State Sideslip	X	X	Data may be acquired by using an inertial measurement system and a synchronized video of: the calibrated airplane instruments; the force/position measurements of cockpit controls. Ground track and wind corrected heading may be used for sideslip angle.	
2.e.(1) Handling Qualities. Landings Normal Landing		X	Data may be acquired by using an inertial measurement system and a synchronized video of: the calibrated airplane instruments; the force/position measurements of cockpit controls.	
2.e.(3) Handling Qualities. Landings Crosswind Landing		X	Data may be acquired by using an inertial measurement system and a synchronized video of: the calibrated airplane instruments; the force/position measurements of cockpit controls.	
2.e.(4) Handling Qualities. Landings One Engine Inoperative Landing (Not required for Single-engine airplanes.)		X	Data may be acquired by using an inertial measurement system and a synchronized video of: the calibrated airplane instruments; the force/position measurements of cockpit controls. Normal and lateral accelerations may be recorded in lieu of AOA and sideslip.	
2.f.		X	Data may be acquired by using calibrated	

Table of Alternative Data Sources, Procedures, and Instrumentation Information				
--Table of Objective Tests -- Test Reference Number and Title	**Sim Level A**	**B**	**Alternative Data Sources, Procedures, and Instrumentation**	**Notes and Reminders**
Handling Qualities. Ground Effect. Test to demonstrate Ground Effect			airplane instruments, an inertial measurement system, and a synchronized video of: the calibrated airplane instruments; the force/position measurements of cockpit controls.	

Attachment 3 to Appendix A to Part 60--

SIMULATOR SUBJECTIVE EVALUATION

1. Requirements.

Begin QPS Requirements

Airports represented in visual scenes required by this part must be representations of real-world, operational airports or representations of fictional airports.

a. If real-world, operational airports are simulated, the visual representation and scene content is compared to that of the actual airport. This comparison requires accurate simulation of that airport to the extent required by this part and as required by the qualification level sought. It also requires the visual scene to be modified when the airport is modified; e.g., when additional runways or taxiways are added; when existing runway(s) are lengthened or permanently closed; when magnetic bearings to or from a runway are changed; when significant and recognizable changes are made to the terminal, other airport buildings, or surrounding terrain; etc.

b. If fictional airports are used, the navigational aids and all appropriate maps, charts, and other navigational reference material for such airports (and surrounding areas as necessary), are evaluated for compatibility, completeness, and accuracy. These items are compared to the visual presentation and scene content of the fictional airport and require simulation to the extent set out in this document and as required by the qualification level sought. An SOC must be submitted that addresses navigation aid installation and performance (including obstruction clearance protection, etc.) and other criteria for all instrument approaches that are available in the simulator. The SOC must reference and account for information in the Terminal Instrument Procedures Manual ("Terps" Manual, FAA Handbook 8260.3, as amended) and the construction and availability of the required maps, charts, and other navigational material. This material must be appropriately marked "for training purposes only."

End QPS Requirements

---

2. Discussion

Begin Information

a. The subjective tests provide a basis for evaluating the capability of the simulator to perform over a typical utilization period; determining that the simulator competently simulates each required maneuver, procedure, or task; and verifying correct operation of the simulator controls, instruments, and systems. The items listed in the Table of Functions and Subjective Tests are for simulator evaluation purposes only. They must not be used to limit or exceed the authorizations for use of a given level of simulator as described on the Statement of Qualification or as may be approved by the TPAA. All items in the following paragraphs are subject to an examination.

b. The Table of Functions and Subjective Tests in this attachment addresses pilot functions, including maneuvers and procedures (called flight tasks), and is divided by flight phases. The performance of these tasks by the NSPM includes an operational examination of the visual system and special effects. There are flight tasks included to address some features of advanced technology airplanes and innovative training programs. For example, "high angle-of-attack maneuvering" is included to provide a required alternative to "approach to stalls" for airplanes employing flight envelope protection functions.

c. The Table of Functions and Subjective Tests in this attachment addresses the overall function and control of the simulator including the various simulated environmental conditions; simulated airplane system operation (normal, abnormal, and emergency); visual system displays; and special effects necessary to meet flightcrew training, evaluation, or flight experience requirements.

d. All simulated airplane systems functions will be assessed for normal and, where appropriate, alternate operations. Normal, abnormal, and emergency operations associated with a flight phase will be assessed during the evaluation of flight tasks or events within that flight phase. Simulated airplane systems are listed separately under "Any Flight Phase" to ensure appropriate attention to systems checks. Operational navigation systems (including inertial navigation systems, global positioning systems, or other long-range systems) and the associated electronic display systems will be evaluated if installed. The NSP pilot will include in his report to the TPAA, the effect of the system operation and any system limitation.

e. Simulators demonstrating a satisfactory circling approach will be qualified for the circling approach maneuver and may be approved for such use by the TPAA in the sponsor's FAA-approved flight training program. To be considered satisfactory, the circling approach will be flown at maximum gross weight for landing, with minimum visibility for the airplane approach category, and must allow proper alignment with a landing runway at least 90° different from the instrument approach course while allowing the pilot to keep an identifiable portion of the airport in sight throughout the maneuver (reference - 14CFR, §91.175(e)).

f. At the request of the TPAA, the NSP Pilot may assess the simulator for a special aspect of a sponsor's training program during the functions and subjective portion of an evaluation. Such an assessment may include a portion of a Line Oriented Flight Training (LOFT) scenario or special emphasis items in the sponsor's training program. Unless directly related to a requirement for the qualification level, the results of such an evaluation would not affect the qualification of the simulator.

End Information

2

TABLE OF FUNCTIONS AND SUBJECTIVE TESTS				
QPS REQUIREMENTS				
	Simulator Level			
Operations Tasks	**A**	**B**	**C**	**D**
1. Operations: Tasks in the Operations Table are subject to evaluation if appropriate for the airplane simulated as indicated in the SOQ Configuration List and/or the level of simulator qualification involved. Items not installed or not functional on the simulator and, therefore, not appearing on the SOQ Configuration List, are not required to be listed as exceptions on the SOQ.				
a. Preparation For Flight Preflight. Accomplish a functions check of all switches, indicators, systems, and equipment at all crewmembers' and instructors' stations and determine that the flight deck design and functions are identical to that of the airplane simulated.	X	X	X	X
b. Surface Operations (Pre-Take-Off)				
(1) Engine Start				
(a) Normal start.	X	X	X	X
(b) Alternate start procedures.	X	X	X	X
(c) Abnormal starts and shutdowns (hot / hung start, tail pipe fire, etc.).	X	X	X	X
(2) Pushback/Powerback.		X	X	X
(3) Taxi				
(a) Thrust response.	X	X	X	X
(b) Power lever friction.	X	X	X	X
(c) Ground handling.	X	X	X	X
(d) Nose wheel scuffing.			X	X
(e) Brake operation (normal and alternate/emergency).	X	X	X	X
(f) Brake fade (if applicable)	X	X	X	X
c. Take-Off (1) Normal				
(a) Airplane/engine parameter relationships.	X	X	X	X
(b) Acceleration characteristics (motion).	X	X	X	X
(c) Nose wheel and rudder steering.	X	X	X	X
(d) Crosswind (maximum demonstrated).	X	X	X	X
(e) Special performance (e.g. reduced V_1, max de-rate, short field operations).	X	X	X	X
(f) Low visibility take-off.	X	X	X	X
(g) Landing gear, wing flap leading edge device operation.	X	X	X	X
(h) Contaminated runway operation.			X	X
(2) Abnormal/emergency.				
(a) Rejected Take-off.	X	X	X	X
(b) Rejected special performance (e.g. reduced V_1, max de-rate, short field operations).	X	X	X	X
(c) With failure of most critical engine at most critical point, continued take-off.	X	X	X	X
(d) With wind shear.	X	X	X	X
(e) Flight control system failures, reconfiguration modes, manual reversion and associated handling.	X	X	X	X
(f) Rejected, brake fade.			X	X

TABLE OF FUNCTIONS AND SUBJECTIVE TESTS				
QPS REQUIREMENTS				
	Simulator Level			
Operations Tasks	**A**	**B**	**C**	**D**
(g) Rejected, contaminated runway.			**X**	**X**
d. Climb				
(1) Normal.	**X**	**X**	**X**	**X**
(2) One or more engines inoperative.	**X**	**X**	**X**	**X**
e. Cruise.				
(1) Performance characteristics (speed vs. power).	**X**	**X**	**X**	**X**
(2) High altitude handling.	**X**	**X**	**X**	**X**
(3) High Mach number handling (Mach tuck, Mach buffet) and recovery (trim change).	**X**	**X**	**X**	**X**
(4) Overspeed warning (in excess of V_{mo} or M_{mo})	**X**	**X**	**X**	**X**
(5) High IAS handling.	**X**	**X**	**X**	**X**
f. Maneuvers.				
(1) High angle of attack, approach to stalls, stall warning, buffet, and g-break (take-off, cruise, approach, and landing configuration).	**X**	**X**	**X**	**X**
(2) Flight envelope protection (high angle of attack, bank limit, overspeed, etc).	**X**	**X**	**X**	**X**
(3) Turns with/without speedbrake/spoilers deployed. (4) Normal and steep turns	**X**	**X**	**X**	**X**
(5) In flight engine shutdown and restart (assisted and windmill).	**X**	**X**	**X**	**X**
(6) Maneuvering with one or more engines inoperative, as appropriate.	**X**	**X**	**X**	**X**
(7) Specific flight characteristics (e.g. direct lift control).	**X**	**X**	**X**	**X**
(8) Flight control system failures, reconfiguration modes, manual reversion and associated handling.	**X**	**X**	**X**	**X**
g. Descent.				
(1) Normal.	**X**	**X**	**X**	**X**
(2) Maximum rate (clean and with speedbrake, etc).	**X**	**X**	**X**	**X**
(3) With autopilot.	**X**	**X**	**X**	**X**
(4) Flight control system failures, reconfiguration modes, manual reversion and associated handling.	**X**	**X**	**X**	**X**
h. Instrument Approaches And Landing. *Those instrument approach and landing tests relevant to the simulated airplane type should be selected from the following list. Some tests should be made with limiting wind velocities, under windshear conditions, and with relevant system failures, including the failure of the Flight Director.* (1) Precision.				
(a) PAR	**X**	**X**	**X**	**X**
(b) CAT I/GBAS (ILS/MLS) published approaches.	**X**	**X**	**X**	**X**
(i) Manual approach with/without flight director including landing.	**X**	**X**	**X**	**X**
(ii) Autopilot/autothrottle coupled approach and manual landing.	**X**	**X**	**X**	**X**
(iii) Manual approach to DH and go-around all engines.	**X**	**X**	**X**	**X**
(iv) Manual one engine out approach to DH and go-around.	**X**	**X**	**X**	**X**
(v) Manual approach controlled with and without flight director to 30	**X**	**X**	**X**	**X**

TABLE OF FUNCTIONS AND SUBJECTIVE TESTS				
QPS REQUIREMENTS				
	Simulator Level			
Operations Tasks	A	B	C	D
m (100 ft) below CAT I minima.				
A With cross-wind (maximum demonstrated)	X	X	X	X
B With windshear	X	X	X	X
(vi) Autopilot/autothrottle coupled approach, one engine out to DH and go-around.	X	X	X	X
(vii) Approach and landing with minimum/standby electrical power.	X	X	X	X
(c) CAT II/GBAS (ILS/MLS) published approaches.	X	X	X	X
(i) Autopilot/autothrottle coupled approach to DH and landing.	X	X	X	X
(ii) Autopilot/autothrottle coupled approach to DH and go-around.	X	X	X	X
(iii) Autocoupled approach to DH and manual go-around.	X	X	X	X
(iv) Category II published approach (auto-coupled, autothrottle).	X	X	X	X
(d) CAT III/GBAS (ILS/MLS) published approaches.	X	X	X	X
(i) Autopilot/autothrottle coupled approach to land and rollout.	X	X	X	X
(ii) Autopilot/autothrottle coupled approach to DH/Alert Height and go-around.	X	X	X	X
(iii) Autopilot/autothrottle coupled approach to land and rollout with one engine out.	X	X	X	X
(iv) Autopilot/autothrottle coupled approach to DH/Alert Height and go-around with one engine out.	X	X	X	X
(v) Autopilot/autothrottle coupled approach (to land or to go around).	X	X	X	X
A With generator failure	X	X	X	X
B With 10 knot tail wind	X	X	X	X
C With 10 knot crosswind	X	X	X	X
(2) Non-precision.				
(a) NDB.	X	X	X	X
(b) VOR, VOR/DME, VOR/TAC.	X	X	X	X
(c) RNAV (GNSS/GPS).	X	X	X	X
(d) ILS LLZ (LOC), LLZ(LOC)/BC.	X	X	X	X
(e) ILS offset localizer.	X	X	X	X
(f) Direction finding facility (ADF/SDF).	X	X	X	X
(g) Surveillance radar.	X	X	X	X
NOTE 1: If Standard Operating Procedures allow use autopilot for non-precision approaches they should include evaluation using the autopilot. *NOTE 2: Level A simulators are not authorized to credit the landing maneuver.*				
i. Visual Approaches (Visual Segment) And Landings.				
(1) Maneuvering, normal approach and landing, all engines operating with and without visual approach aid guidance.	X	X	X	X
(2) Approach and landing with one or more engines inoperative.	X	X	X	X
(3) Operation of landing gear, flap/slats and speedbrakes (normal and abnormal).	X	X	X	X
(4) Approach and landing with crosswind (max. demonstrated).	X	X	X	X
(5) Approach to land with windshear on approach.	X	X	X	X
(6) Approach and landing with flight control system failures, reconfiguration modes, manual reversion and associated handling (most significant degradation which is probable).	X	X	X	X

TABLE OF FUNCTIONS AND SUBJECTIVE TESTS				
QPS REQUIREMENTS				
	Simulator Level			
Operations Tasks	**A**	**B**	**C**	**D**
(7) Approach and landing with trim malfunctions.	**X**	**X**	**X**	**X**
(a) Longitudinal trim malfunction.	**X**	**X**	**X**	**X**
(b) Lateral-directional trim malfunction.	**X**	**X**	**X**	**X**
(8) Approach and landing with standby (minimum) electrical/hydraulic power.	**X**	**X**	**X**	**X**
(9) Approach and landing from circling conditions (circling approach).	**X**	**X**	**X**	**X**
(10) Approach and landing from visual traffic pattern.	**X**	**X**	**X**	**X**
(11) Approach and landing from non-precision approach.	**X**	**X**	**X**	**X**
(12) Approach and landing from precision approach.	**X**	**X**	**X**	**X**
(13) Approach procedures with vertical guidance (APV), e.g., SBAS.	**X**	**X**	**X**	**X**
NOTE 1: Level A simulators are not authorized to credit the landing maneuver. *NOTE 2: Flight simulators with visual systems, which permit completing a special approach procedure in accordance with applicable regulations, may be approved for that particular approach procedure.*				
j. Missed Approach.				
(1) All engines.	**X**	**X**	**X**	**X**
(2) One or more engine(s) out.	**X**	**X**	**X**	**X**
(3) With flight control system failures, reconfiguration modes, manual reversion and associated handling.	**X**	**X**	**X**	**X**
k. Surface Operations (Landing roll and taxi**).**				
(1) Spoiler operation.	**X**	**X**	**X**	**X**
(2) Reverse thrust operation.	**X**	**X**	**X**	**X**
(3) Directional control and ground handling, both with and without reverse thrust.		**X**	**X**	**X**
(4) Reduction of rudder effectiveness with increased reverse thrust (rear pod-mounted engines).		**X**	**X**	**X**
(5) Brake and anti-skid operation with dry, wet, and icy conditions.			**X**	**X**
(6) Brake operation, to include auto-braking system where applicable.	**X**	**X**	**X**	**X**
l. Any Flight Phase.				
(1) Airplane and powerplant systems operation.				
(a) Air conditioning and pressurization (ECS).	**X**	**X**	**X**	**X**
(b) De-icing/anti-icing.	**X**	**X**	**X**	**X**
(c) Auxiliary powerplant/auxiliary power unit (APU).	**X**	**X**	**X**	**X**
(d) Communications.	**X**	**X**	**X**	**X**
(e) Electrical.	**X**	**X**	**X**	**X**
(f) Fire and smoke detection and suppression.	**X**	**X**	**X**	**X**
(g) Flight controls (primary and secondary).	**X**	**X**	**X**	**X**
(h) Fuel and oil, hydraulic and pneumatic.	**X**	**X**	**X**	**X**
(i) Landing gear.	**X**	**X**	**X**	**X**
(j) Oxygen.	**X**	**X**	**X**	**X**
(k) Powerplant.	**X**	**X**	**X**	**X**
(l) Airborne radar.	**X**	**X**	**X**	**X**
(m) Autopilot and Flight Director.	**X**	**X**	**X**	**X**

TABLE OF FUNCTIONS AND SUBJECTIVE TESTS				
QPS REQUIREMENTS				
	Simulator Level			
Operations Tasks	**A**	**B**	**C**	**D**
(n) Collision avoidance systems. [e.g. (E)GPWS,TCAS]	**X**	**X**	**X**	**X**
(o) Flight control computers including stability and control augmentation.	**X**	**X**	**X**	**X**
(p) Flight display systems.	**X**	**X**	**X**	**X**
(q) Flight management computers.	**X**	**X**	**X**	**X**
(r) Head-up guidance, head-up displays	**X**	**X**	**X**	**X**
(s) Navigation systems	**X**	**X**	**X**	**X**
(t) Stall warning/avoidance	**X**	**X**	**X**	**X**
(u) Wind shear avoidance equipment	**X**	**X**	**X**	**X**
(v) Automatic landing aids.	**X**	**X**	**X**	**X**
(2) Airborne procedures.				
(a) Holding.	**X**	**X**	**X**	**X**
(b) Air hazard avoidance. (Traffic, Weather,...)			**X**	**X**
(c) Windshear.			**X**	**X**
(d) Effects of airframe ice.			**X**	**X**
(3) Engine shutdown and parking.				
(a) Engine and systems operation.	**X**	**X**	**X**	**X**
(b) Parking brake operation..	**X**	**X**	**X**	**X**

2. Instructor Operating Station (IOS), as appropriate. Functions in this section are subject to evaluation only if appropriate for the airplane and/or installed on the specific simulator involved.				
(a) Power Switch(es)	X	X	X	X
(b) Airplane conditions. (1) Gross weight, center of gravity, fuel loading and allocation, etc	X	X	X	X
(2) Airplane systems status.	X	X	X	X
(3) Ground crew functions (e.g., ext. power, push back, etc.)	X	X	X	X
(c) Airports. (1) Number and selection.	X	X	X	X
(2) Runway selection.	X	X	X	X
(3) Runway surface condition (e.g., rough, smooth, icy, wet, etc.)			X	X
(4) Preset positions (e.g. ramp, gate, #1 for takeoff, takeoff position, over FAF, etc.)	X	X	X	X
(5) Lighting controls.	X	X	X	X
(d) Environmental controls. (1) Clouds (base and tops).	X	X	X	X
(2) Visibility (statute miles (kilometers)).	X	X	X	X
(3) Runway visual range (in feet (meters)).	X	X	X	X
(4) Temperature.	X	X	X	X
(5) Climate conditions (e.g., ice, snow, rain, etc.).	X	X	X	X
(6) Wind speed and direction.	X	X	X	X
(7) Windshear.			X	X
(e) Airplane system malfunctions. (1) Insertion / deletion.	X	X	X	X
(f) Locks, Freezes, and Repositioning. (1) Problem (all) freeze / release.	X	X	X	X
(2) Position (geographic) freeze / release.	X	X	X	X
(3) Repositioning (locations, freezes, and releases).	X	X	X	X
(4) Ground speed control.	X	X	X	X
(g) Remote IOS.	X	X	X	X
6. Sound Controls. On / off / adjustment	X	X	X	X
7. Motion / Control Loading System.				
(a) On / off / emergency stop.	X	X	X	X
(b) Crosstalk (motion response in a given degree of freedom not perceptible in other degrees of freedom).	X	X	X	X
(c) Smoothness (no perceptible “turn-around bump” as the direction of motion reverses with the simulator being “flown” normally).	X	X	X	X
8. Observer Seats / Stations. Position / Adjustment / Positive restraint system.	X	X	X	X

Attachment 4 to Appendix A to Part 60--

SAMPLE DOCUMENTS

Table of Contents

Title of Sample

ATTACHMENT 4 TO APPENDIX A TO PART 60—
Figure 1 – Sample Letter , Request for Initial, Upgrade, or Reinstatement Evaluation..
INFORMATION

Edward Cook, PhD.
Manager, National Simulator Program
Federal Aviation Administration
P.O. Box 20636 (AFS-205)
Atlanta, GA 30320

Dear Dr. Cook:

RE: Request for Initial [Upgrade / Reinstatement] Evaluation

(Sponsor's name) ___________________ requests your evaluation of our (make, model, series) ________ airplane simulator for Level ______ qualification, located in (City/State) at the (Facility) on (proposed evaluation date). [The proposed evaluation date must not be more than 180 days following the date of this letter.] This simulator [has / has not] been previously qualified by the FAA [and had been issued FAA identification number XXX]. Under separate cover, we have asked our Principal Operations Inspector (POI) (Training Center Program Manager, TCPM), Mr./Ms.__________________(Name), to forward to you a letter concurring with this request.

[The history of this simulator is as follows: ____.]

We agree to provide a Qualification Test Guide (QTG) to your staff not later than 45 days prior to the proposed evaluation date [if tests not run at training site, an additional "1/3 on-site" tests must be provided not later than 14 days prior the proposed evaluation date]. If we are unable to meet the above date for the evaluation, this may result in a significant delay, perhaps 45 days or more, in rescheduling and completing the evaluation. With our forwarding the QTG, we acknowledge that the simulator meets all applicable requirements of Title 14 of the Code of Federal Regulation (14 CFR) Part 60; that it meets the requirements of the Airplane Flight Simulator Qualification Performance Standards (QPS); and that appropriate hardware and software configuration control procedures have been established.

We also agree to forward to you, not later than five (5) business days prior to the scheduled evaluation of this simulator, a confirmation statement that will include the following information:

1. That (a) pilot(s) we have designated, who is(are) qualified on the (make, model, series) _______ airplane, has(have) assessed the simulator and found that the performance and flying qualities of the simulator represent the (make, model, series) _______ airplane. This determination will be made after flying all the maneuvers and procedures and exercising the tasks listed in the Table of Functions and Subjective Tests in Attachment 3 to the Airplane Simulator QPS (except for those listed in the attachment to this letter).

2. That (a) pilot(s), or (an)other person(s) we have designated, has(have) found the simulator systems

and sub-systems (including simulated aircraft systems) functionally represent the (make, model, series) ________ airplane. This determination will be made after having exercised the operation of the simulator and the functions available through the Instructor Operating Station.

3. That, for type specific airplanes, (a) pilot(s), or (an)other person(s) we have designated, has(have) found the cockpit configuration represents the configuration of the (make, model, and series) ________ aircraft.

The names of the person(s) providing this information will be available to you upon your request.

[Added comments from Operator/Sponsor, if any]

Please contact (Name and Telephone Number of Sponsor's Contact) to confirm the date for this initial (upgrade / re-instatement) evaluation. We understand a member of your National Simulator Program staff will respond to this request within 14 days.

Sincerely,

(Signature –Management Representative)

ATTACHMENT 4 TO APPENDIX A TO PART 60--

Figure 2 – Sample Qualification Test Guide Cover Page

INFORMATION

SPONSOR NAME

SPONSOR ADDRESS

FAA QUALIFICATION TEST GUIDE

(SPECIFIC AIRPLANE MODEL)
for example
Stratos BA797-320A

(Type of Simulator)

(Simulator Identification Including Manufacturer, Serial Number, Visual System Used)

(Simulator Level)

(Qualification Performance Standard Used)

(Simulator Location)

FAA Initial Evaluation

Date: ______________

____________________________ Date: ____________
(Sponsor)

____________________________ Date: ____________
Manager, National
Simulator Program, FAA

ATTACHMENT 4 TO APPENDIX A TO PART 60—

Figure 3 – Sample Simulator Information Page

INFORMATION

SPONSOR NAME	
SPONSOR SIMULATOR CODE:	BA-797 #1
AIRPLANE MODEL:	Stratos BA797-320A
AERODYNAMIC DATA REVISION:	BA797-320, CPX-8D, January 1988
ENGINE MODEL(S) AND REVISION:	CPX-8D; RPT-6, January 1988 DRQ-4002, RPT-3, April 1991
FLIGHT CONTROLS DATA REVISION:	BA707-320; May 1988
FLIGHT MANAGEMENT SYSTEM:	Berry XP
SIMULATOR MODEL AND MANUFACTURER:	MTD-797, Tinker Simulators, Inc.
DATE OF SIMULATOR MANUFACTURE:	1988
SIMULATOR COMPUTER:	CIA
VISUAL SYSTEM MODEL, MANUFACTURER, and DISPLAY TYPE:	ClearView, Inc. “Real World T2;” 5 Channel, 6-window CRT display
VISUAL SYSTEM COMPUTER:	LMB-6
MOTION SYSTEM:	Tinker 6 DOF

Information on this page must be updated and kept current with any modifications or changes made to the simulator and reflected on the log of revisions and the list of effective pages.

ATTACHMENT 4 TO APPENDIX A TO PART 60—
Figure 4 – Sample Statement of Qualification

INFORMATION
(subject to change)

Federal Aviation Administration
National Simulator Program

Statement of Qualification

This is to certify that representatives of the
National Simulator Program
Completed an evaluation of the

Go-Fast Training Center
Stratos BA-797 Flight Simulator

FAA Identification Number 701

And found it to meet the standards set forth
In the Qualification Performance Standards
For a simulator at

Level C

____________________ ______________________________
(date) for the NSPM

Subject to the attached
Configuration List and Restrictions

ATTACHMENT 4 TO APPENDIX A TO PART 60—

Figure 4A – Sample Statement of Qualification; Configuration List

INFORMATION

STATEMENT of QUALIFICATION
CONFIGURATION LIST
Go-Fast Training Center Stratos BA-797-232 -- Level C -- FAA ID# 701

Configuration		Date Qualified
Airplane Model:.......................... Re-configurable to:..................	BA-797-232................................... BA-797-287 (see FAA ID#722)	July 12, 1988
Engine Model -- Revision:...	CPX-8D, RPT-6........................ DRQ-4002, RPT-3....................	July 12, 1988 April 1, 1991
Flight Management System:.......	Berry XP..	July 12, 1988
Visual System / Manufacturer: CRT Installation:....................	Real World T2, Clear View, Inc. 5 Channel, 6 Window....................	 July 12, 1988
Flight Instruments: Electro-Mechanical:................ Heads-Up Display..................	 .... Jones Industries.............................	 July 12, 1988 December 1, 1993
Flight Director: Dual Cue................................	 Sperry..	 July 12, 1988
Engine Instruments: Electro-Mechanical.................		 July 12, 1988
Navigation Type(s): ADF....................................... VOR/ILS............................... INS.......................................		 July 12, 1988 July 12, 1988 October 10, 1991
Weather Radar:	Jones Industries, Inc.	August 3, 1996
Windshear Equipment		July 12, 1988
TCAS		October 9, 2003
	(Continue as Necessary)	

ATTACHMENT 4 TO APPENDIX A TO PART 60—
Figure 4B – Sample Statement of Qualification
Qualified / Non-Qualified Maneuvers, Procedures, Tasks, Functions

INFORMATION

STATEMENT of QUALIFICATION

Qualified / Non-Qualified Maneuvers, Procedures, Tasks, Functions
Go-Fast Training Center
Stratos BA-797 -- Level C -- FAA ID# 701

The FFS is qualified to perform all of the Maneuvers, Procedures, Tasks, and Functions listed in the Table of Functions and Subjective Tests, Part 60, Appendix A, Attachment 3, In Effect on [mm/dd/yyyy] except for the following listed Tasks or Functions.

(*Example*)

Non-Qualified Operations Tasks and Functions

1.b.(2) Power Back.
1.b.(3)(g) Other (SMGCS).
1.c.(1) Normal Takeoff, Daylight Conditions.
1.h.(1)(a) Precision Approaches, Precision Approach Radar (PAR)
1.l.(1)(d) Communications (ACARS)
1.l.(1)(l) Airborne Radar (Weather Radar System)
1.l.(1)(r) (Heads-Up Flight Guidance System [HUD]).
1.i.(14) Other (Land and Hold Short Operations [LAHSO])

Non-Qualified Simulator Systems:

6.g. Remote IOS

Additional Qualified Tasks or Functions in addition to those listed in the Table of Functions and Subjective Tests, Part 60, Appendix A, Attachment 3.

(None)

ATTACHMENT 4 TO APPENDIX A TO PART 60

Figure 5 – Sample Continuing Qualification Evaluation Requirements Page Information

Recurrent Evaluation Requirements ***Completed at conclusion of Initial Evaluation***	
Recurrent Evaluations to be conducted each _(fill in)__ months Allotting ______ hours of FTD time. Signed: ________________________________ NSPM / Evaluation Team Leader	Recurrent evaluations are due as follows: _(month)__ and __(month)_ and __(month)_ (enter or strike out, as appropriate) ______________________ Date

Revision: Based on (enter reasoning):	
Recurrent Evaluations are to be conducted each _(fill in)__ months. Allotting ______ hours. Signed: ________________________________ NSPM Evaluation Team Leader	Recurrent evaluations are due as follows: _(month)__ and __(month)_ and __(month)_ (enter or strike out, as appropriate) ______________________ Date

Revision: Based on (enter reasoning):	
Recurrent Evaluations are to be conducted each _(fill in)__ months. Allotting ______ hours. Signed: ________________________________ NSPM Evaluation Team Leader	Recurrent evaluations are due as follows: _(month)__ and __(month)_ and __(month)_ (enter or strike out, as appropriate) ______________________ Date

(Repeat as Necessary)

ATTACHMENT 4 TO APPENDIX A TO PART 60—

Figure 6 – Sample MQTG Index of Effective FSTD Directives.

INFORMATION

Index of Effective FSTD Directives
Filed in this Section

Notification Number	**Received From: (TPAA/NSPM)**	**Date of Notification**	**Date of Modification Completion**

Continue as Necessary....

Attachment 5 to Appendix A to Part 60—

SIMULATOR QUALIFICATION REQUIREMENTS

FOR WINDSHEAR TRAINING PROGRAM USE

1. Applicability.

Begin QPS Requirements

This attachment applies to all simulators used to satisfy the training requirements of 14 CFR part 121 that pertain to the sponsor's approved low-altitude windshear flight training program, or the training permitted in accordance with an FAA-approved training program under 14CFR part 121, 135, or 142, that addresses low-altitude windshear encounters.

End QPS Requirements

2. Statement of Compliance and Capability (SOC).

Begin QPS Requirements

a. The sponsor must submit an SOC that confirms that the aerodynamic model is based on flight test data supplied by the airplane manufacturer, or other approved source, and that any change to environmental wind parameters, including variances in those parameters for windshear conditions, once inserted for computation, result in the correct simulated performance. This statement must also include examples of where environmental wind parameters are currently evaluated in the simulator (such as crosswind takeoffs, crosswind approaches, and crosswind landings).

b. For those simulators where windshear warning, caution, or guidance hardware was not provided as original equipment, the SOC must also state that the simulation of the added simulator hardware and/or software, including associated cockpit displays and annunciations, function the same or equivalent to the system(s) installed in the airplane and be accompanied by a block diagram that depicts the input and output signal flow, comparing that signal flow to the equipment installed in the airplane being simulated.

End QPS Requirements

3. Models.

Begin QPS Requirements

The windshear models installed in the simulator software that will be used for the qualification evaluation must do the following:

a. Provide cues necessary for recognition of the onset of a windshear phenomena and potential performance degradation that would require a pilot to initiate recovery procedures. The cues must include all of the following, as may be appropriate for the appropriate portion of the flight envelope:

(1) Rapid airspeed change of at least ±15 knots (kts).

(2) Stagnation of airspeed during the takeoff roll.

(3) Rapid vertical speed change of at least ±500 feet per minute (fpm).

(4) Rapid pitch change of at least $\pm 5^0$.

b. Be adjustable in intensity (or other parameter to achieve an intensity effect) to at least two (2) levels so that upon encountering the windshear the pilot may identify its presence by the cues described above, and that when the pilot applies the recommended procedures for escape from such a windshear:

(1) If the intensity is lesser, the performance capability of the simulated airplane in the windshear permits the pilot to maintain a satisfactory flightpath; and

(2) If the intensity is greater, the performance capability of the simulated airplane in the windshear does not permit the pilot to maintain a satisfactory flightpath (crash).

Note: The means used to accomplish the "nonsurvivable" scenario of paragraph 3.b.(2) of this attachment, that involve operational elements of the simulated airplane, must reflect parameters that fall within the dispatch limitations of the airplane.

c. Be available for use in the FAA-approved windshear flight training program.

End QPS Requirements

4. Demonstrations.

Begin QPS Requirements

a. The sponsor must identify two of the required, survivable training windshear models – one takeoff and one approach. The sponsor must identify the wind components of the two models selected and present this information in graphical format so that all components of the windshear are shown, including initiation point, variance in magnitude, and either time or distance correlation as may be appropriate. The simulator must be operated at the same gross weight, airplane configuration, and initial airspeed in all of the following situations:

(1) Takeoff – through calm air.

(2) Takeoff – through the first selected survivable windshear.

(3) Approach – through calm air.

(4) Approach – through the second selected survivable windshear.

b. In each of these four situations, at an "initiation point" (that point being where the onset of windshear conditions is, or would have been recognized, depending on the test being run), the recommended procedures for windshear recovery are applied, and the results are recorded, as specified in paragraph 5 of this attachment.

c. These recordings are made without the presence of programmed random turbulence. Turbulence that results from the windshear model is to be expected, and no attempt may be made to neutralize turbulence from this source.

d. The definition of the models and the results of the demonstrations of all four(4) cases described in paragraph 4.a of this attachment, must be made a part of the MQTG.

End QPS Requirements

---

5. Recording Parameters.

Begin QPS Requirements

a. In each of the four MQTG cases, an electronic recording (time history) must be made of the following parameters:

(1) Indicated or calibrated airspeed.

(2) Indicated vertical speed.

(3) Pitch attitude.

(4) Indicated or radio altitude.

(5) Angle of attack.

(6) Elevator position.

(7) Engine data (thrust, N_1 , or throttle position).

(8) Wind magnitudes (simple windshear model assumed).

b. These recordings shall be initiated at least 10 seconds prior to the initiation point and continued until recovery is complete or ground contact is made.

End QPS Requirements

---

6. Equipment Installation and Operation.

Begin QPS Requirements

All windshear warning, caution, or guidance hardware installed in the simulator must operate as it operates in the airplane being simulated. For example: if the simulator encounters a rapidly changing wind speed and/or direction that would have resulted in a windshear warning in the airplane were the same conditions encountered, the simulator must respond equivalently, without instructor/evaluator intervention.

End QPS Requirements

7. Qualification Test Guide.

Begin QPS Requirements

a. All QTG material (performance demonstration recordings, etc.) will be forwarded to the NSPM.

b. The simulator will be scheduled for an evaluation in accordance with normal procedures. Use of recurrent evaluation schedules will be used to the maximum extent possible.

c. During the on-site evaluation, the evaluator will ask the operator to run the performance tests and record the results. The results of these on-site tests will be compared to those results previously approved and placed in the QTG or MQTG, as appropriate.

d. QTG's for new (or MQTG's for upgraded) simulators must contain or reference the information described in paragraphs 2, 3, 4, and 5 of this attachment.

End QPS Requirements

8. Subjective Evaluation.

Begin Information

The NSPM will fly the simulator in at least two of the available windshear scenarios to examine the function of the simulator and the simulated airplane and to evaluate subjectively the performance of the simulator as it encounters the programmed windshear conditions according to the following:

a. One scenario will include parameters that enable the pilot to maintain a satisfactory flightpath.

b. One scenario will include parameters that will not enable the pilot to maintain a satisfactory flightpath (crash).

c. Other scenarios may be examined at the discretion of the NSPM.

End Information

9. Qualification Basis.

Begin Information

The addition of windshear programming to a simulator in order to comply with the qualification for required windshear training does not change the original qualification basis of the simulator.

End Information

10. Demonstration Repeatability.

Begin Information

For the purposes of demonstration repeatability, it is recommended that the simulator be flown by means of the simulator's autodrive function (for those simulators that have autodrive capability) during the demonstrations.

End Information

Appendix B to Part 60—Qualification Performance Standards for Airplane Flight Training Devices

Begin Information

This appendix establishes the standards for Airplane Flight Training Device (FTD) evaluation and qualification at one of the established levels. The Flight Standards Service, National Simulator Program (NSP) staff, under the direction of the NSP Manager (NSPM), is responsible for the development, application, and interpretation of the standards contained within this appendix.
The procedures and criteria specified in this appendix will be used by the NSPM, or a person or persons assigned by the NSPM (e.g., FAA pilots and/or FAA aeronautical engineers, assigned to and trained under the direction of the NSP – referred to as NSP pilots or NSP engineers, other FAA personnel, etc.) when conducting airplane FTD evaluations.

End Information

Table of Contents

1. Introduction

Begin Information

a. This appendix contains background information as well as material that is either directive or informative in nature as described later in this section. Except for this Introduction section, the directive or the informative material is presented in sections that correspond with sections of part 60. This material provides additional requirements and/or provides information regarding that subject. Some sections will have neither additional regulatory or informational material. In these instances the corresponding section in the Table of Contents will show "(No Info)."

b. To assist the reader in determining what areas are directive or required and what areas are guiding or permissive –

(1) The text in this appendix is contained within one of two sections: regulatory requirements that are in addition to the requirements in part 60 but are found only in this appendix, referred to as "QPS Requirements;" and advisory or informative material, referred to as "Information."

(a) The FAA has chosen to place into special QPS Requirements sections those requirements that are more likely to change on a more regular basis for a variety of reasons, e.g., increased knowledge about human factors, analysis of incident/accident data, and/or changes in aircraft or simulation technology. Using this capability, the FAA will be able to use information resulting from these factors to expeditiously modify the regulatory requirements without compromising the timeliness of those changes and without violating the Administrative Procedure Act (APA). In accordance with the APA, the FAA intends to treat all such QPS Requirements changes as Notices of Proposed Rule Making (NPRM), will seek input and suggestions from a representative cross-section of the affected industry through an Aviation Rulemaking Committee, will seek public comment through announcement of any proposed change in the Federal Register, and will review changes before final action on them is complete. The FAA does not expect that many changes to these QPS Requirements will justify the expenditure of time and resources at the highest levels of the agency and will therefore streamline the process for making technical changes to these QPS Requirements by delegating authority for final review and issuance from the Administrator to the Director, Flight Standards Service.

(b) Similarly, the FAA has chosen to place into special Information sections additional material regarding the adjacent regulatory requirements such as acceptable examples of practices and either additional or clarifying information that may be useful to the public in identifying the intent of the FAA.

(2) The text presented between horizontal lines beginning with the heading "Begin QPS Requirements" and ending with the heading "End QPS Requirements," contains the regulatory requirements that are in addition to the requirements in the body of the part 60 language but found only in this appendix.

(3) The text presented between horizontal lines beginning with the heading "Begin Information" and ending with the heading "End Information," is advisory or informative.

(4) The tables in this appendix have rows across the top of each table –

(a) The data presented in columns under the heading "QPS REQUIREMENTS" is regulatory but is found only in this appendix.

(b) The data presented in columns under the heading "INFORMATION" is advisory or informative.

c. Questions regarding the contents of this publication should be sent to: U.S. Department of Transportation, Federal Aviation Administration, Flight Standards Service, National Simulator Program Staff, AFS-205, PO Box 20636, Atlanta, Georgia, 30320. Telephone contact numbers are: phone, 404-305-6100; fax, 404-305-6118. The National Simulator Program Internet Web Site address is: http://www.faa.gov/nsp. On this Web Site you will find an NSP personnel list with contact information, a list of qualified flight simulation devices, advisory circulars, a description of the qualification process, NSP policy, and an NSP "In-Works" section. Also linked from this site are additional information sources, handbook bulletins, frequently asked questions, a listing and text of the Federal Aviation Regulations, Flight Standards Inspector's handbooks, and other FAA links.

d. The NSPM encourages the use of electronic media for communication and the gathering, storage, presentation, or transmission of any record, report, request, test, or statement required by this appendix provided the media used has adequate provision for security and is acceptable to the NSPM. The NSPM recommends inquiries on system compatibility prior to any such activity. Minimum System requirements may be found on the NSP Website.

e. Related Reading References.(1) 14CFR part 60
(2) 14CFR part 61.
(3) 14CFR part 63.
(4) 14CFR part 121.
(5) 14CFR part 125
(6) 14CFR part 135.
(7) 14CFR part 141
(8) 14CFR part 142
(9) Advisory Circular (AC) 120-28C, Criteria for Approval of Category III Landing Weather Minima.
(10) AC 120-29, Criteria for Approving Category I and Category II Landing Minima for part 121 operators.
(11) AC 120-35B, Line Operational Simulations: Line-Oriented Flight Training, Special Purpose Operational Training, Line Operational Evaluation.
(12) AC 120-41, Criteria for Operational Approval of Airborne Wind Shear Alerting and Flight Guidance Systems.
(13) AC 120-57A, Surface Movement Guidance and Control System (SMGS).
(14) AC 150/5300-13, Airport Design.
(15) AC 150/5340-1G, Standards for Airport Markings.
(16) AC 150/5340-4C, Installation Details for Runway Centerline Touchdown Zone Lighting Systems.
(17) AC 150/5340-19, Taxiway Centerline Lighting System.
(18) AC 150/5340-24, Runway and Taxiway Edge Lighting System.
(19) AC 150/5345-28D, Precision Approach Path Indicator (PAPI) Systems
(20) International Air Transport Association document, “Flight Simulator Design and Performance Data Requirements," as amended.
(21) AC 25-7, as amended, Flight Test Guide for Certification of Transport Category Airplanes.
(22) AC 23-8A, as amended, Flight Test Guide for Certification of Part 23 Airplanes.
(23) International Civil Aviation Organization (ICAO) Manual of Criteria for the Qualification of Flight Simulators, as amended.
(24) Airplane Flight Simulator Evaluation Handbook, Volume I, as amended and Volume II, as amended, The Royal Aeronautical Society, London, UK.
(25) FAA Publication FAA-S-8081 series (Practical Test Standards for Airline Transport Pilot Certificate, Type Ratings, Commercial Pilot, and Instrument Ratings).
(26) The FAA Aeronautical Information Manual (AIM), FAA Handbook XXXXX

f. Background.
(1) The primary objective of flight training continues to be one of providing a means for flightcrew members to acquire the skills and knowledge necessary to perform to a desired safe standard. By the same measure, flight simulation continues to provide the most effective, viable environment for the instruction, demonstration, and practice of the maneuvers and procedures (called training events) pertinent to a particular airplane and crew member position. The complexity, operating costs, and operating environment of modern airplanes, together with the steady technological advances in flight simulation, have continued to encourage, and, in fact, have demanded, the expanded use of flight simulation (both FTDs and simulators) in the training and checking of flightcrew members.
(2) The FAA has traditionally recognized the value of training devices and has awarded credit for their use in the completion of specific training and checking events in both general aviation and air carrier flight training programs and in pilot certification activities. Such credits are delineated in 14CFR Parts 61 and 121; and in other appropriate sources such as handbooks and guidance documents. These CFR sources,

however, have, in the past, referred only to a “training device” or to a "flight training device," with no further descriptive information. Other sources had referred to flight training devices in several categories such as Cockpit Procedures Trainers, Cockpit Systems Simulators, Fixed Base Simulators, and other descriptors. Prior to the advent of the predecessor to this document, these categories and names had no standard definition or design criteria within the industry and no single source guidance document had existed to categorize these devices, to provide qualification standards for each category, or to relate one category to another in terms of capability or technical complexity. As a result, approval of these devices for use in training programs had not always been equitable. This circumstance has changed. The recognizable and understood technical definitions and descriptions in previous documents has provided a foundation. Knowledge of the FAA-authorized uses of FTDs built on this foundation and has significantly influenced the flight training industry to increase the use of FTDs and has garnered support for multiplying that use in the future.

(3). For information purposes, the following is a chronological listing of the documents preceding part 60 that have addressed the qualification criteria for airplane flight training device (FTD) evaluation and qualification by the FAA, including the effective dates of those documents:

AC 120-45	05/11/87 to 02/05/92
AC 120-45A	02/05/92 to (date TBD)

End Information

---

2. Applicability (§§ 60.1 & 60.2)

There is no additional regulatory or informational material that applies to § 60.1, Applicability, or to § 60.2, Applicability of sponsor rules to person who are not sponsors and who are engaged in certain unauthorized activities.

---

4. Definitions (§ 60.3)

Begin Information

See Appendix E of this part for a list of definitions and abbreviations from part 1 and part 60. These definitions are regulatory. Additional definitions and abbreviations used in reading and understanding this appendix are presented within the QPS Requirements section. These definitions are also regulatory but are found only in this appendix.

End Information

---

4. Qualification Performance Standards (§ 60.4)

There is no additional regulatory or informational material that applies to § 60.4, Qualification Performance Standards.

---

5. Quality Management System (§ 60.5).

Begin Information

Additional regulatory material and informational material regarding Quality Management Systems for Flight Simulation Training Devices may be found in appendix E of this part.

End Information

---

6. Sponsor Qualification Requirements. (§ 60.7).

Begin Information

a. The intent of the language used in § 60.7(b) is to have a specific FTD, identified by the sponsor, used by the sponsor at least once in the sponsor's FAA-approved flight training program for the airplane simulated during the 12-month period described. The identification of the specific FTD may change from one 12-month period to the next 12-month period as long as that sponsor sponsors and uses at least one FTD at least once during the prescribed period. There is no minimum number of hours or minimum FTD periods required.

b. To assist in avoiding confusion regarding the requirements for use of a qualified FTD the following examples/descriptions are provided to describe acceptable operational practices:

(1) Example One.

a. A sponsor is sponsoring a single, specific FTD for their own use, in their own facility or elsewhere – this single FTD forms the basis for the sponsorship. The sponsor uses that FTD at least once in each 12-month period in that sponsor's FAA-approved flight training program for the airplane simulated. This 12-month period is established according to the following:

(i) If the FTD was qualified prior to [insert the effective date of this rule] the 12-month period begins on the date of the first NSPM-conducted continuing qualification after [insert the effective date of this rule] and continues for each subsequent 12-month period;

(ii) If the FTD satisfactorily completes an initial or upgrade evaluation on or after [insert the effective date of this rule] the 12-month period begins on the date of that completed initial or upgrade evaluation and continues for each subsequent 12-month period.

b. There is no minimum number of hours or minimum FTD periods required.

c. The identification of the specific FTD may change from one 12-month period to the next 12-month period as long as that sponsor sponsors and uses at least one FTD at least once during the prescribed period.

(2) Example Two.

a. A sponsor sponsors an additional number of FTDs, in their facility or elsewhere. Each such additionally sponsored FTD must be –

(i) Used by the sponsor in the sponsor's FAA-approved flight training program for the airplane simulated [as described in § 60.7(d)(1)] at least once in each 12-month period in that sponsor's FAA-approved flight training program for the airplane simulated (this 12-month period is established in the same manner as in example one);

OR

(ii) Used by another FAA certificate holder in that other certificate holder's FAA-approved flight training program for the airplane simulated [as described in § 60.7(d)(1)] at least once in each 12-month period in that certificate holder's FAA-approved flight training program for the airplane simulated (this 12-month period is established in the same manner as in example one);

OR

(iii) Provided a statement each year from a qualified pilot, (after having flown the airplane, not the subject FTD or another FTD, during the preceding 12-month period) stating that the subject FTD's performance and handling qualities represent the airplane [as described in § 60.7(d)(2)]. This statement is provided at least once in each 12-month period established in the same manner as in example one.

b. There is no minimum number of hours or minimum FTD periods required.

(3) Example Three.

a. A sponsor (in this example, a Part 142 certificate holder) in "New York" (having at least one FTD used at least once per year in the sponsor's FAA-approved flight training program) establishes a "satellite" training center in "Chicago" and/or a satellite center in "Moscow."

b. The satellite function means that the "Chicago" and/or "Moscow" center(s) must operate under the "New York" center's certificate (in accordance with all of the "New York" center's practices, procedures, and policies; e.g., instructor and/or technician training/checking requirements, record keeping, QMS program, etc.).

c. All of the FTDs in the "Chicago" center and/or the "Moscow" center could be dry-leased (i.e., the certificate holder does not have and utilize FAA-approved flight training programs for the simulators in the "Chicago" and/or the "Moscow" center) because –

(i) Each FTD in the “Chicago” center and/or each FTD in the “Moscow” center is used at least once each 12-month period by another FAA certificate holder in that other certificate holder’s FAA-approved flight training program for the airplane [as described in § 60.7(d)(1)];or
(ii) A statement is obtained from a qualified pilot (having flown the airplane, not the subject FTD or another FTD during the preceding 12-month period) stating that the performance and handling qualities of each FTD in the “Chicago” center and/or each FTD in the “Moscow” center represent the airplane [as described in § 60.7(d)(2)].

End Information

---

7. Additional Responsibilities of the Sponsor (§ 60.9)..

Begin Information

The intent of the language “as soon as practicable” used in §60.9(a) means without unnecessarily disrupting or delaying beyond a reasonable time the training, evaluation, or experience being conducted in the FSTD.

End Information

---

8. FTD Use (§ 60.11).

There is no additional regulatory or informational material that applies to § 60.11, Simulator Use.

---

9. FTD Objective Data Requirements (§ 60.13).

Begin QPS Requirements

a. The FTD sponsor must maintain a liaison with the manufacturer of the aircraft being simulated (or with the holder of the aircraft type certificate for the aircraft being simulated if the manufacturer is no longer in business), and/or, if appropriate, with the person having supplied the aircraft data package for the FTD in order to facilitate the notification described in this paragraph. The sponsor must immediately notify the NSPM when an addition to or a revision of the flight related data or airplane systems related data is available if this data is used to program and/or operate a qualified FTD. The data referred to in this sub-section are those data that are used to validate the performance, handling qualities, or other characteristics of the aircraft, including data related to any relevant changes occurring after the type certification is issued. The notification must also provide technical information about this data to the NSPM relative to the data’s significance for training, evaluation, or flight experience activities in the FTD.

b. Flight test data used to validate FTD performance and handling qualities must have been gathered in accordance with a flight test program containing the following:
(1) A flight test plan, that contains:
  (a) The required maneuvers and procedures.

(b) For each maneuver or procedure --
(i) The procedures and control input the flight test pilot and/or engineer are to use.
(ii) The atmospheric and environmental conditions.
(iii) The initial flight conditions.
(iv) The airplane configuration, including weight and center of gravity.
(v) The data that is to be gathered.
(vi) Any other appropriate factors.

(2) Appropriately qualified flight test personnel.
(3) An understanding of the accuracy of the data to be gathered.
(4) Appropriate and sufficient data acquisition equipment or system(s), including appropriate data reduction and analysis methods and techniques, as would be acceptable to the FAA's Aircraft Certification Service.
(5) Calibration of data acquisition equipment and airplane performance instrumentation must be current and traceable to a recognized standard.

c. The data, regardless of source, must be presented:
(1) in a format that supports the FTD validation process;
(2) in a manner that is clearly readable and annotated correctly and completely;
(3) with resolution sufficient to determine compliance with the tolerances set forth in attachment 2 of this appendix.
(4) with any necessary guidance information provided; and
(5) without alteration, adjustments, or bias; however the data may be re-scaled, digitized, or otherwise manipulated to fit the desired presentation.

d. After completion of any additional flight test, a flight test report must be submitted in support of the validation data. The report must contain sufficient data and rationale to support qualification of the FTD at the level requested.

End QPS Requirements

Begin Information

e. It is the intent of the NSPM that for new aircraft entering service, at a point well in advance of preparation of the Qualification Test Guide (QTG), the sponsor should submit to the NSPM for approval, a descriptive document (a validation data roadmap) containing the plan for acquiring the validation data, including data sources. This document should clearly identify sources of data for all required tests, a description of the validity of these data for a specific engine type and thrust rating configuration, and the revision levels of all avionics affecting the performance or flying qualities of the aircraft. Additionally, this document should provide rationale or explanations for cases where data or data parameters are missing, where engineering simulation data are used, where flight test methods require further explanations, etc. and provide a brief narrative describing the cause and effect of any deviation from data requirements. This document may be provided by the aircraft manufacturer.

f. There is no requirement for any flight test data supplier to submit a flight test plan/program prior to gathering flight test data. However, the NSP staff has experience that indicates at least some data gatherers, primarily those that do not have a satisfactory "history" of supplying such data, often provide data that is irrelevant, not properly marked, without adequate justification for selection, without adequate information regarding initial conditions, without adequate information regarding the test maneuver, etc. The NSP staff has been forced to not accept such data submissions as validation data for FTD evaluation. It is for this reason that the NSP staff recommends that any data supplier not previously experienced in this area review the data necessary for programming and for validating the performance of the FTD and discuss the flight test plan anticipated for acquiring such data with the NSP staff well in advance of commencing the flight tests.

g. The NSPM will consider, on a case-by-case basis, whether or not to approve supplemental validation data derived from flight data recording systems such as a Quick Access Recorder or Flight Data Recorder.

End Information

10. Special Equipment and Personnel Requirements for Qualification of the FTD (§ 60.14).

Begin Information

a. In the event that the NSPM determines that special equipment or (a) specifically qualified person(s) will be required for the conduct of any evaluation, the NSPM will make every attempt to notify the sponsor at least one (1) week, but in no case less than 72 hours, in advance of the evaluation. Examples of special equipment include spot photometers, flight control measurement devices, sound analyzer, etc. Examples of specially qualified personnel would be those specifically qualified to install or use any special equipment when its use is required.

b. Examples of a special evaluation would be an evaluation conducted after the move of an FTD; at the request of the TPAA; as a result of comments received from users of the FTD that, upon analysis and confirmation, might cause a question as to the continued qualification or use of the FTD; etc.

End Information

11. Initial (and Upgrade) Qualification Requirements (§ 60.15).

Begin QPS Requirement

a. The request described in § 60.15(a) must include all of the following:

(1) A statement that the FTD meets all of the applicable provisions of this part and all applicable provisions of the QPS.

(2) A confirmation that the sponsor will forward to the NSPM the statement described in § 60.15(b) in such time as to be received no later than 5 business days prior to the scheduled evaluation and may be forwarded to the NSPM via traditional or electronic means.

(3) A qualification test guide (QTG), acceptable to the NSPM, that includes all of the following:

(i) Objective data obtained from aircraft testing or another approved source.

(ii) Correlating objective test results obtained from the performance of the FTD as prescribed in the appropriate QPS.

(iii) The result of FTD performance demonstrations prescribed in the appropriate QPS.

(iv) A description of the equipment necessary to perform the evaluation for initial qualification and the continuing qualification evaluations.

b. The QTG described in paragraph a(3) of this section, must provide the documented proof of compliance with the FTD objective tests in attachment 2 of this appendix.

c. The QTG is prepared and submitted by the sponsor, or the sponsor's agent on behalf of the sponsor, to the NSPM for review and approval, and must include, for each objective test:
(1) Parameters, tolerances, and flight conditions;
(2) Pertinent and complete instructions for the conduct of automatically and manually conducted tests;
(3) A means of comparing the FTD's test results to the objective data;
(4) An explanation, or other information as necessary, to assist in the evaluation of the test results;
(5) Other information appropriate to the qualification level of the FTD.

d. The QTG described in paragraphs a(3) and b of this section, must include the following:
(1) A QTG cover page with sponsor and FAA approval signature blocks (see Attachment 4, Figure 2, for a sample QTG cover page).
(2) A continuing qualification evaluation schedule requirements page – to be used by the NSPM to establish and record the frequency with which continuing qualification evaluations must be conducted and any subsequent changes that may be determined by the NSPM. See Attachment 4, Figure 4, for a sample Continuing Qualification Evaluation Schedule Requirements page.
(3) An FTD information page that provides the information listed in this paragraph (see Attachment 4, Figure 3, for a sample FTD information page). For convertible FTDs, a separate page is submitted for each configuration of the FTD.
(a) The sponsor's FTD identification number or code.
(b) The airplane model and series being simulated.
(c) The aerodynamic data revision number or reference.
(d) The engine model(s) and its data revision number or reference.
(e) The flight control data revision number or reference.
(f) The flight management system identification and revision level.
(g) The FTD model and manufacturer.

(h) The date of FTD manufacture.
(i) The FTD computer identification.
(j) The visual system model and manufacturer, including display type.
(k) The motion system type and manufacturer, including degrees of freedom.
(4) A Table of Contents.
(5) A log of revisions and a list of effective pages.
(6) List of all relevant data references.
(7) A glossary of terms and symbols used (including sign conventions and units).
(8) Statements of compliance and capability (SOC's) with certain requirements. SOC's must provide references to the sources of information for showing the capability of the FTD to comply with the requirement, a rationale explaining how the referenced material is used, mathematical equations and parameter values used, and the conclusions reached; i.e. that the FTD complies with the requirement. Refer to the "Additional Details" column in attachment 1, "FTD Standards," or in the "Test Details" column in attachment 2, "FTD Objective Tests," to see when SOC's are required.
(9) Recording procedures or equipment required to accomplish the objective tests.
(10) The following information for each objective test designated in attachment 2, as applicable to the qualification level sought:
(a) Name of the test.
(b) Objective of the test.
(c) Initial conditions.
(d) Manual test procedures.
(e) Automatic test procedures (if applicable).
(f) Method for evaluating FTD objective test results.

(g) List of all relevant parameters driven or constrained during the automatically conducted test(s).
(h) List of all relevant parameters driven or constrained during the manually conducted test(s).
(i) Tolerances for relevant parameters.
(j) Source of Validation Data (document and page number).
(k) Copy of the Validation Data (if located in a separate binder, a cross reference for the identification and page number for pertinent data location must be provided).
(l) FTD Objective Test Results as obtained by the sponsor. Each test result must reflect the date completed and must be clearly labeled as a product of the device being tested.

f. Form and manner of presentation of objective test results in the QTG:
(1) The sponsor's FTD test results must be recorded in a manner, acceptable to the NSPM, that will allow easy comparison of the FTD test results to the validation data (e.g., use of a multi-channel recorder, line printer, cross plotting, overlays, transparencies, etc.).
(2) FTD results must be labeled using terminology common to airplane parameters as opposed to computer software identifications.
(3) Validation data documents included in a QTG may be photographically reduced only if such reduction will not alter the graphic scaling or cause difficulties in scale interpretation or resolution.
(4) Scaling on graphical presentations must provide the resolution necessary to evaluate the parameters shown in attachment 2 of this appendix.
(5) For tests involving time histories, data sheets (or transparencies thereof) and FTD test results must be clearly marked with appropriate reference points to ensure an accurate comparison between FTD and airplane with respect to time. Time histories recorded via a line printer are to be clearly identified for cross-plotting on the airplane data. Over-plots must not obscure the reference data.

g. The sponsor may elect to complete the QTG objective tests at the manufacturer’s facility. Tests performed at this location must be conducted after assembly of the FTD has been essentially completed, the systems and sub-systems are functional and operate in an interactive manner, and prior to the initiation of disassembly for shipment. The sponsor must substantiate FTD performance at the sponsor’s training facility by repeating a representative sampling of all the objective tests in the QTG and submitting these repeated test results to the NSPM. This sample must consist of at least one-third of the QTG objective tests. The QTG must be clearly annotated to indicate when and where each test was accomplished.

h. While the subjective tests are normally accomplished at the sponsor’s training facility, the sponsor may elect to complete the subjective tests at the manufacturer’s facility. Tests performed at this location will be conducted after assembly of the FTD has been essentially completed, the systems and sub-systems are functional and operate in an interactive manner, and prior to the initiation of disassembly for shipment. The sponsor must substantiate FTD performance at the sponsor’s training facility by having the pilot(s) who performed these tests originally (or similarly qualified pilot(s)), repeat a representative sampling of these subjective tests (need not take more than one normal FTD period – e.g., 4 hours) and submit a statement to the NSPM that the FTD has not changed from the original determination. This statement must clearly indicate when and where these repeated tests were completed.

i..The sponsor must maintain a copy of the MQTG at the FTD location.

j. All FTDs for which the initial qualification is conducted after [insert 6 years after effective date of this rule] must have an electronic MQTG (eMQTG) including all objective data obtained from airplane testing, or another approved source (reformatted or digitized), together with correlating objective test results obtained from the performance of the FTD (reformatted or digitized) as prescribed in this appendix, the general FTD performance or demonstration results (reformatted or digitized) prescribed in this appendix, and a description of the equipment necessary to perform the evaluation for initial qualification and the continuing qualification evaluations for continuing qualification. This eMQTG must include the original validation data used to validate FTD performance and handling qualities in either the original digitized format from the data supplier or an electronic scan of the original time-history plots that were provided by the data supplier. An eMQTG must be provided to the NSPM.

k. All other FTDs (not covered in subparagraph "j") must have an electronic copy of the MQTG by and after [insert 6 years after effective date of this rule], a copy of which must be provided to the NSPM. This may be provided by an electronic scan presented in a Portable Document File (PDF), or similar format, acceptable to the NSPM.

End QPS Requirements

Begin Information

l. Only those FTDs that are sponsored by a certificate holder (as defined for use in part 60 and this QPS appendix) will be evaluated by the NSPM. However, other FTD evaluations may be conducted on a case-by-case basis as the Administrator deems appropriate, but only in accordance with applicable agreements.

m. Each FTD must be evaluated as completely as possible. To ensure a thorough and uniform evaluation, each FTD is subjected to the general FTD requirements and performance demonstrations in attachment 1, the objective tests listed in attachment 2, and the subjective tests listed in attachment 3 of this appendix. The evaluation(s) described herein will include, but not necessarily be limited to the following, as appropriate, for the qualification level of the FTD:
(1) Airplane responses, including longitudinal and lateral-directional control responses (see attachment 2 of this appendix);
(2) Performance in authorized portions of the simulated airplane's operating envelope, to include tasks evaluated by the NSPM in the areas of ground operations, takeoff, climb, cruise, descent, approach, and landing as well as abnormal and emergency operations (see paragraph [check reference] and attachment 2 of this appendix);
(3) Control checks (see attachment 1 and attachment 2 of this appendix);
(4) Cockpit configuration (see attachment 1 of this appendix);
(5) Pilot, flight engineer, and instructor station functions checks (see attachment 1 and attachment 3 of this appendix);
(6) Airplane systems and sub-systems (as appropriate) as compared to the airplane simulated (see attachment 1 and attachment 3 of this appendix);
(7) FTD systems and sub-systems, including force cueing (motion), visual, and aural (sound) systems, as appropriate (see attachment 1 and attachment 2 of this appendix); and
(8) Certain additional requirements, depending upon the complexity of the FTD qualification level sought, including equipment or circumstances that may become hazardous to the occupants. The sponsor may be subject to Occupational Safety and Health Administration requirements.

n. The NSPM administers the objective and subjective tests, which includes an examination of functions. The tests include a qualitative assessment of the simulator by an NSP pilot. The NSP evaluation team leader may assign other qualified personnel to assist in accomplishing the functions examination and/or the objective and subjective tests performed during an evaluation when required.
(1) Objective tests provide a basis for measuring and evaluating simulator performance and determining compliance with the requirements of this part.

(2) Subjective tests provide a basis for:

(a) Evaluating the capability of the FTD to perform over a typical utilization period;

(b) Determining that the FTD satisfactorily simulates each required task;

(c) Verifying correct operation of the FTD controls, instruments, and systems; and

(d) Demonstrating compliance with the requirements of this part.

o. The tolerances for the test parameters listed in attachment 2 of this appendix are the maximum acceptable to the NSPM for FTD validation and are not to be confused with design tolerances specified for FTD manufacture. In making decisions regarding tests and test results, the NSPM relies on the use of operational and engineering judgment in the application of data (including consideration of the way in which the flight test was flown and way the data was gathered and applied) data presentations, and the applicable tolerances for each test.

p. In addition to the scheduled continuing qualification evaluation (see paragraph [check reference]), each FTD is subject to evaluations conducted by the NSPM at any time with no prior notification to the sponsor. Such evaluations would be accomplished in a normal manner (i.e., requiring exclusive use of the FTD for the conduct of objective and subjective tests and an examination of functions) if the FTD is not being used for flightcrew member training, testing, or checking. However, if the FTD were being used, the evaluation would be conducted in a non-exclusive manner. This non-exclusive evaluation will be conducted by the FTD evaluator accompanying the check airman, instructor, Aircrew Program Designee (APD), or FAA inspector aboard the FTD along with the student(s) and observing the operation of the FTD during the training, testing, or checking activities.

q. Problems with objective test results are handled according to the following:
(1) If a problem with an objective test result is detected by the NSP evaluation team during an evaluation, the test may be repeated and/or the QTG may be amended.
(2) If it is determined that the results of an objective test do not support the level requested but do support a lower level, the NSPM may qualify the FTD at that lower level. For example, if a Level 6 evaluation is requested and the FTD fails to meet the Level 6 Spiral Stability test tolerances but does meet the Level 5 tolerances, it could be qualified at Level 5.

r. After the NSPM issues a statement of qualification to the sponsor when an FTD is successfully evaluated, the FTD is recommended to the TPAA, who will exercise authority on behalf of the Administrator in approving the FTD in the appropriate airplane flight training program.

s. Under normal circumstances, the NSPM establishes a date for the initial or upgrade evaluation within 10 working days after determining that a complete QTG is acceptable. Unusual circumstances may warrant establishing an evaluation date before this determination is made; however, once a schedule is agreed to, any slippage of the evaluation date at the sponsor's request may result in a significant delay, perhaps 45 days or more, in rescheduling and completing the evaluation. A sponsor may commit to an initial evaluation date under this early process, in coordination with and the agreement of the NSPM, but the request must be in writing and must include an acknowledgment of the potential schedule impact if the sponsor slips the evaluation from this early-committed date. See Attachment 4, figure 5, of the appendix, Sample Request for Initial Evaluation Date.

t. A convertible FTD is addressed as a separate FTD for each model and series airplane or set of airplanes to which it will be converted and for the FAA qualification level sought. An NSP evaluation is required for each configuration. For example, if a sponsor seeks qualification for two models of an airplane type using a convertible FTD, two QTG's, or a supplemented QTG, and two evaluations are required.

u. The numbering system used for objective test results in the QTG should closely follow the numbering system set out in Attachment 2 of this appendix, FTD Objective Tests.

v. If additional information is needed regarding the preferred qualifications of pilots used to meet the requirements of §60.15(e), the reader should contact the NSPM or visit the NSPM website.

w. Examples of the exclusions for which the FTD might not have been subjectively tested by the sponsor or the NSPM and for which qualification might not be sought or granted, as described in §60.15(h)(6), include windshear training, circling approaches, etc.

End Information

---

12. Additional Qualifications for Currently Qualified FTD's (§ 60.16).

There is no additional regulatory or informational material that applies to § 60.16, Additional Qualifications for a Currently Qualified Simulator.

---

13. Previously Qualified FTDs (§ 60.17).

Begin QPS Requirements

a. In instances where a sponsor plans to remove an FTD from active status for prolonged periods, the following procedures will apply:
(1) The NSPM must be advised in writing and the advisement must include an estimate of the period that the FTD will be inactive;
(2) Continuing Qualification evaluations would not be scheduled during the inactive period;
(3) The NSPM will remove the FTD from the list of qualified FSTD’s on a mutually established date not later than the date on which the first missed continuing qualification evaluation would have been scheduled;
(4) Before the FTD may be restored to qualified status, it will require an evaluation by the NSPM. The evaluation content and time required for accomplishment will be based on the number of continuing qualification evaluations and sponsor-conducted quarterly inspections missed during the period of inactivity. For example, if the FTD were out of service for a 1 year period, it would be necessary to complete the entire QTG, since all of the quarterly evaluations would have been missed;

(5) The sponsor must notify the NSPM of any changes to the original scheduled time out of service;
(6) The FTD will normally be re-qualified using the FAA-approved MQTG and the criteria that was in effect prior to its removal from qualification; however, inactive periods of 2 years or more will require a review of the qualification basis and will likely result in the re-qualification to be against the standards in effect and current at the time of re-qualification.

End QPS Requirements

Begin Information

b. Other certificate holders or persons desiring to use an FTD may contract with FTD sponsors to use those FTDs already qualified at a particular level for an airplane type or set of airplanes and approved for use within an FAA-approved flight training program. Such FTDs are not required to undergo an additional qualification process, except as described in paragraph 12 of this appendix.

c.Each FTD user must obtain approval from the appropriate TPAA to use any FTD in an FAA-approved flight training program.

d. The intent of the requirement listed in § 60.17(b), for each FTD to have a Statement of Qualification within 6 years, is to have the availability of that statement (including the configuration list and the limitations to authorizations) to provide a complete picture of the FTD inventory regulated by the FAA. The issuance of the statement will not require any additional evaluation or require any adjustment to the evaluation basis for the FTD.

e. Downgrading of a FTD is a permanent change in qualification level. If a temporary restriction is placed on a FTD because of a missing, malfunctioning, or inoperative component or some repair is in progress, the restriction is not a permanent change in qualification level and such a temporary restriction can, and is, removed when the reason for the restriction has been resolved. It would be inappropriate to permanently downgrade an FTD and, at some undetermined time in the future, allow that FTD to be returned to its original status (i.e., accomplish an "upgrade") using the original qualification standards.

End Information

---

14. Inspection, Maintenance, and Recurrent Evaluation Requirements (§ 60.19).

Begin QPS Requirement

a. The sponsor must conduct a minimum of four evenly spaced inspections throughout the year. The objective test sequence and content of each inspection in this sequence will be developed by the sponsor and will be acceptable to the NSPM.

b. The description of what constitutes the functional preflight inspection will be contained in the sponsor's QMS.

(c) Record "functional preflight" in the FTD discrepancy log book or other acceptable location, including any item found to be missing, malfunctioning, or inoperative.

End QPS Requirements

Begin Information

d. In determining the acceptability of the sponsor's test sequence and the content of each quarterly inspection required in § 60.19(a)(1), the NSPM looks for a balance and a mix from the performance demonstrations and objective test requirement areas listed as follows:

(1) Performance.

(2) Handling qualities.

(3) Motion system (where appropriate).

(4) Visual system (where appropriate).

(5) Sound system (where appropriate).

(6) Other FTD systems.

e. If the NSP evaluator plans to accomplish specific tests during a normal continuing qqualification that requires the use of special equipment or technicians, the sponsor will be notified as far in advance of the evaluation as practical; but not less than 72 hours. These tests include latencies, control dynamics, sounds and vibrations, motion, and/or some visual system tests.

f. The continuing qualification evaluations described in § 60.19(b), normally will require 4 hours of FTD time. Flexibility is necessary to address those situations that are not normal or those that involve aircraft with additional levels of complexity (e.g. computer controlled aircraft) and may require additional time. The continuing qualification evaluations will consist of the following:

(1) Review of the results of the objective tests and all the designated FTD performance demonstrations (quarterly inspections) conducted by the sponsor since the last scheduled continuing qualification evaluation.

(2) At the discretion of the evaluator, a selection of approximately 8 to 15 objective tests from the MQTG, that will, in the opinion of the evaluator, provide an adequate opportunity to evaluate, first hand, the performance of the FTD. The tests chosen will be performed either automatically or manually, at the discretion of the evaluator and should be able to be conducted within approximately one-third (1/3) of the allotted FTD time.

(3) A subjective evaluation of the FTD to perform a representative sampling of the tasks set out in attachment 3 of this appendix, selected at the discretion of the evaluator. This portion of the evaluation should take approximately two-thirds (2/3) of the allotted FTD time.

(4) An examination of the functions of the FTD, to include, but not necessarily limited to, the motion system, visual system, sound system as applicable, the instructor operating station, and the normal functions and simulated malfunctions of the simulated airplane systems. This examination is normally accomplished simultaneously with the subjective evaluation requirements noted in subparagraph d(3).

g. The requirement established in § 60.19(b)(4) regarding the frequency of NSPM-conducted continuing qualification evaluations for each FTD is typically 12 months. However, the establishment and satisfactory operation of an approved quality management system for a sponsor will provide a basis for adjusting the interval between evaluations on some FTDs at a given sponsor's location to exceed this 12-month interval.

End Information

15.Logging FTD Discrepancies (§ 60.20).

There is no additional regulatory or informational material that applies to § 60.20. Logging Simulator Discrepancies.

16. [Reserved].

17. Modifications to FTDs (§ 60.23).

Begin QPS Requirements

a. The notification described in § 60.23(c)(2) must include a complete description of the planned modification, with a description of the operational and engineering effect the proposed modification will have on the operation of the FTD and the results that are expected with the modification incorporated.

b. Prior to using the modified FTD:

(i) All the applicable objective tests that have been run with the modification incorporated, including any necessary updates to the MQTG must be acceptable to the NSPM; and

(ii) The sponsor must provide the NSPM with a statement signed by the MR that the factors cited in § 60.15(b) are addressed by the appropriate personnel as described in that section.

End QPS Requirements

Begin Information

c. See Attachment 4 for a sample Index of Effective FSTD Directives.

End Information

18. Operation with Missing, Malfunctioning, or Inoperative Components (§ 60.25).

Begin Information

a. Once the sponsor fairly and accurately advises the user of an FTD's current status, including any missing, malfunctioning, or inoperative (MMI) component(s), the sponsor's responsibility with respect to § 60.25(a) will have been satisfied.

b. If the 29^{th} or 30^{th} day of the 30-day period described in § 60.25(b) is on a Saturday, a Sunday, or a holiday, the intent of the FAA is to automatically extend the deadline until the next business day.

c. In accordance with the authorization described in § 60.25(b)**,** the NSPM may find as acceptable a discrepancy prioritizing system wherein the length of time authorized to repair or replace any given MMI component is based on the level of impact on the capability of the FTD to provide the required training, evaluation, or flight experience, with the larger impact on this capability associated with a higher priority for repair or replacement.

End Information

19. Automatic Loss of Qualification and Procedures for Restoration of Qualification (§ 60.27).

Begin Information

If the sponsor provides a plan for how the FTD is to be maintained during its out-of-service period (e.g., periodic exercise of mechanical, hydraulic, and electrical systems; routine replacement of hydraulic fluid; control of the environmental factors in which the FTD is to be maintained, etc.) there is a greater likelihood of being able to determine the amount of testing that would be required for re-qualification.

End Information

20. Other Losses of Qualification and Procedures for Restoration of Qualification (§ 60.29).

Begin Information

If the sponsor provides a plan for how the FTD is to be maintained during its out-of-service period (e.g., periodic exercise of mechanical, hydraulic, and electrical systems; routine replacement of hydraulic fluid; control of the environmental factors in which the FTD is to be maintained, etc.) there is a greater likelihood of being able to determine the amount of testing that would be required for re-qualification.

End Information

21. Recordkeeping and Reporting (§ 60.31).

Begin QPS Requirements

a. The minimally acceptable record of programming changes, as described in § 60.31(a)(2), must consist of the name of the aircraft system software, aerodynamic model, or engine model change, the date of the change, a summary of the change, and the reason for the change.

b. If a coded form for record keeping is used, it must provide for the preservation and retrieval of information with appropriate security or controls to prevent the illegal or inappropriate alteration of such records after the fact.

End QPS Requirements

22. Applications, Logbooks, Reports, and Records: Fraud, Falsification, or Incorrect Statements (§ 60.33).

There are no additional QPS requirements or informational material that apply to § 60.33, Applications, Logbooks, Reports, and Records: Fraud, Falsification, or Incorrect Statements.

23. (Reserved).

24. Levels of FTD.

Begin Information

a. The following is a general description of each level of FTD. Detailed standards and tests for the various levels of FTDs are fully defined in attachments 1 through 3 of this appendix.
(1) Level 4. A device that may have an open, airplane-specific, flight deck area, or an enclosed, airplane-specific cockpit; at least one operating system; and possessing at least air/ground logic (no aerodynamic programming required).
(2) Level 5. A device that may have an open, airplane-specific, flight deck area, or an enclosed, airplane-specific cockpit, with a generic aerodynamic program; at least one operating system; and control loading that as a minimum is representative of the simulated airplane only at an approach speed.
(3) Level 6. A device that has an enclosed, airplane-specific cockpit and aerodynamic program; all airplane systems operating; control loading that is representative of the simulated airplane throughout it's ground and flight envelope; and significant sound representation.

b. Non-visual simulators have been placed into Level 6 for reference purposes. The placement of these unique simulators into this level has not affected the standards or criteria of Level 6 FTDs, nor will these FTDs affect the standards or criteria of these simulators.

End Information

25. [Reserved]

Attachment 1 to Appendix B to Part 60--

General FTD REQUIREMENTS

Begin QPS Requirements

1. Requirements

Certain FTD requirements included in this appendix must be supported with a Statement of Compliance and Capability (SOC) and/or, in some designated cases, an Objective Test. The SOC will describe how the requirement was met. The test results must show that the requirement has been attained. Other requirements are satisfied by either an Objective Test or a Subjective Test. In the following tabular listing, requirements for SOCs and tests are indicated in the "Additional Details" column.

End QPS Requirements

Begin Information

2. Discussion

a.This attachment describes the minimum general requirements for qualifying Level 2 through Level 6 flight training devices (information regarding Level 1 FTDs is found in paragraph 24 in the body of this QPS). To determine the complete requirements for a specific level FTD, the objective tests in attachment 2 and the subjective tests listed in attachment 3 for this QPS must also be consulted.

b.The material contained in this attachment is divided into the following categories:

(1) General Cockpit Configuration.

(2) Programming.

(3) Equipment Operation.

(4) Instructor or Evaluator Facilities.

(5) Motion System.

(6) Visual System

(7) Sound System

End Information

TABLE OF MINIMUM FTD REQUIREMENTS					
QPS REQUIREMENTS					INFORMATION
General FTD Requirements	FTD Level			Additional Details	
	4	5	6		
1. General Cockpit Configuration.					
a. The FTD must have a cockpit that is a full-scale replica of the airplane, or set of airplanes, simulated with controls, equipment, observable cockpit indicators, circuit breakers, and bulkheads properly located, functionally accurate and replicating the airplane or set of airplanes. The direction of movement of controls and switches must be identical to that in the airplane or set of airplanes.			X	Level 3 must be representative of a single set of airplanes, and must have navigation controls, displays, and instrumentation as set out in 14CFR Part 91, §91.33 for operation in accordance with instrument flight rules (IFR). Crewmember seats must afford the capability for the occupant to be able to achieve the design "eye position" for specific airplanes, or to approximate such a position for a generic set of airplanes.	For FTD purposes, the cockpit consists of all that space forward of a cross section of the fuselage at the most extreme aft setting of the pilots' seats including additional, required crewmember duty stations and those required bulkheads aft of the pilot seats. . For clarification, bulkheads containing only items such as landing gear pin storage compartments, fire axes or extinguishers, spare light bulbs, aircraft documents pouches etc., are not considered essential and may be omitted.
b. The FTD must have equipment (i.e., instruments, panels, systems, and controls) simulated sufficiently for the authorized training/checking events to be accomplished. The installed equipment, must be located in a spatially correct configuration, and may be in a cockpit or an open flight deck area. Actuation of this equipment must replicate the appropriate function in the airplane.	X	X		Level 2 must be representative of a single set of airplanes.	
c. Circuit breakers must function accurately when they are involved in operating procedures or malfunctions requiring or involving flight crew response.		X	X	Level 6 devices must have installed circuit breakers properly located in the FTD cockpit.	
2. Programming.					
a. The FTD must provide the proper effect of aerodynamic changes for the combinations of drag and thrust normally encountered in flight. This must include the effect of change in airplane attitude, thrust, drag, altitude, temperature, and configuration.		X	X	Levels 3 and 6 additionally require the effects of change in gross weight and center of gravity. Levels 2, 3, and 5 require only generic aerodynamic programming.	

TABLE OF MINIMUM FTD REQUIREMENTS					
QPS REQUIREMENTS					INFORMATION
General FTD Requirements	FTD Level			Additional Details	
	4	5	6		
b. The FTD must have the computer (analog or digital) capability (i.e., capacity, accuracy, resolution, and dynamic response) needed to meet the qualification level sought.	X	X	X		
c. The FTD hardware and programming must be updated within 6 months of any airplane modifications or data releases (or any such modification or data releases applicable to the set of airplanes) unless, with prior coordination, the NSPM authorizes otherwise.	X	X	X		
d. Relative responses of the cockpit instruments (and the visual and motion systems, if installed and training, testing, or checking credits are being sought) must be coupled closely to provide integrated sensory cues. The instruments (and the visual and motion systems, if installed, and training, testing, or checking credits are being sought) must respond to abrupt input at the pilot's position within the allotted time, but not before the time, when the airplane or set of airplanes would respond under the same conditions. If a visual system is installed and training, testing, or checking credits are sought, the visual scene changes from steady state disturbance must occur within the appropriate system dynamic response limit but not before the instrument response (and not before the motion system onset if a motion system is installed). (1) Latency: The FTD instrument and, if applicable, the motion system and the visual system response must not be prior to that time when the airplane responds and may respond up to 300 milliseconds after that time under the same conditions. (2) Transport Delay: As an alternative to the Latency requirement, above, a transport delay objective test may be used to demonstrate that the FTD system does not exceed the specified limit. The sponsor must measure all the delay encountered by a step signal migrating from the pilot's control through all the simulation software modules in the correct order, using a handshaking protocol, finally through the normal output interfaces to the instrument display and, if applicable, the motion system, and the visual system.		X	X	A demonstration is required and must simultaneously record: the output from the pilot's controller(s); and the output signal to the pilot's attitude indicator. These recordings must be compared to airplane response data in the following configurations: takeoff, cruise, and approach or landing. The results must be recorded in the QTG. Additionally, if a visual system is installed and training, testing, or checking credits are sought, the output signal to the visual system display (including visual system analog delays must be recorded); and if a motion system is installed and training, testing, or checking credits are sought, the output from an accelerometer attached to the motion system platform located at an acceptable location near the pilots' seats is also required.	Latency: The intent is to verify that the FTD provides instrument, and if applicable, motion, and visual cues that are, within the stated time delays, like the airplane responses. For airplane response, acceleration in the appropriate, corresponding rotational axis is preferred. FTD Latency is measured from the start of a control input to the appropriate perceivable change in flight instrument indication; visual system response; or motion system response (this does not include airplane response time as per the manufacturer's data). Transport Delay: The transport delay is the time between the control input and the individual hardware (i.e., instruments, motion system, visual system) responses. If Transport Delay is the chosen method to demonstrate relative responses, it is expected that, when reviewing those existing tests where latency

TABLE OF MINIMUM FTD REQUIREMENTS					
QPS REQUIREMENTS					INFORMATION
General FTD Requirements	**FTD Level**			**Additional Details**	
	4	**5**	**6**		
					can be identified (e.g., short period, roll response, rudder response, etc.) the sponsor and the NSPM will apply additional scrutiny to ensure proper FTD response.
3. Equipment Operation.					
a. All relevant instrument indications involved in the simulation of the airplane (or set of airplanes) must automatically respond to control movement or external disturbances to the simulated airplane or set of airplanes; e.g., turbulence or winds.		**X**	**X**		
b. Navigation equipment must be installed and operate within the tolerances applicable for the airplane or set of airplanes.		**X**	**X**	Level 5 need have only that navigation equipment necessary to fly an instrument approach. Levels 6 must also include communication equipment (inter-phone and air/ground) like that in the airplane, or set of airplanes, and, if appropriate to the operation being conducted, an oxygen mask microphone system.	
c. Installed systems must simulate the applicable airplane (or set of airplanes) system operation, both on the ground and in flight. At least one airplane system must be represented. Systems must be operative to the extent that applicable normal, abnormal, and emergency operating procedures included in the sponsor's training programs can be accomplished.	**X**	**X**	**X**	Level 6 must simulate all applicable airplane flight, navigation, and systems operation. Level 5 must have functional flight and navigational controls, displays, and instrumentation.	
d. The lighting environment for panels and instruments must be sufficient for the operation being conducted.	**X**	**X**	**X**		
e. The FTD must provide control forces and control travel that correspond to the replicated airplane, or set of airplanes. Control forces must react in the same manner as in the airplane, or set of airplanes, under the same flight conditions.			**X**		

TABLE OF MINIMUM FTD REQUIREMENTS					
QPS REQUIREMENTS					INFORMATION
General FTD Requirements	**FTD Level**			**Additional Details**	
	4	**5**	**6**		
f. The FTD must provide control forces and control travel of sufficient precision to manually fly an instrument approach. The control forces must react in the same manner as in the airplane, or set of airplanes, under the same flight conditions.		**X**			
4. Instructor or Evaluator Facilities.					
a. In addition to the flight crewmember stations, suitable seating arrangements for an instructor/check airman and FAA Inspector must be available. These seats must provide adequate view of crewmember's panel(s).	**X**	**X**	**X**		These seats need not be a replica of an aircraft seat and may be as simple as an office chair placed in an appropriate position.
b. The FTD must have instructor controls that permit activation of normal, abnormal, and emergency conditions, as may be appropriate. Once activated, proper system operation must result from system management by the crew and not require input from the instructor controls.	**X**	**X**	**X**		
5. Motion System.					
a. The FTD may have a motion system; if desired, although it is not required.	**X**	**X**	**X**	If installed, the motion system operation may not be distracting. The motion system standards set out in part 60, Appendix A for at least Level A simulators is acceptable.	
6. Visual System.					
a. The FTD may have a visual system; if desired, although it is not required. If a visual system is installed, it must meet the following criteria: (1) Single channel, uncollimated display is acceptable. (2) Minimum field of view: 18° vertical / 24° horizontal for the pilot flying. (3) Maximum paralax error: 10° per pilot. (4) Scene content may not be distracting. (5) Minimum distance from the pilot's eye position to the surface of a direct view display may not be less than the distance to any front panel instrument. (6) Minimum resolution of 5 arc-min. for both computed and displayed pixel size.	**X**	**X**	**X**	A statement of capability is required. A demonstration of latency or through-put is required. Visual system standards set out in part 60, Appendix A, for at least Level A simulators is acceptable. However, if additional authorizations (training, testing, or checking credits) are sought that require the use of a visual system, these standards apply.	.

TABLE OF MINIMUM FTD REQUIREMENTS						
QPS REQUIREMENTS						INFORMATION
General FTD Requirements	**FTD Level**			**Additional Details**		
	4	**5**	**6**			
(7) Maximum latency or through-put must not exceed 300 milliseconds.						
7. Sound System.						
a. The FTD must simulate significant cockpit sounds resulting from pilot actions that correspond to those heard in the airplane.			**X**			

Attachment 2 to Appendix B to Part 60--
FLIGHT TRAINING DEVICE (FTD) OBJECTIVE EVALUATION

1. General

Begin QPS Requirements

a. Test Requirements.

(1) The ground and flight tests required for qualification are listed in the following Table of Objective Tests. Computer generated FTD test results must be provided for each test except where specifically authorized an alternate means by the NSPM. If a flight condition or operating condition is required for the test but which does not apply to the airplane being simulated or to the qualification level sought, it may be disregarded (for example: an engine out missed approach for a single-engine airplane; a maneuver using reverse thrust for an airplane without reverse thrust capability; etc.). Each test result is compared against the validation data described in §60.13, and Paragraph 9 in the main body of this appendix. (See paragraph 1.b. of this attachment for additional information.) Although use of a driver program designed to automatically accomplish the tests is encouraged, each test must be able to be accomplished manually while recording all appropriate parameters. The results must be produced on an appropriate recording device acceptable to the NSPM and must include FTD number, date, time, conditions, tolerances, and appropriate dependent variables portrayed in comparison to the validation data. Time histories are required unless otherwise indicated in the Table of Objective Tests. All results must be labeled using the tolerances and units given.

(2) The Table of Objective Tests in this attachment sets out the test results required, including the parameters, tolerances, and flight conditions for FTD validation. Tolerances are provided for the listed tests because mathematical modeling and acquisition/development of reference data are often inexact. All tolerances listed in the following tables are applied to FTD performance. When two tolerance values are given for a parameter, the less restrictive may be used unless otherwise indicated.

(3) Certain tests included in this attachment must be supported with a Statement of Compliance and Capability (SOC). In the following tabular listing of FTD tests, requirements for SOC's are indicated in the “Test Details” column.

(4) When operational or engineering judgment is used in making assessments for flight test data applications for FTD validity, such judgment must not be limited to a single parameter. For example, data that exhibit rapid variations of the measured parameters may require interpolations or a “best fit” data section. All relevant parameters related to a given maneuver or flight condition must be provided to allow overall interpretation. When it is difficult or impossible to match FTD to airplane data throughout a time history, differences must be justified by providing a comparison of other related variables for the condition being assessed.

(5) It is not sufficient, nor is it acceptable, to program the FTD so that the mathematical modeling is correct only at the validation test points. Unless noted otherwise, tests must represent airplane performance and handling qualities at normal operating weights and centers of gravity (CG). If a test is supported by aircraft data at one extreme weight or CG, another test supported by aircraft data at mid-conditions or as close as possible to the other extreme is necessary. Certain tests that are relevant only at one extreme CG or weight condition need not be repeated at the other extreme. The results of the tests for Levels 3 and 6 are expected to be indicative of the device's performance and handling qualities throughout the following:

(a) the airplane weight and CG envelope;
(b) the operational envelope; and
(c) varying atmospheric ambient and environmental conditions – including the extremes authorized for the respective airplane or set of airplanes.

(6) When comparing the parameters listed to those of the airplane, sufficient data must also be provided to verify the correct flight condition and airplane configuration changes. For example: to show that control force is within ±5 pounds (2.2 daN) in a static stability test, data to show the correct airspeed, power, thrust or torque, airplane configuration, altitude, and other appropriate datum identification parameters must also be given. If comparing short period dynamics, normal acceleration may be used to establish a match to the airplane, but airspeed, altitude,

control input, airplane configuration, and other appropriate data must also be given. If comparing landing gear change dynamics, pitch, airspeed, and altitude may be used to establish a match to the airplane, but landing gear position must also be provided. All airspeed values must be clearly annotated as to indicated, calibrated, etc., and like values used for comparison.

(7) The QTG provided by the sponsor must describe clearly and distinctly how the FTD will be set up and operated for each test. Overall integrated testing of the FTD must be accomplished to assure that the total FTD system meets the prescribed standards; i.e., it is not acceptable to test only each FTD subsystem independently. A manual test procedure with explicit and detailed steps for completion of each test must also be provided.

(8) In those cases where the objective test results authorize a "snapshot test" or a "series of snapshot tests" results in lieu of a time-history result, the sponsor or other data provider must ensure that a steady state condition exists from at least 5 seconds prior to, through at least 2 seconds after, the instant of time captured by the "snapshot."

(9) For previously qualified FTDs, the tests and tolerances of this appendix may be used in subsequent continuing qualification evaluations for any given test providing the sponsor has submitted a proposed MQTG revision to the NSPM and has received NSPM approval.

(10) FTDs are evaluated and qualified with an engine model simulating the airplane data supplier's flight test engine. For qualification of alternative engine models (either variations of the flight test engines or other manufacturer's engines) additional tests with the alternative engine models may be required. Where thrust is more than 5% greater or more than 15% less than that of the flight test engine, flight test data from an airplane equipped with the alternative engine is required. However, if the validation data supplier shows that a thrust increase greater than 5% will not significantly change the airplane's flight characteristics, then flight validation data are not needed. Where the airplane data supplier certifies that the only impact on the FTD model is thrust, and that other variables related to the alternative engine (such as drag and thrust vector) are unchanged or are insignificantly changed, additional FTD tests may be run with the same initial conditions using the thrust from the flight test data as a driven parameter for the alternative engine model.

(11) Tests of handling qualities must include validation of augmentation devices. FTDs for highly augmented airplanes will be validated both in the unaugmented configuration (or failure state with the maximum permitted degradation in handling qualities) and the augmented configuration. Where various levels of handling qualities result from failure states, validation of the effect of the failure is necessary. Requirements for testing will be mutually agreed to between the sponsor and the NSPM on a case-by-case basis.

End QPS Requirements

b. Discussion.

Begin Information

If relevant winds are present in the objective data, the wind vector should be clearly noted as part of the data presentation, expressed in conventional terminology, and related to the runway being used for the test.

End Information

QPS REQUIREMENTS

TEST	TOLERANCE	FLIGHT CONDITIONS	Flight Training Device LEVEL			TEST DETAILS		Information
			4	**5**	**6**			
2. Performance								
a. Takeoff								
(1) Ground Acceleration Time.	±5% Time or ±1 Second	Takeoff			**X**	Record acceleration time for a minimum of 80% of the total segment from brake release to V_r. Preliminary aircraft certification data may be used.		
b. Climb								
(1) Normal Climb	±3 Kts Airspeed, ±5% or ±100 FPM (0.5 Meters/Sec) Climb Rate	All Engines Operating		**X**	**X**	Record results at nominal climb speed and at nominal altitude. Manufacturer's gross climb gradient may be used for flight test data. May be a snapshot test result.		
c. Ground Deceleration								
(1) Deceleration time, using manual application of wheel Brakes; no reverse thrust	±5% time or ±1 Second	Rejected Takeoff Dry Runway			**X**	Record time for at least 80% of the segment from initiation of the Rejected Takeoff to full stop.		
(2) Deceleration time, using reverse thrust and no wheel brakes.	±5% Time, or ±1 Second	Rejected Takeoff Dry Runway			**X**	Record time for at least 80% of the segment from initiation of Rejected Takeoff to full stop.		
d. Engines								
(1) Acceleration	±10% Time	Approach or Landing		**X**	**X**	Record engine power (N_1, N_2, EPR, Torque, etc.) from idle to go-around power for a rapid (slam) throttle movement. Tolerance of ±1 second authorized for Levels 2, 3, and 5.		

QPS REQUIREMENTS								
TEST	**TOLERANCE**	**FLIGHT CONDITIONS**	**Flight Training Device LEVEL**			**TEST DETAILS**		**Information**
			4	**5**	**6**			
(2) Deceleration	±10% Time	Ground/Takeoff		**X**	**X**	Record engine power (N_1, N_2, EPR, Torque, etc.) from Max T/O power to 90% decay of Max T/O power for a rapid (slam) throttle movement. Tolerance of ±1 second authorized for Levels 2, 3, and 5.		
3. Handling Qualities								

Note: For FTDs requiring Static or Dynamic tests at the controls, special test fixtures will not be required during initial or upgrade evaluations if the sponsor's QTG/MQTG shows both test fixture results and the results of an alternative approach, such as computer plots produced concurrently, that show satisfactory agreement. Repeat of the alternative method during the initial or upgrade evaluation would then satisfy this test requirement. Contact the NSPM for clarification of any issue regarding airplanes with reversible controls.

a. Static Control Checks								
(1)(a) Column Position vs. Force and Surface Position Calibration	±2 lbs. (0.9daN) Breakout, ±5 lbs. (2.2 daN) or ±10% Force, ±2° Elevator	Ground			**X**	Record results for an uninterrupted control sweep to the stops. (**CCA:** Position vs. force not required if cockpit controller is installed in the FTD.)		
(1)(b) Column Position vs. Force	±2 lbs. (0.9daN) Breakout, ±5 lbs. (2.2 daN) or ±10% Force	Ground		**X**		Record results for an uninterrupted control sweep to the stops. (**CCA:** Position vs. force not required if cockpit controller is installed in the FTD.)		

TABLE OF OBJECTIVE TESTS

QPS REQUIREMENTS

TEST	TOLERANCE	FLIGHT CONDITIONS	Flight Training Device LEVEL 4	5	6	TEST DETAILS		Information
(2)(a) Wheel Position vs. Force and Surface Position Calibration	±2 lbs. (0.9daN) Breakout, ±3 lbs. (1.34 daN) or ±10% Force, ±1° Aileron, ±2° Spoiler	Ground			X	Record results for an uninterrupted control sweep to the stops. (**CCA:** Position vs. force not required if cockpit controller is installed in the FTD.)		
(2)(b) Wheel Position vs. Force	±2 lbs. (0.9daN) Breakout, ±3 lbs. (1.3 daN) or ±10% Force	Ground		X		Record results for an uninterrupted control sweep to the stops. (**CCA:** Position vs. force not required if cockpit controller is installed in the FTD.)		
(3)(a) Pedal Position vs. Force and Surface Position Calibration.	±5 lbs. (2.2 daN) Breakout; ±5 lbs. (2.2 daN) or ±10% Force, ±2° Rudder	Ground			X	Record results for an uninterrupted control sweep to the stops.		
(3)(b) Pedal Position vs. Force	±5 lbs. (2.2 daN) Breakout; ±5 lbs. (2.2 daN) or ±10% Force	Ground		X		Record results for an uninterrupted control sweep to the stops.		
(4) Nosewheel Steering Force	±2 lbs. (0.9 daN) Breakout; ±3 lbs. (1.3 daN) or ±10% Force	Ground			X			
(5) Rudder Pedal Steering Calibration	±2° Nosewheel Angle	Ground			X			
(6) Pitch Trim Calibration, Indicator vs. Computed.	±0.5° of Computed Trim Angle	Ground			X			

QPS REQUIREMENTS								
TEST	**TOLERANCE**	**FLIGHT CONDITIONS**	**Flight Training Device LEVEL**			**TEST DETAILS**		**Information**
			4	**5**	**6**			
(7) Alignment of Power Lever (or Cross Shaft Angle) vs. Selected Engine Parameter (e.g., EPR, N1, Torque, Manifold Pressure, etc.)	±5° of Power Lever Angle or Cross Shaft Angle or Equivalent	Ground			**X**	Requires recording for all engines. No simulator throttle position may be more than 5° (in either direction) from the airplane throttle position. Also, no simulator throttle position may differ from any other simulator throttle position by more than 5°. Where power levers do not have angular travel, a tolerance of ± 0.8 in (2 cm) applies. In the case of propeller powered airplanes, if a propeller lever is present, it must also be checked. May be a series of snapshot test results.		
(8) Brake Pedal Position vs. Force	±2° Pedal Position, ±5 lbs. (2.2 daN) or 10% Force	Ground			**X**	Two data points are required (zero and maximum deflection). Computer output results may be used to show compliance.		
b. Longitudinal								
(1) Power Change Force	±5 lbs. (2.2 daN) or ±20% Force	Cruise or Approach		**X**	**X**	May be a series of snapshot test results. Power change dynamics will be accepted. (**CCA:** Test in Normal and Non-normal control state.)		
(2) Flap/slat Change Force	±5 lbs. (2.2 daN) or ±20% Force	Takeoff and Approach		**X**	**X**	May be a series of snapshot test results. Flap change dynamics will be accepted. **CCA:** Test in Normal and Non-normal control state.		

TABLE OF OBJECTIVE TESTS								
QPS REQUIREMENTS								
TEST	**TOLERANCE**	**FLIGHT CONDITIONS**	**Flight Training Device LEVEL**			**TEST DETAILS**		**Information**
			4	**5**	**6**			
(3) Gear Change Force	±5 lbs. (2.2 daN) or ±20% Force	Takeoff and Approach		**X**	**X**	May be a series of snapshot test results. Gear change dynamics will be accepted. (**CCA:** Test in Normal and Non-normal control state.)		
(4) Gear and Flap Operating Times	±3 Seconds or ±10% of Time	Takeoff and Approach		**X**	**X**			
(5) Longitudinal Trim	±1° Pitch Control (Stab and Elevator); ±1° Pitch Angle, ±2% Net Thrust or	Cruise, Approach, Landing		**X**	**X**	May be a series of snapshot test results. Levels 2,3, and 5 may use equivalent stick and trim controllers in lieu of stabilizer and elevator. (**CCA:** Test in Normal and Non-normal control state.)		
(6) Longitudinal Maneuvering Stability (Stick Force/g)	±5 lbs. (2.2 daN) or ±10% Column Force or Equivalent Surface position.	Cruise, Approach, Landing			**X**	May be a series of snapshot test results. Force or surface deflection must be in the correct direction. (**CCA:** Test in Normal and Non-normal control state.)		
(7) Longitudinal Static Stability	±5 lbs. (2.2 daN) or ±10% Column Force or Equivalent Surface position.	Approach		**X**	**X**	May be a series of snapshot test results. Level 5 must exhibit positive static stability, but need not comply with the numerical tolerance. (**CCA:** Test in Normal and Non-normal control state.)		
(8) Stall Warning (actuation of stall warning device)	±3 Kts Airspeed, ±2° Bank	Second Segment Climb and Approach or Landing		**X**	**X**			

QPS REQUIREMENTS								Information
TEST	TOLERANCE	FLIGHT CONDITIONS	Flight Training Device LEVEL			TEST DETAILS		Information
			4	5	6			
(9)(a) Phugoid Dynamics	±10% of Period, ±10% of Time to 1/2 Amplitude or ±.02 of Damping Ratio	Cruise			X	Results must include whichever is less of the following: Three (3) full cycles (6 overshoots after the input is completed), or the number of cycles sufficient to determine time to ½ or double amplitude. (**CCA:** Test in Normal and Non-normal control state.)		
(9)(b) Phugoid Dynamics	±10% of Period with Representative Damping	Cruise		X		(**CCA:** Test in Normal and Non-normal control state.)		
(10) Short Period Dynamics	±1.5° Pitch or ± 2°/sec Pitch Rate, ± 0.10g Normal Acceleration.	Cruise			X	(**CCA:** Test in Normal and Non-normal control state.)		
c. Lateral Directional								
(1) Roll Response	±10% or ± 2°/sec Roll Rate	1) Cruise and 2) Approach or Landing		X	X			
(2) Response to Roll Controller Step Input	±10% or ± 2°/sec Roll Rate	Approach or Landing			X	(**CCA:** Test in Normal and Non-normal control state.)		
(3)(a) Spiral Stability	Correct Trend	Cruise		X		(**CCA:** Test in Normal and Non-normal control state.)		
(3)(b) Spiral Stability	Correct Trend, and ±3° of Bank Angle or ±10% at 30 sec.	Cruise			X	Data averaged from multiple tests in same direction may be used. (**CCA:** Test in Normal and Non-normal control state.)		
(4)(a) Rudder Response	±2°/sec, or ±10% Yaw Rate or ±10% Rate of Heading Change for small pitch attitudes.	Approach or Landing			X	(**CCA:** Test in Normal and Non-normal control state.) May be deleted if rudder input and response is shown in Dutch roll test.		

TABLE OF OBJECTIVE TESTS

QPS REQUIREMENTS								
TEST	TOLERANCE	FLIGHT CONDITIONS	Flight Training Device LEVEL			TEST DETAILS		Information
			4	5	6			
(4)(b) Rudder Response	Yaw Rate ±2°/sec, Bank Angle ±3°	Approach or Landing		**X**		May be roll response to a given rudder deflection. (**CCA:** Test in Normal and Non-normal control state.)		
(5)(a) Dutch Roll, Yaw Damper Off.	1) ±10% of Period and 2a) ±10% of Time to 1/2 Amplitude or Double Amplitude, or 2b) ±.02 of Damping Ratio	1) Cruise and 2) Approach or Landing			**X**	Record results for at least 6 cycles with stability augmentation off. (**CCA:** Test in Normal and Non-normal control state.)		
(5)(b) Dutch Roll, Yaw Damper Off.	±10% of Period With Correct Trend and Number of Cycles	1) Cruise and 2) Approach or Landing				(**CCA:** Test in Normal and Non-normal control state.)		
(6) Steady State Sideslip.	For given rudder position; ±2° Bank, ±1° Sideslip, ±10% or ±2° Aileron, ±10% or ±5° Spoiler or Equivalent Wheel Position or Force	Approach or Landing		**X**	**X**	May be a series of snapshot test results. Propeller driven airplanes must test in each direction.		

4. Alternative Objective Data for FTD Level 5.

Begin QPS Requirements

a. This paragraph 5 (including the following tables) is relevant only to FTD Level 5 and is provided due to the fact that this level is required to perform and handle similarly to a set of airplanes having similar performance (normal airspeed/altitude operating envelope), that have similar handling characteristics, and have the same number and type of propulsion systems (engines).

b. The following tables reflect the performance range typical for the stated set of airplanes and may be used without having to acquire flight test data or gather validation data from any other source. However, if the performance of the device does not fall within the established range (according to the following tables) for a specific table entry, and the sponsor has airplane flight test data, acceptable to the NSPM, that matches the performance of the device within the tolerances established in the Table of Objective Tests, this flight test data may be used for that specific table entry requirement. fg

c. The following applies to those wishing to pursue this alternative approach:

(1) The sponsor will submit a complete QTG including the following:

(a) If this alternate source of data method is used, recordings that demonstrate that the performance of the FTD is within the allowable performance range.

(b) Results from the objective tests appropriate to the level of qualification sought.

(2) The QTG test results must include all appropriate parameters for which tolerances are established in the Table of Objective Tests, and must include all relevant information concerning the conditions under which the test was conducted; e.g., gross weight, center of gravity, airspeed, power setting, altitude (climbing, descending, or level), temperature, configuration, and any other parameter that would have an impact on the conduct of the test.

(3) One reviewed and accepted by the NSPM, these test results are the validation data against which the initial and all subsequent recurrent evaluations will be compared. These subsequent evaluations will use the tolerances listed in the Table of Objective Tests.

(4) Subjective testing of the device must be performed to determine that the device performs and handles acceptably like an airplane within the appropriate set of airplanes.

End QPS Requirements

Begin Information

d. The alternative source data contained in the following tables have been derived from a consensus of aviation professionals, including simulator and flight training device manufacturers; pilots and instructors familiar with the various sets of airplanes, and airplane manufacturer's representatives for airplanes fitting the appropriate set of airplanes.

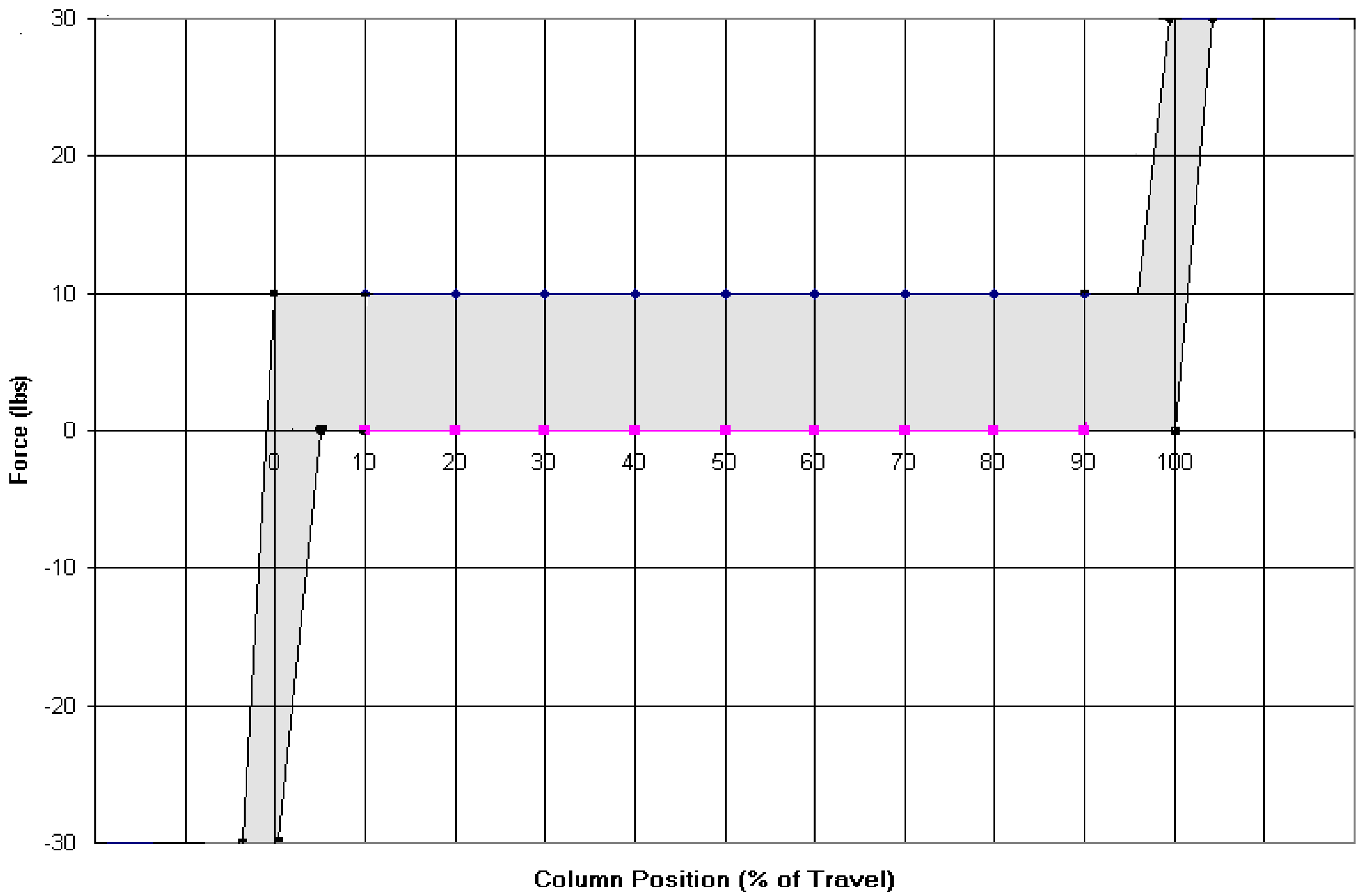
e. The reader is encouraged to consult the Airplane Flight Simulator Evaluation Handbook, Volumes I and II, published by the Royal Aeronautical Society, London, UK, in February 1995 and July 1996, respectively, and FAA Advisory Circulars (AC) 25-7, Flight Test Guide for Certification of Transport Category Airplanes, and (AC) 23-8A, Flight Test Guide for Certification of Part 23 Airplanes, for references and examples regarding flight testing requirements and techniques.

End Information

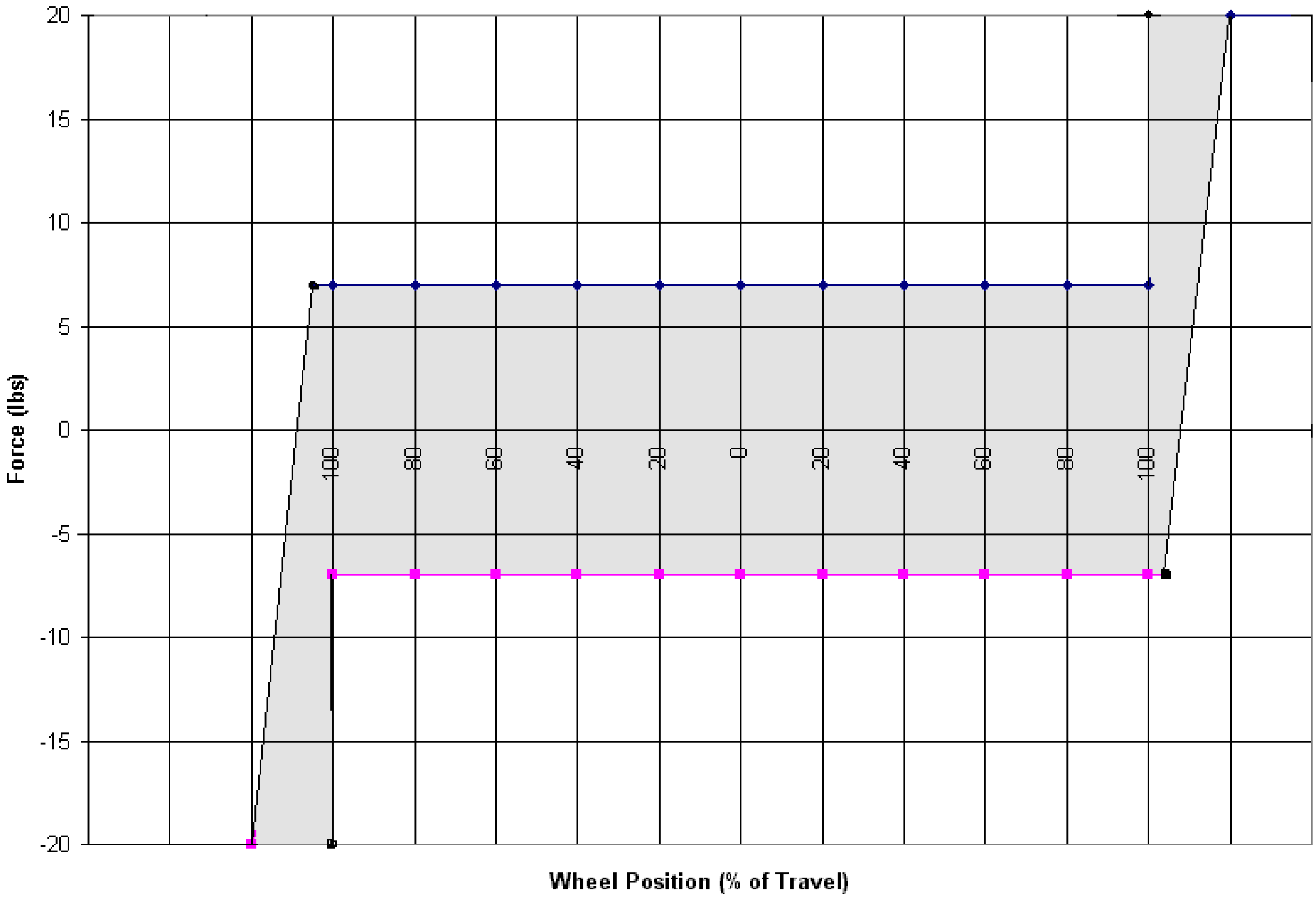
Table of Alternative Source Data FTD Level 5. Small, Single Engine (Reciprocating) Airplane	
QPS REQUIREMENT	
Applicable Test and Test Number	**Authorized Performance Range**
2. Performance	
a. Takeoff.	
(1) Ground acceleration time; brake release to liftoff Speed.	20 - 30 Seconds.
b. Climb.	
(1) Normal climb with nominal gross weight, at best rate-of-climb airspeed.	Climb rate = 500 - 1200 fpm (2.5 - 6 m/sec).
c. Ground Deceleration.	
(1) Deceleration time from 60 knots to zero; with a nominal gross weight; using wheel brakes on a dry runway.	5 - 15 Seconds.
d. Engines.	
(1) Acceleration; idle to takeoff power.	2 - 4 Seconds.
(2) Deceleration; takeoff power to idle.	2 - 4 Seconds.
3. Handling Qualities. **a.** Static Control Checks.	
(1)(b) Column position vs. force.	Plot of Column Position vs. Force must fall within the shaded areas shown in Figure 3 of this attachment (Small, Single Engine Airplanes).
(2)(b) Wheel position vs. force.	Plot of Wheel Position vs. Force must fall within the shaded areas shown in Figure 3a of this attachment (Small, Single Engine Airplanes).
(3)(b) Pedal position vs. force.	Plot of Rudder Pedal Position vs. Force must fall within the shaded areas shown in Figure 3b of this attachment (Small, Single Engine Airplanes).
(4) Nosewheel steering force.	Plot of Rudder Pedal Position vs. Force must fall within the shaded areas shown in Figure 3b of this attachment (Small, Single Engine Airplanes).
(5) Rudder pedal steering calibration with full rudder pedal travel.	10 - 30 degrees of nosewheel angle, both sides of neutral.
(8) Brake pedal position vs. force; at maximum pedal deflection.	30 - 100 lbs (13.2 - 44 daN) of force.
b. Longitudinal.	
(1) Power change force. (a) Trim for straight and level flight at 80% of normal cruise airspeed with necessary power. Reduce power to flight idle. Do not change trim or configuration. After stabilized, record column force necessary to maintain original airspeed. OR (b) Trim for straight and level flight at 80% of normal cruise airspeed with necessary power. Add power to maximum setting. Do not change trim or configuration. After stabilized, record column force necessary to maintain original airspeed.	(a) 5 - 15 lbs (2.2 - 6.6 daN) of force (Pull). (b) 5 - 15 lbs (2.2 - 6.6 daN) of force (Push).
(2) Flap/slat change force.	

Table of Alternative Source Data FTD Level 5. Small, Single Engine (Reciprocating) Airplane	
QPS REQUIREMENT	
Applicable Test and Test Number	**Authorized Performance Range**
(a) Trim for straight and level flight with flaps fully retracted at a constant airspeed within the flaps-extended airspeed range. Do not adjust trim or power. Extend the flaps to 50% of full flap travel. After stabilized, record stick force necessary to maintain original airspeed. OR (b) Trim for straight and level flight with flaps extended to 50% of full flap travel, at a constant airspeed within the flaps-extended airspeed range. Do not adjust trim or power. Retract the flaps to zero. After stabilized, record stick force necessary to maintain original airspeed.	(a) 5 - 15 lbs (2.2 - 6.6 daN) of force (Pull). (b) 5 - 15 lbs (2.2 - 6.6 daN) of force (Push).
(3) Gear change force. (a) Trim for straight and level flight with landing gear retracted at a constant airspeed within the landing gear-extended airspeed range. Do not adjust trim or power. Extend the landing gear. After stabilized, record stick force necessary to maintain original airspeed. OR (b) Trim for straight and level flight with landing gear extended, at a constant airspeed within the landing gear-extended airspeed range. Do not adjust trim or power. Retract the landing gear. After stabilized, record stick force necessary to maintain original airspeed.	(a) 2 - 12 lbs (0.88 - 5.3 daN) of force (Pull). (b) 2 - 12 lbs (0.88 - 5.3 daN) of force (Push).
(4) Gear and flap operating times. (a) Extend gear. (b) Retract gear. (c) Extend flaps, zero to 50% travel. (d) Retract flaps, 50% travel to zero.	(a) 2 - 12 seconds. (b) 2 - 12 seconds. (c) 3 - 13 seconds. (d) 3 - 13 seconds
(5) Longitudinal trim.	Must be able to trim longitudinal stick force to “zero” in each of the following configurations: cruise; approach; and landing.
(7) Longitudinal static stability.	Must exhibit positive static stability.
(8) Stall warning (actuation of stall warning device) with nominal gross weight; wings level; and a deceleration rate of approximately one (1) knot per second. (a) Landing configuration: (b) Clean configuration:	(a) 40 - 60 knots; ± 5° of bank. (b) Landing configuration speed + 10 - 20 percent.

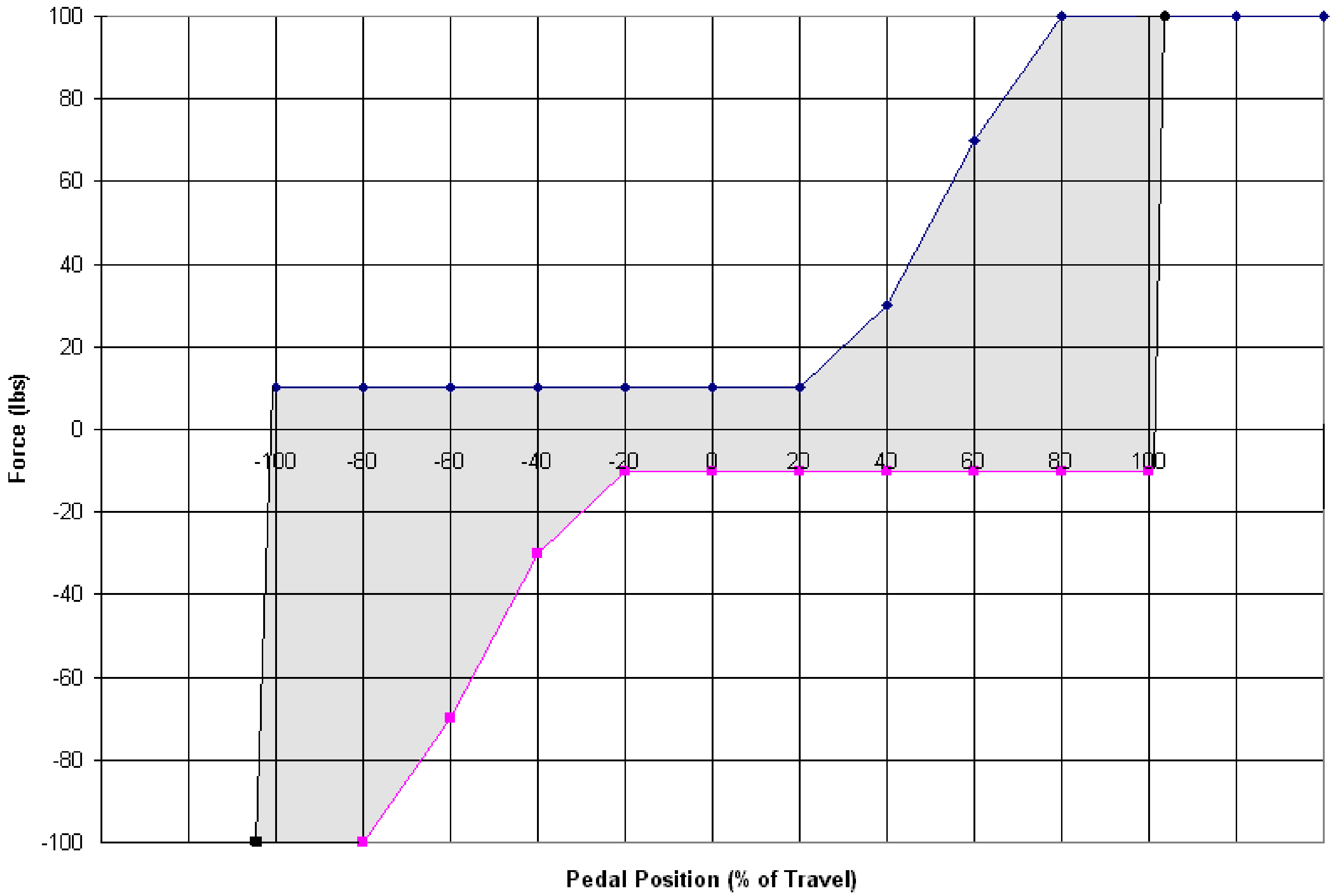
Table of Alternative Source Data FTD Level 5. Small, Single Engine (Reciprocating) Airplane	
QPS REQUIREMENT	
Applicable Test and Test Number	**Authorized Performance Range**
(9)(b) Phugoid dynamics.	Must have a phugoid with a period of 30 - 60 seconds. May not reach ½ or double amplitude in less than 2 cycles.
c. Lateral Directional.	
(1) Roll response. Roll rate must be measured through at least 30 degrees of roll. Aileron control must be deflected 50 percent of maximum travel.	Must have a roll rate of 6 - 40 degrees/second.
(2) Response to roll controller step input. Trim for straight and level flight at nominal gross weight and approach airspeed. Roll into a 30 degree bank turn and stabilize. When ready, input a 50 percent aileron control opposite to the direction of turn. When reaching zero bank angle, rapidly neutralize the aileron control and release. Record the response from at least 2 seconds prior to the initiation of control input opposite to the direction of turn until at least 20 seconds after neutralization of the controls.	Roll rate must decrease to not more than 10 percent of the roll rate achieved, within 1 - 3 seconds of control release.
(3)(a) and (b) Spiral stability. Cruise configuration and normal cruise airspeed. Establish a 20 - 30 degree bank. When stabilized, neutralize the aileron control and release. Must be completed in both directions of turn.	Initial bank angle (± 5 degrees) after 20 seconds.
(4)(b) Rudder response. Use 50 percent of maximum rudder deflection. Applicable to approach or landing configuration	6 - 12 degrees/second yaw rate.
(5)(b) Dutch roll, yaw damper off. Applicable to cruise and approach configurations.	A period of 2 - 5 seconds; and ½ - 2 cycles.
(6) Steady state sideslip. Use 50 percent rudder deflection. Applicable to approach and landing configurations.	2 - 10 degrees of bank; 4 - 10 degrees of sideslip; and 2 -10 degrees of aileron.
4. Cockpit Instrument Response.	
Instrument systems response to an abrupt pilot controller input. One test is required in each axis (pitch, roll, yaw).	300 milliseconds or less.



ATTACHMENT 2 TO APPENDIX B TO PART 60—
FIGURE 3. SMALL SINGLE ENGINE (RECIPROCATING) AIRPLANE
<u>COLUMN POSITION VS. FORCE</u>



ATTACHMENT 2 TO APPENDIX B TO PART 60—
FIGURE 3a. SMALL, SINGLE ENGINE (RECIPROCATING) AIRPLANE
WHEEL POSITION VS. FORCE



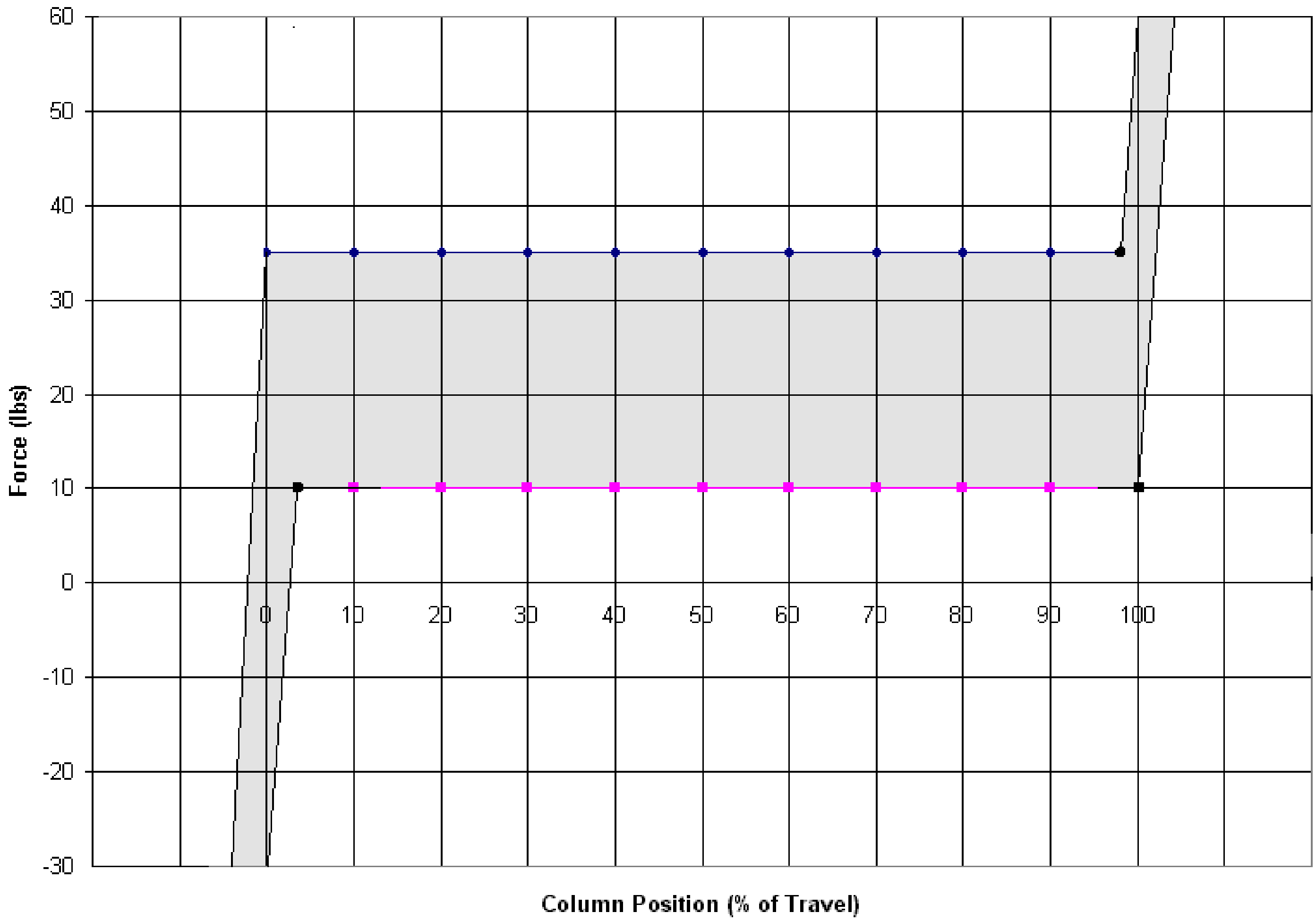
ATTACHMENT 2 TO APPENDIX B TO PART 60—

FIGURE 3b. SMALL, SINGLE ENGINE (RECIPROCATING) AIRPLANE RUDDER PEDAL POSITION VS. FORCE

Table of Alternative Source Data FTD Level 5. Small, Multi-Engine (Reciprocating) Airplane	
QPS REQUIREMENT	
Applicable Test and Test Number	**Authorized Performance Range**
2. Performance	
a. Takeoff.	
(1) Ground acceleration time; brake release to liftoff speed.	20 - 30 Seconds.
b. Climb.	
(1) Normal climb with nominal gross weight, at best rate-of-climb airspeed.	Climb airspeed = 95 -115 knots. Climb rate = 500 - 1500 fpm (2.5 - 7.5 m/sec).
c. Ground Deceleration.	
(1) Deceleration time from 80 knots to zero; with a nominal gross weight; using wheel brakes on a dry runway.	10 - 20 Seconds.
d. Engines.	
(1) Acceleration; idle to takeoff power.	2 - 5 Seconds.
(2) Deceleration; takeoff power to idle.	2 - 5 Seconds.
3. Handling Qualities. **a.** Static Control Checks.	
(1)(b) Column position vs. force.	Plot of Column Position vs. Force must fall within the shaded areas shown in Figure 4, page 29 (Small, Multi-Engine Airplanes).
(2)(b) Wheel position vs. force.	Plot of Wheel Position vs. Force must fall within the shaded areas shown in Figure 5, page 30 (Small, Multi-Engine Airplanes).
(3)(b) Pedal position vs. force.	Plot of Rudder Pedal Position vs. Force must fall within the shaded areas shown in Figure 6, page 31 (Small, Multi-Engine Airplanes).
(4) Nosewheel steering force.	Plot of Rudder Pedal Position vs. Force must fall within the shaded areas shown in Figure 6, page 31 (Small, Multi-Engine Airplanes).
(5) Rudder pedal steering calibration with full rudder pedal travel.	10 - 30 degrees of nosewheel angle, both sides of neutral.
(8) Brake pedal position vs. force; at maximum pedal deflection.	50 - 150 lbs (22 - 66 daN) of force;
b. Longitudinal.	
(1) Power change force. (a) Trim for straight and level flight at 80% of normal cruise airspeed with necessary power. Reduce power to flight idle. Do not change trim or configuration. After stabilized, record column force necessary to maintain original airspeed. OR (b) Trim for straight and level flight at 80% of normal cruise airspeed with necessary power. Add power to maximum setting. Do not change trim or configuration. After stabilized, record column force necessary to maintain original airspeed.	(a) 10 - 25 lbs (2.2 - 6.6 daN) of force (Pull). (b) 5 - 15 lbs (2.2 - 6.6 daN) of force (Push).
(2) Flap/slat change force.	

Table of Alternative Source Data FTD Level 5. Small, Multi-Engine (Reciprocating) Airplane	
QPS REQUIREMENT	
Applicable Test and Test Number	**Authorized Performance Range**
(a) Trim for straight and level flight with flaps fully retracted at a constant airspeed within the flaps-extended airspeed range. Do not adjust trim or power. Extend the flaps to 50% of full flap travel. After stabilized, record stick force necessary to maintain original airspeed. OR (b) Trim for straight and level flight with flaps extended to 50% of full flap travel, at a constant airspeed within the flaps-extended airspeed range. Do not adjust trim or power. Retract the flaps to zero (fully retracted). After stabilized, record stick force necessary to maintain original airspeed.	(a) 5 - 15 lbs (2.2 - 6.6 daN) of force (Pull). (b) 5 - 15 lbs (2.2 - 6.6 daN) of force (Push).
(3) Gear change force. (a) Trim for straight and level flight with landing gear retracted at a constant airspeed within the landing gear-extended airspeed range. Do not adjust trim or power. Extend the landing gear. After stabilized, record stick force necessary to maintain original airspeed. OR (b) Trim for straight and level flight with landing gear extended, at a constant airspeed within the landing gear-extended airspeed range. Do not adjust trim or power. Retract the landing gear. After stabilized, record stick force necessary to maintain original airspeed.	(a) 2 - 12 lbs (0.88 - 5.3 daN) of force (Pull). (b) 2 - 12 lbs (0.88 - 5.3 daN) of force (Push).
(4) Gear and flap operating times. (a) Extend gear. (b) Retract gear. (c) Extend flaps, zero to 50% travel. (d) Retract flaps, 50% travel to zero.	(a) 2 - 12 seconds. (b) 2 - 12 seconds. (c) 3 - 13 seconds. (d) 3 - 13 seconds.
(5) Longitudinal trim.	Must be able to trim longitudinal stick force to "zero" in each of the following configurations: (a) cruise; (b) approach; and (c) landing.
(7) Longitudinal static stability.	Must exhibit positive static stability.
(8) Stall warning (actuation of stall warning device) with nominal gross weight; wings level; clean configuration, and a deceleration	

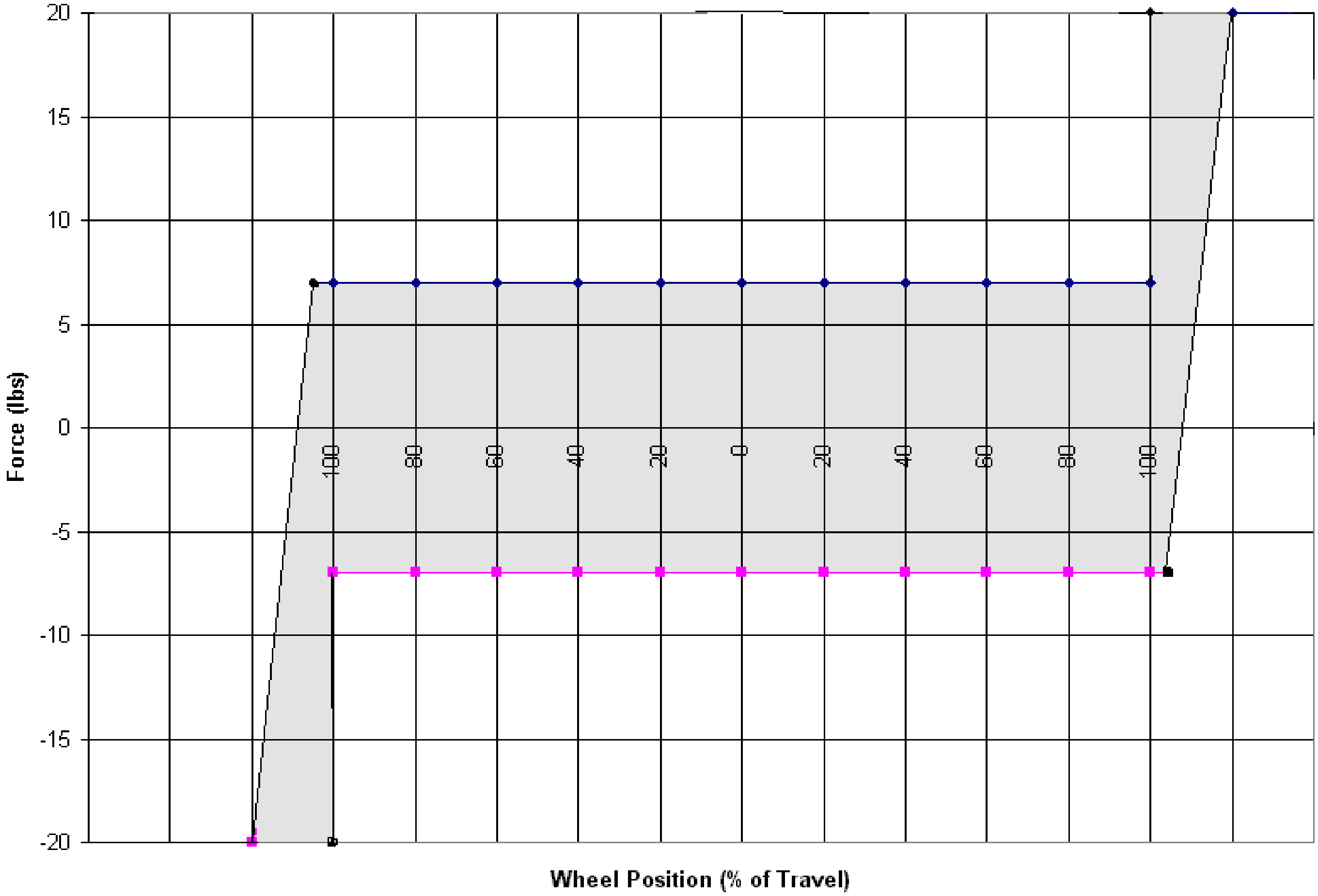
rate of approximately one (1) knot per second. (a) Landing configuration: (b) Clean configuration:	 (a) 60 - 90 knots; ± 5 degrees of bank. (b) Landing configuration speed, + 10 - 20 percent.
(9)(b) Phugoid dynamics.	(a) Must have a phugoid with a period of 30 - 60 seconds. (b) May not reach ½ or double amplitude in less than 2 cycles.
c. Lateral Directional.	
(1) Roll response. Roll rate must be measured through at least 30 degrees of roll. Aileron control must be deflected 50 percent of maximum travel.	Must have a roll rate of 6 - 40 degrees/second.
(2) Response to roll controller step input. Trim for straight and level flight at nominal gross weight and approach airspeed. Roll into a 30 degree bank turn and stabilize. When ready, input a 50 percent aileron control opposite to the direction of turn. When reaching zero bank angle, rapidly neutralize the aileron control and release. Record the response from at least 2 seconds prior to the initiation of control input opposite to the direction of turn until at least 20 seconds after neutralization of the controls.	Roll rate must decrease to not more than 10 percent of the roll rate achieved, within 1 - 3 seconds of control release.
(3)(a) and (b) Spiral stability. Cruise configuration and normal cruise airspeed. Establish a 20 - 30 degree bank. When stabilized, neutralize the aileron control and release. Must be completed in both directions of turn.	Initial bank angle (± 5 degrees) after 20 seconds.
(4)(b) Rudder response. Use 50 percent of maximum rudder deflection. Applicable to approach or landing configuration	6 - 12 degrees/second yaw rate.
(5)(b) Dutch roll, yaw damper off. Applicable to cruise and approach configurations.	(a) A period of 2 - 5 seconds; and ½ - 2 cycles.
(6) Steady state sideslip. Use 50 percent rudder deflection; Applicable to approach and landing configurations.	2 - 10 degrees of bank; 4 - 10 degrees of sideslip; and 2 -10 degrees of aileron.
3. Cockpit Instrument Response.	
Instrument systems response to an abrupt pilot controller input. One test is required in each axis (pitch, roll, yaw).	300 milliseconds or less.



ATTACHMENT 2 TO APPENDIX B TO PART 60—

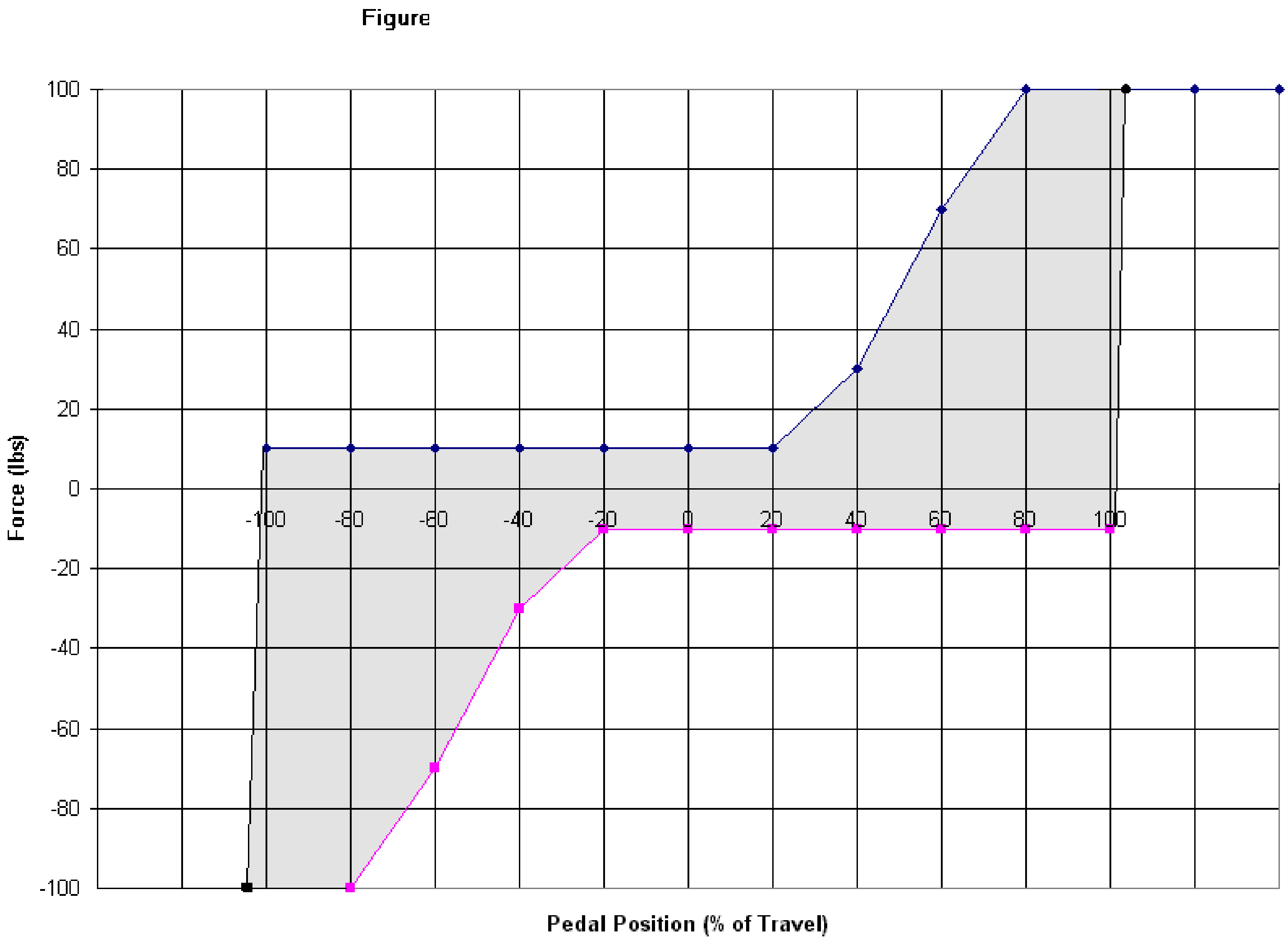
FIGURE 4. SMALL, MULTI-ENGINE (RECIPROCATING) AIRPLANE

COLUMN POSITION VS. FORCE



ATTACHMENT 2 TO APPENDIX B TO PART 60—

FIGURE 5. SMALL, MULTI-ENGINE (RECIPROCATING) AIRPLANE WHEEL POSITION VS. FORCE



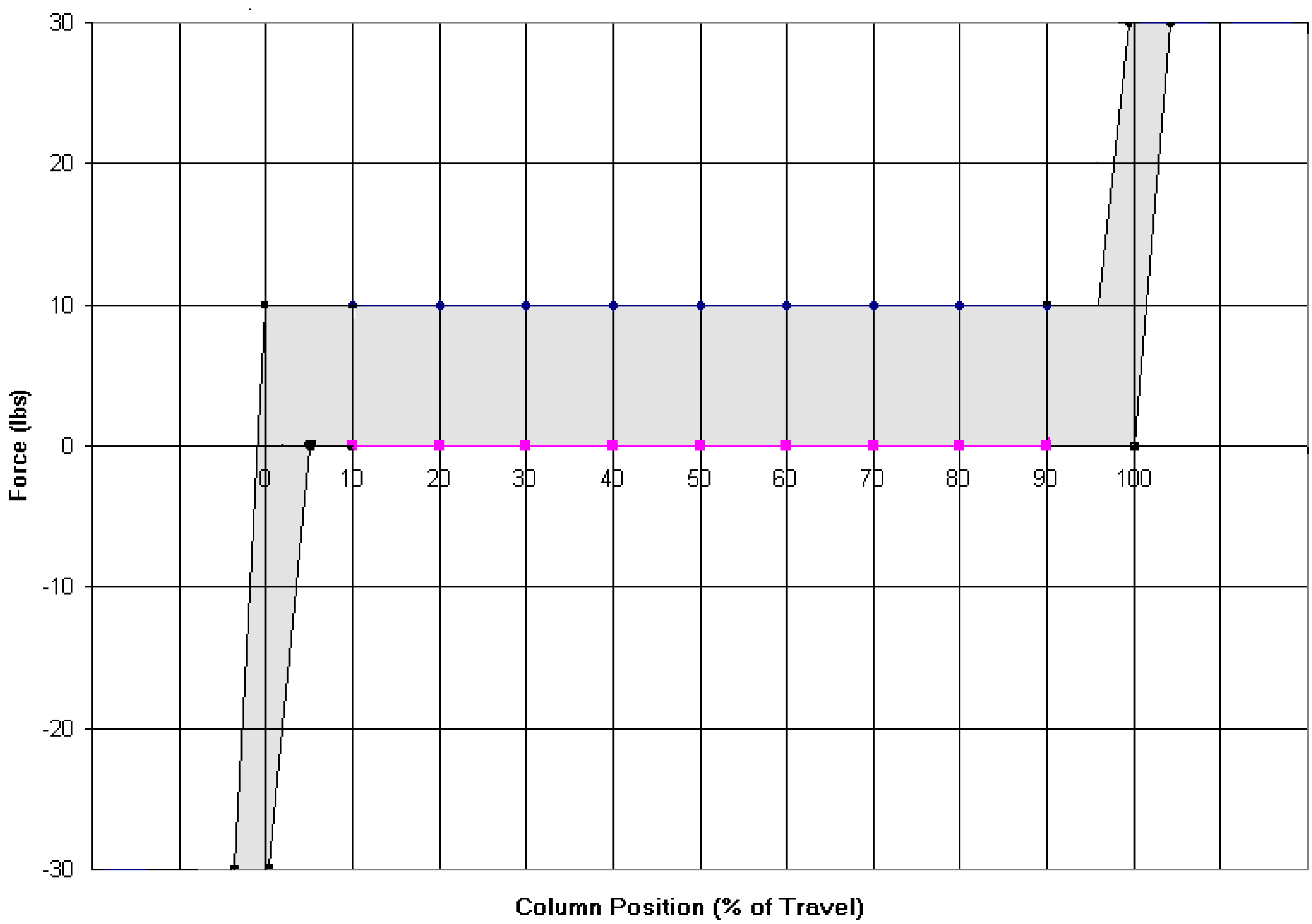
ATTACHMENT 2 TO APPENDIX B TO PART 60—

FIGURE 6. SMALL, MULTI-ENGINE (RECIPROCATING) AIRPLANE RUDDER PEDAL POSITION VS. FORCE

Table of Alternative Source Data FTD Level 5. Single Engine (Turbo-Propeller) Airplane	
QPS REQUIREMENT	
Applicable Test and Test Number	**Authorized Performance Range**
2. Performance	
a. Takeoff.	
(1) Ground acceleration time; brake release to liftoff speed.	20 - 30 Seconds.
b. Climb.	
(1) Normal climb with nominal gross weight, at best rate-of-climb airspeed.	Climb airspeed = 95 -115 knots. Climb rate = 800 - 1800 fpm (4 – 9 m/sec).
c. Ground Deceleration.	
(1) Deceleration time from 80 knots to zero; with a nominal gross weight; using wheel brakes on a dry runway.	20 - 35 Seconds.
d. Engines.	
(1) Acceleration; idle to takeoff power.	4 - 8 Seconds.
(2) Deceleration; takeoff power to idle.	3 - 7 Seconds.
3. Handling Qualities. **a.** Static Control Checks.	
(1)(b) Column position vs. force.	Plot of Column Position vs. Force must fall within the shaded areas shown in Figure 7 of this appendix (Single Engine [Turbo-Propeller] Airplanes).
(2)(b) Wheel position vs. force.	Plot of Wheel Position vs. Force must fall within the shaded areas shown in Figure 8 of this appendix (Single Engine [Turbo-Propeller] Airplanes)
(3)(b) Pedal position vs. force.	Plot of Rudder Pedal Position vs. Force must fall within the shaded areas shown in Figure 9 of this appendix (Single Engine [Turbo-Propeller] Airplanes)
(4) Nosewheel steering force.	Plot of Rudder Pedal Position vs. Force must fall within the shaded areas shown in Figure 9 of this appendix (Single Engine [Turbo-Propeller] Airplanes)
(5) Rudder pedal steering calibration with full rudder pedal travel.	10 - 30 degrees of nosewheel angle, both sides of neutral.
(8) Brake pedal position vs. force; at maximum pedal deflection.	50 - 100 lbs (22 - 44 daN) of force;
b. Longitudinal.	
(2) Power change force. (a) Trim for straight and level flight at 80% of normal cruise airspeed with necessary power. Reduce power to flight idle. Do not change trim or configuration. After stabilized, record column force necessary to maintain original airspeed. OR (b) Trim for straight and level flight at 80% of normal cruise airspeed with necessary power. Add power to maximum setting. Do not change trim or configuration. After stabilized, record column force necessary to maintain original airspeed.	(a) 8 lbs (3.5 daN) of Push force to 8 lbs (3.5 daN) of Pull force. (b) 12-22 lbs (5.3 – 9.7 daN) of force (Push).
(3) Flap/slat change force. (a) Trim for straight and level flight with flaps fully retracted at a constant airspeed within the flaps-extended airspeed range. Do	(a) 5 - 15 lbs (2.2 - 6.6 daN) of force (Pull).

Table of Alternative Source Data FTD Level 5. Single Engine (Turbo-Propeller) Airplane	
QPS REQUIREMENT	
Applicable Test and Test Number	**Authorized Performance Range**
not adjust trim or power. Extend the flaps to 50% of full flap travel. After stabilized, record stick force necessary to maintain original airspeed. OR (b) Trim for straight and level flight with flaps extended to 50% of full flap travel, at a constant airspeed within the flaps-extended airspeed range. Do not adjust trim or power. Retract the flaps to zero (fully retracted). After stabilized, record stick force necessary to maintain original airspeed.	(b) 5 - 15 lbs (2.2 - 6.6 daN) of force (Push).
(4) Gear change force. (a) Trim for straight and level flight with landing gear retracted at a constant airspeed within the landing gear-extended airspeed range. Do not adjust trim or power. Extend the landing gear. After stabilized, record stick force necessary to maintain original airspeed. OR (b) Trim for straight and level flight with landing gear extended, at a constant airspeed within the landing gear-extended airspeed range. Do not adjust trim or power. Retract the landing gear. After stabilized, record stick force necessary to maintain original airspeed.	(a) 2 - 12 lbs (0.88 - 5.3 daN) of force (Pull). (b) 2 - 12 lbs (0.88 - 5.3 daN) of force (Push).
(5) Gear and flap operating times. (a) Extend gear. (e) Retract gear. (f) Extend flaps, zero to 50% travel. (g) Retract flaps, 50% travel to zero.	(a) 2 - 12 seconds. (b) 2 - 12 seconds. (c) 3 - 13 seconds. (d) 3 - 13 seconds.
(6) Longitudinal trim.	Must be able to trim longitudinal stick force to "zero" in each of the following configurations: (d) cruise; (e) approach; and (f) landing.
(7) Longitudinal static stability.	Must exhibit positive static stability.
(9) Stall warning (actuation of stall warning device) with nominal gross weight; wings level; clean configuration, and a deceleration rate of approximately one (1) knot per second. (c) Landing configuration: (d) Clean configuration:	(c) 60 - 90 knots; ± 5 degrees of bank. (d) Landing configuration speed, + 10 - 20 percent.

Table of Alternative Source Data FTD Level 5. Single Engine (Turbo-Propeller) Airplane	
QPS REQUIREMENT	
Applicable Test and Test Number	**Authorized Performance Range**
(9)(b) Phugoid dynamics.	(a) Must have a phugoid with a period of 30 - 60 seconds. (b) May not reach ½ or double amplitude in less than 2 cycles.
c. Lateral Directional.	
(2) Roll response. Roll rate must be measured through at least 30 degrees of roll. Aileron control must be deflected 50 percent of maximum travel.	Must have a roll rate of 6 - 40 degrees/second.
(2) Response to roll controller step input. Trim for straight and level flight at nominal gross weight and approach airspeed. Roll into a 30 degree bank turn and stabilize. When ready, input a 50 percent aileron control opposite to the direction of turn. When reaching zero bank angle, rapidly neutralize the aileron control and release. Record the response from at least 2 seconds prior to the initiation of control input opposite to the direction of turn until at least 20 seconds after neutralization of the controls.	Roll rate must decrease to not more than 10 percent of the roll rate achieved, within 1 - 3 seconds of control release.
(3)(a) and (b) Spiral stability. Cruise configuration and normal cruise airspeed. Establish a 20 - 30 degree bank. When stabilized, neutralize the aileron control and release. Must be completed in both directions of turn.	Initial bank angle (± 5 degrees) after 20 seconds.
(4)(b) Rudder response. Use 50 percent of maximum rudder deflection. Applicable to approach or landing configuration	6 - 12 degrees/second yaw rate.
(5)(b) Dutch roll, yaw damper off. Applicable to cruise and approach configurations.	A period of 2 - 5 seconds; and ½ - 3 cycles.
(7) Steady state sideslip. Use 50 percent rudder deflection; Applicable to approach and landing configurations.	2 - 10 degrees of bank; 4 - 10 degrees of sideslip; and 2 -10 degrees of aileron.
4. Cockpit Instrument Response.	
Instrument systems response to an abrupt pilot controller input. One test is required in each axis (pitch, roll, and yaw).	300 milliseconds or less.

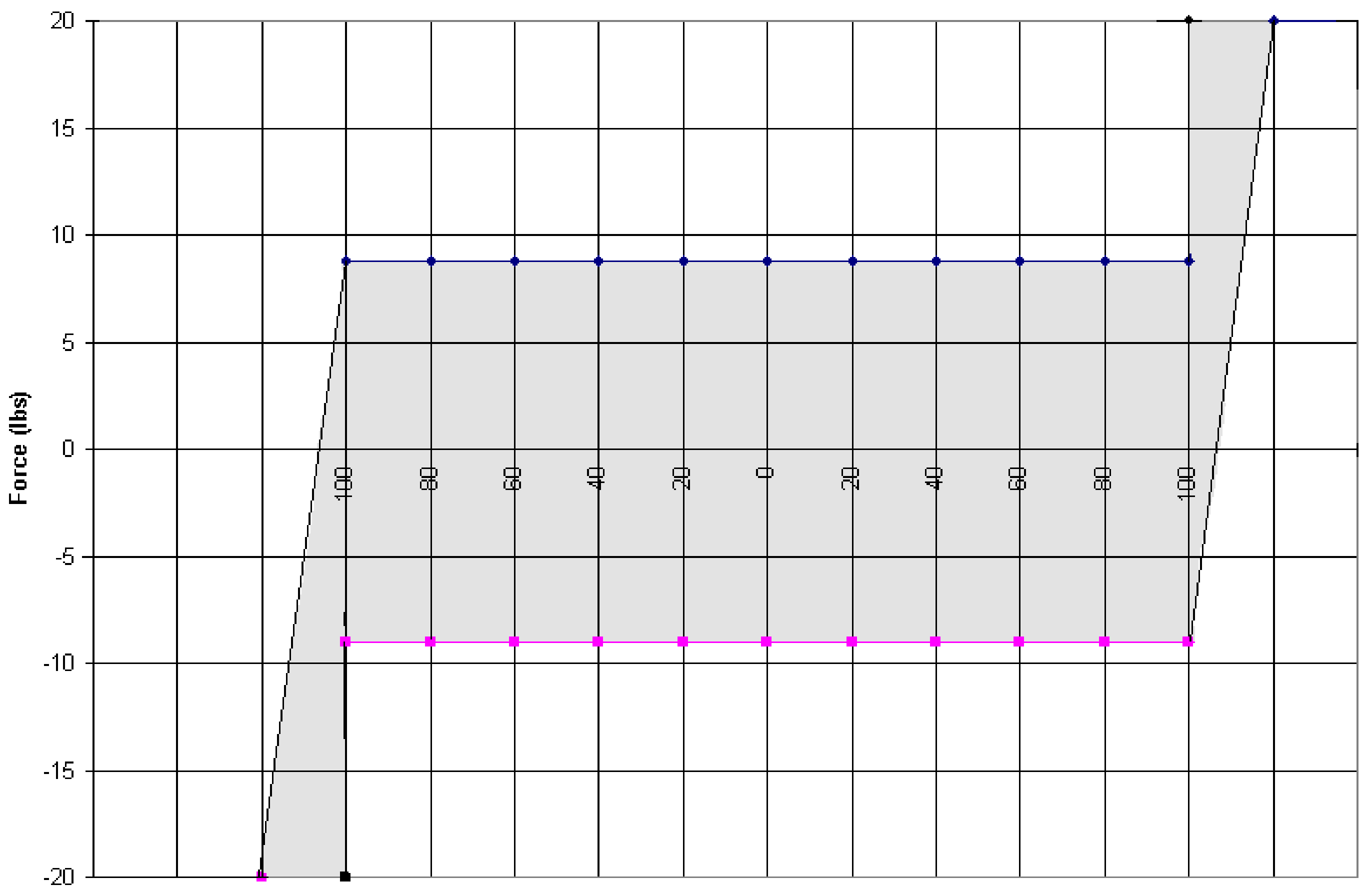


ATTACHMENT 2 TO APPENDIX B TO PART 60—

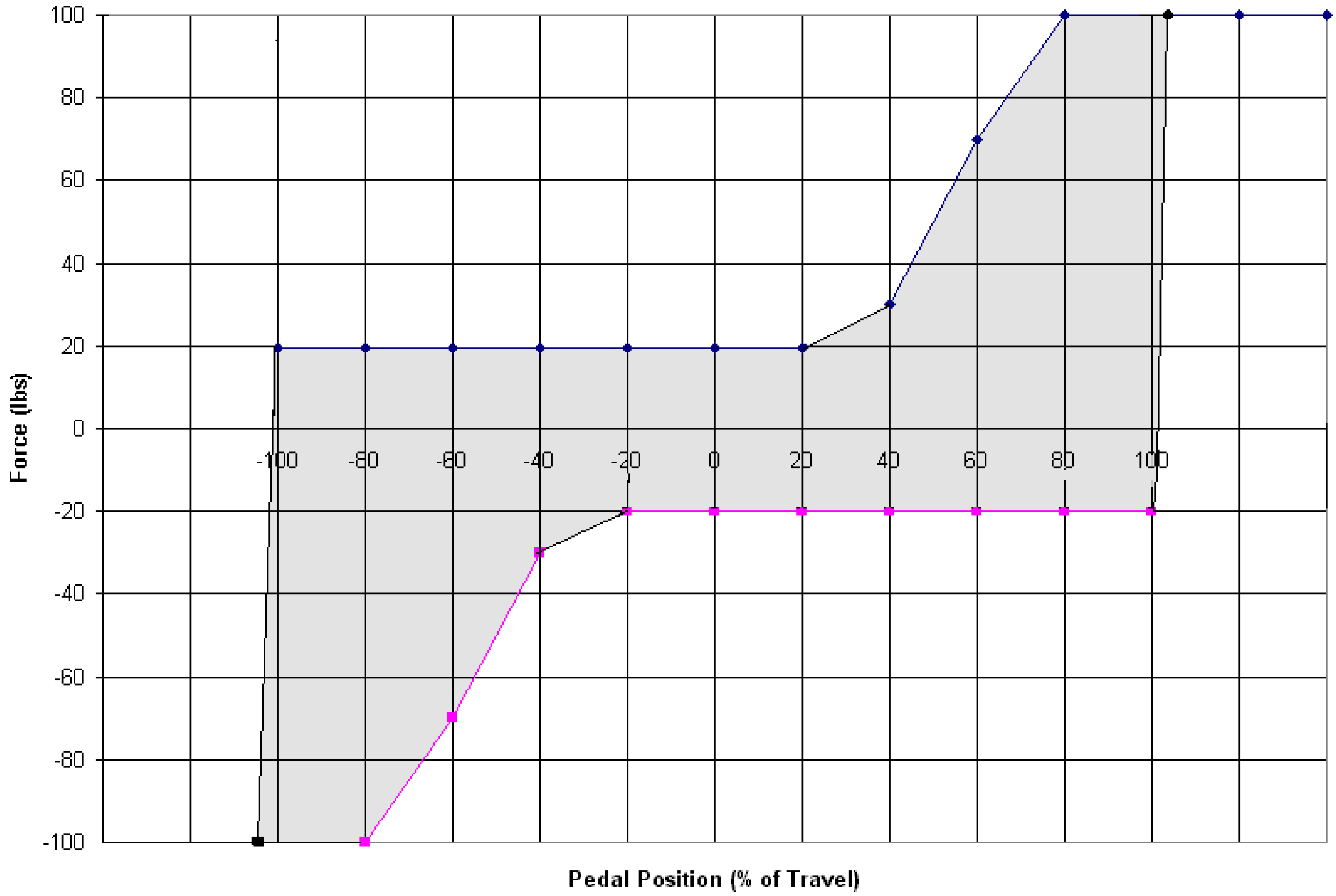
FIGURE 7. SINGLE ENGINE TURBO-PROPELLER AIRPLANE

COLUMN POSITION VS. FORCE

Figure 8. Single Engine Turbo-Propeller Airplane
Wheel Position vs. Force



ATTACHMENT 2 TO APPENDIX B TO PART 60—
<u>FIGURE 8. SINGLE ENGINE TURBO-PROPELLER AIRPLANE</u>
WHEEL POSITION VS. FORCE



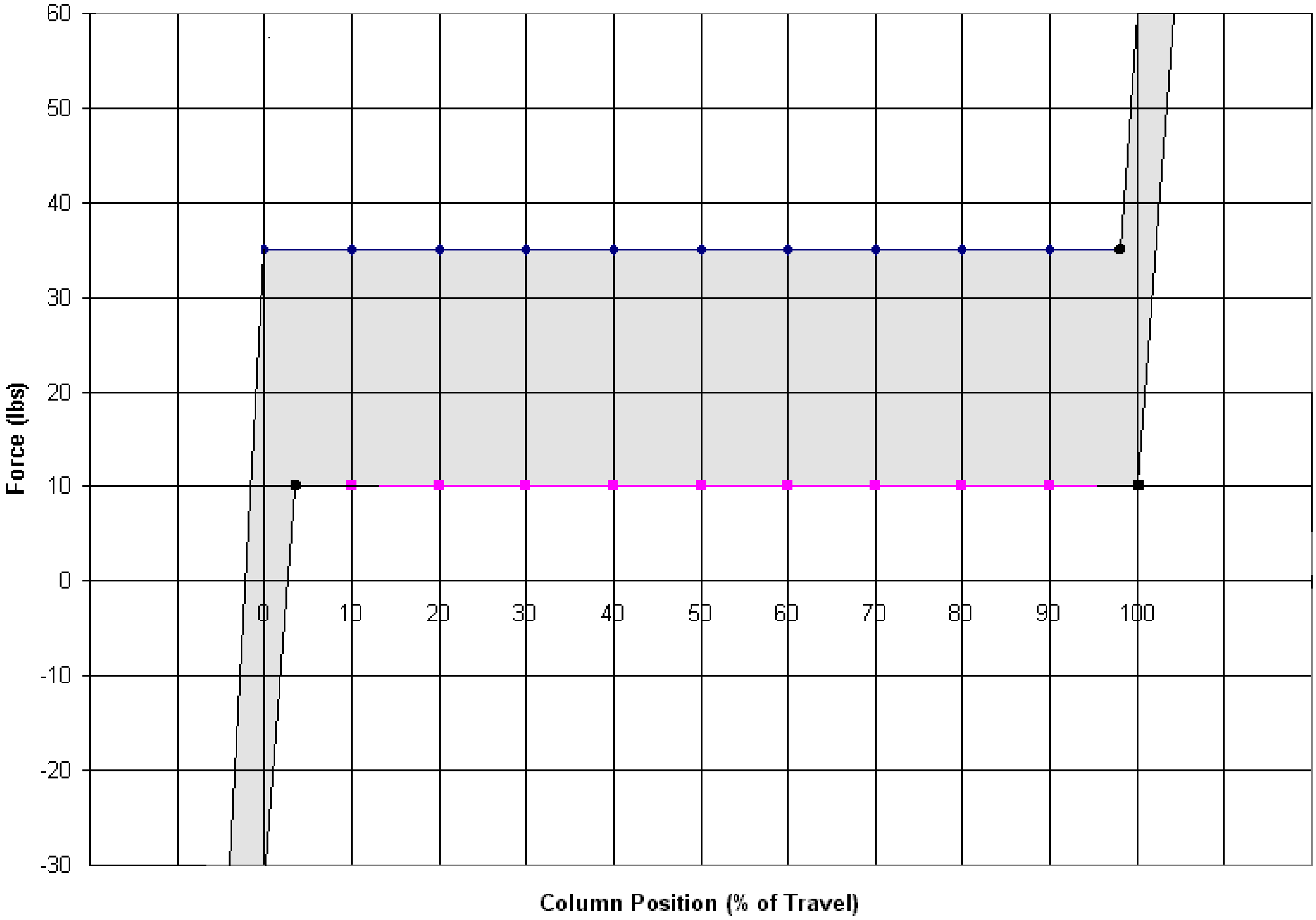
ATTACHMENT 2 TO APPENDIX B TO PART 60—

FIGURE 9. SINGLE ENGINE TURBO-PROPELLER AIRPLANE
RUDDER PEDAL POSITION VS. FORCE

Table of Alternative Source Data FTD Level 5. Multi Engine (Turbo-Propeller) Airplanes ≤ 19,000 Pounds	
QPS REQUIREMENT	
Applicable Test and Test Number	**Authorized Performance Range**
2. Performance	
a. Takeoff.	
(1) Ground acceleration time; brake release to liftoff speed.	20 - 30 Seconds.
b. Climb.	
(1) Normal climb with nominal gross weight, at best rate-of-climb airspeed	Climb airspeed: 120 -140 knots; Climb rate; 1000 - 3000 fpm (5 - 15 m/sec)
c. Ground Deceleration.	
(1) Deceleration time from 90 knots to zero; with a nominal gross weight; using wheel brakes on a dry runway.	20 - 35 Seconds.
d. Engines.	
(1) Acceleration; idle to takeoff power.	2 - 6 Seconds.
(2) Deceleration; takeoff power to idle.	1 - 5 Seconds.
3. Handling Qualities. **a.** Static Control Checks.	
(1)(b) Column position vs. force.	Plot of Column Position vs. Force must fall within the shaded areas shown in Figure 10 of this appendix (Multi-Engine Turbo-Propeller Airplanes).
(2)(b) Wheel position vs. force.	Plot of Wheel Position vs. Force must fall within the shaded areas shown in Figure 11 of this appendix (Multi-Engine Turbo-Propeller Airplanes).
(3)(b) Pedal position vs. force.	Plot of Rudder Pedal Position vs. Force must fall within the shaded areas shown in Figure 12 of this appendix (Multi-Engine Turbo-Propeller Airplanes).
(4) Nosewheel steering force.	Plot of Rudder Pedal Position vs. Force must fall within the shaded areas shown in Figure 12 of this appendix (Multi-Engine Turbo-Propeller Airplanes).
(5) Rudder pedal steering calibration with full rudder pedal travel.	10 - 30 degrees of nosewheel angle, both sides of neutral.
(8) Brake pedal position vs. force; at maximum pedal deflection.	50 - 150 lbs (22 - 66 daN) of force.
b. Longitudinal.	
(1) Power change force. (a) Trim for straight and level flight at 80% of normal cruise airspeed with necessary power. Reduce power to flight idle. Do not change trim or configuration. After stabilized, record column force necessary to maintain original airspeed. OR (b) Trim for straight and level flight at 80% of normal cruise airspeed with necessary power. Add power to maximum setting. Do not change trim or configuration. After stabilized, record column force necessary to maintain original airspeed.	(a) 8 lbs (3.5 daN) of Push force to 8 lbs (3.5 daN) of Pull force. (b) 12 - 22 lbs (5.3 - 9.7 daN) of force (Push).
(2) Flap/slat change force. (a) Trim for straight and level flight with flaps fully retracted at a	(a) 5 - 15 lbs (2.2 - 6.6 daN) of force (Pull).

Table of Alternative Source Data FTD Level 5. Multi Engine (Turbo-Propeller) Airplanes ≤ 19,000 Pounds	
QPS REQUIREMENT	
Applicable Test and Test Number	**Authorized Performance Range**
constant airspeed within the flaps-extended airspeed range. Do not adjust trim or power. Extend the flaps to 50% of full flap travel. After stabilized, record stick force necessary to maintain original airspeed. OR (b) Trim for straight and level flight with flaps extended to 50% of full flap travel, at a constant airspeed within the flaps-extended airspeed range. Do not adjust trim or power. Retract the flaps to zero (fully retracted). After stabilized, record stick force necessary to maintain original airspeed.	(b) 5 - 15 lbs (2.2 - 6.6 daN) of force (Push).
(3) Gear change force. (a) Trim for straight and level flight with landing gear retracted at a constant airspeed within the landing gear-extended airspeed range. Do not adjust trim or power. Extend the landing gear. After stabilized, record stick force necessary to maintain original airspeed. OR (b) Trim for straight and level flight with landing gear extended, at a constant airspeed within the landing gear-extended airspeed range. Do not adjust trim or power. Retract the landing gear. After stabilized, record stick force necessary to maintain original airspeed.	(a) 2 - 12 lbs (0.88 - 5.3 daN) of force (Pull). (b) 2 - 12 lbs (0.88 - 5.3 daN) of force (Push).
(4) Gear and flap operating times. (a) Extend gear. (b) Retract gear. (c) Extend flaps, zero to 50% travel. (d) Retract flaps, 50% travel to zero.	(a) 2 - 12 seconds. (b) 2 - 12 seconds. (c) 3 - 13 seconds. (d) 3 - 13 seconds.
(5) Longitudinal trim.	Must be able to trim longitudinal stick force to “zero” in each of the following configurations: (a) cruise; (b) approach; and (c) landing.
(7) Longitudinal static stability.	Must exhibit positive static stability.
(8) Stall warning (actuation of stall warning device) with nominal gross weight; wings level; clean configuration, and a deceleration rate of approximately one (1) knot per second. (a) Landing configuration:	

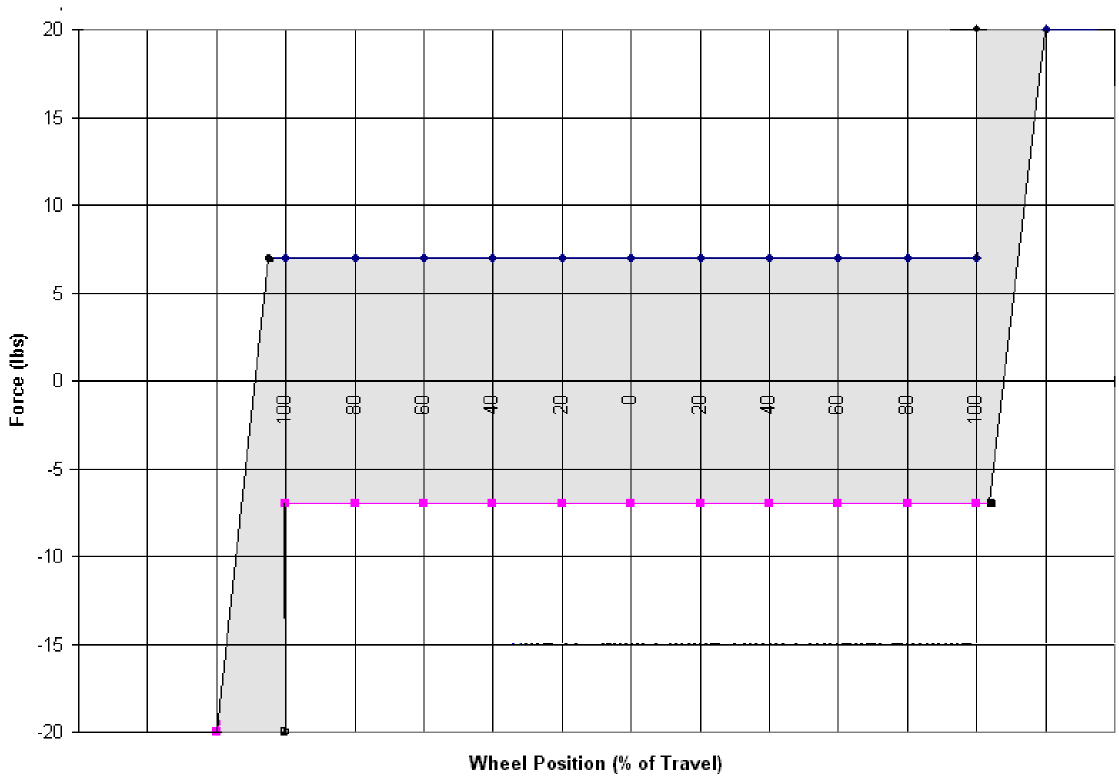
Table of Alternative Source Data FTD Level 5. Multi Engine (Turbo-Propeller) Airplanes ≤ 19,000 Pounds	
QPS REQUIREMENT	
Applicable Test and Test Number	**Authorized Performance Range**
(b) Clean configuration:	(a) 80 - 100 knots; ± 5 degrees of bank. (b) Landing configuration speed + 10 -20 percent.
(9)(b) Phugoid dynamics.	(a) Must have a phugoid with a period of 30 - 60 seconds. (b) May not reach ½ or double amplitude in less than 2 cycles.
c. Lateral Directional.	
(1) Roll response. (a) Roll rate must be measured through at least 30 degrees of roll. Aileron control must be deflected 50 percent of maximum travel.	Must have a roll rate of 6 - 40 degrees/second.
(2) Response to roll controller step input. Trim for straight and level flight at nominal gross weight at approach airspeed. Roll into a 30 degree band turn and stabilize. When ready, input a 50 percent aileron control opposite the direction of turn. When reaching zero bank angle, rapidly neutralize the aileron control and release. Record the response from at least 2 seconds prior to initiation of control input at least 20 seconds after neutralization of the controls.	Roll rate must decrease to not more than 10 percent of the roll rate achieved, and must do so within 1 -3 seconds.
(3)(a) and (b) Spiral stability. Cruise configuration and normal cruise airspeed. Establish a 20 - 30 degree bank. When stabilized, neutralize the aileron control and release. (Must be completed in both directions of turn)	Initial bank angle (± 5 degrees) after 20 seconds.
(4)(b) Rudder response. Use 50 percent of maximum rudder deflection. Applicable to approach or landing configuration.	6 - 12 degrees/second yaw rate.
(5)(b) Dutch roll, yaw damper off. Applicable to cruise and approach configurations.	(a) A period of 2 - 5 seconds; and (b) ½ - 3 cycles.
(6) Steady state sideslip. Use 50 percent rudder deflection. Applicable to approach and landing configurations.	(a) 2 - 10 degrees of bank; (b) 4 - 10 degrees of sideslip; and (c) 2 -10 degrees of aileron.
4. Cockpit Instrument Response.	
Instrument systems response to an abrupt pilot controller input. One test is required in each axis (pitch, roll, yaw).	300 milliseconds or less.



ATTACHMENT 2 TO APPENDIX B TO PART 60—

FIGURE 10. MULTI-ENGINE TURBO-PROPELLER AIRPLANE

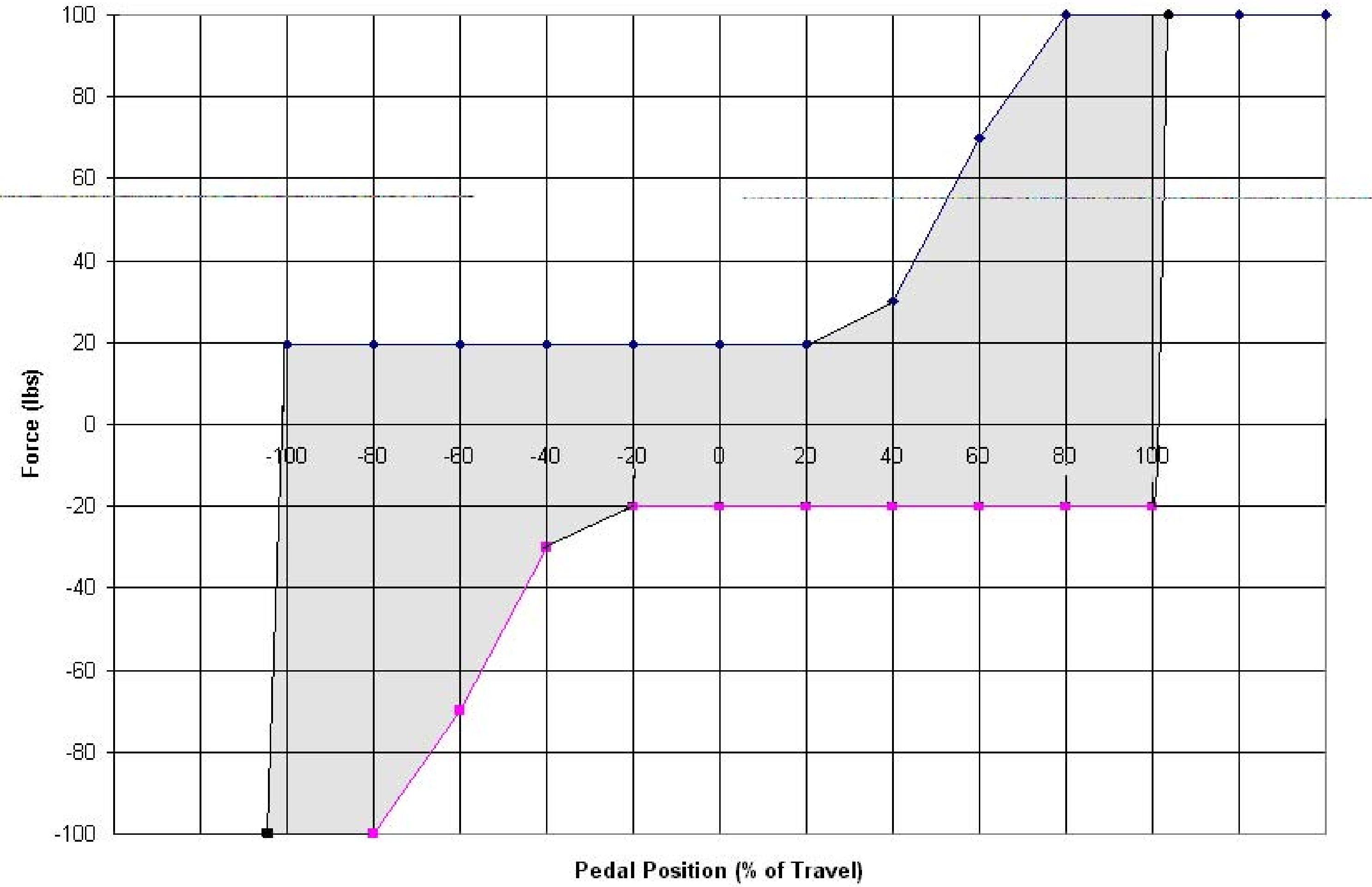
COLUMN POSITION VS. FORCE



ATTACHMENT 2 TO APPENDIX B TO PART 60—

FIGURE 11. MULTI-ENGINE TURBO-PROPELLER AIRPLANE

WHEEL POSITION VS. FORCE



ATTACHMENT 2 TO APPENDIX B TO PART 60—

FIGURE 12. MULTI-ENGINE TURBO-PROPELLER AIRPLANE

RUDDER PEDAL POSITION VS. FORCE

6. Alternative Data Sources, Procedures, and Instrumentation: Level 6 FTD Only

Begin Information

a. In recent years, considerable progress has been made by highly experienced aircraft and FTD manufacturers in improvement of aerodynamic modeling techniques. In conjunction with increased accessibility to very high powered computer technology, these techniques have become quite sophisticated. Additionally, those who have demonstrated success in combining these modeling techniques with minimal flight testing have incorporated the use of highly mature flight controls models and have had extensive experience in comparing the output of their effort with actual flight test data - and they have been able to do so on an iterative basis over a period of years.

b. It has become standard practice for experienced FTD manufacturers to use such techniques as a means of establishing data bases for new FTD configurations while awaiting the availability of actual flight test data; and then comparing this new data with the newly available flight test data. The results of such comparisons have, as reported by some recognized and experienced simulation experts, become increasingly consistent and indicate that these techniques, applied with appropriate experience, are becoming dependably accurate for the development of aerodynamic models for use in Level 6 FTDs.

c. In reviewing this history, the NSPM has concluded that, with proper care, those who are experienced in the development of aerodynamic models for FTD application can successfully use these modeling techniques to acceptably alter the method by which flight test data may be acquired and, when applied to Level 6 FTDs, does not compromise the quality of that simulation.

d. The information in the table that follows (Table of Alternative Data Sources, Procedures, and Information: Level 6 FTD Only) is presented to describe an acceptable alternative to data sources for Level 6 FTD modeling and validation and as an acceptable alternative to the procedures and instrumentation found in the traditionally accepted flight test methods used to gather such modeling and validation data.

(1) Alternative data sources which may be used for part or all of a data requirement are the Airplane Maintenance Manual, the Airplane Flight Manual (AFM), Airplane Design Data, the Type Inspection Report (TIR), Certification Data or acceptable supplemental flight test data.

(2) The NSPM recommends that use of the alternative instrumentation noted in the following Table be coordinated with the NSPM prior to employment in a flight test or data gathering effort.

e. The NSPM position regarding the use of these alternative data sources, procedures, and instrumentation is based on three primary preconditions and presumptions regarding the objective data and FTD aerodynamic program modeling.

(1) While the data gathered through the alternative means does not require angle of attack (AOA) measurements or control surface position measurements for any flight test, AOA can be sufficiently derived if the flight test program insures the collection of acceptable level, unaccelerated, trimmed flight data. Any of the FTD time history tests that begin in level, unaccelerated, and trimmed flight, including the three basic trim tests and “fly-by” trims, can be a successful validation of angle of attack by comparison with flight test pitch angle.

(2) a rigorously defined and fully mature simulation controls system model that includes accurate gearing and cable stretch characteristics (where applicable), determined from actual aircraft measurements, will be used. Such a model does not require control surface position measurements in the flight test objective data in these limited applications.

(3) The authorized uses of Level 6 FTDs (as listed in the appropriate Commercial, Instrument, or Airline Transport Pilot and/or Type Rating Practical Test Standards) for “initial,” “transition,” or “upgrade” training, still requires additional flight training and/or flight testing/checking in the airplane or in a Level C or Level D simulator.

f. The sponsor is urged to contact the NSPM for clarification of any issue regarding airplanes with reversible control systems. This table is not applicable to Computer Controlled Aircraft flight FTDs.

g. Utilization of these alternate data sources, procedures, and instrumentation does not relieve the sponsor from compliance with the balance of the information contained in this document relative to Level 6 simulators.

End Information

Table of Alternative Data Sources, Procedures, and Instrumentation: Level 6 FTD Only		
	QPS REQUIREMENT (if this source used)	
Applicable Test and Test Number	**Alternative Data Sources, Procedures, and Instrumentation**	**Notes, Reminders, and Information**
2.a.(1) Performance. Takeoff. Minimum Radius turn	TIR, AFM, or Design data may be used.	
2.b.(1) Performance. Climb. Normal Climb	Data may be acquired with a synchronized video of: calibrated airplane instruments and engine power throughout the climb range.	
2.c.(1) Performance. In-Flight. Stall Warning (activation of stall warning device)	Data may be acquired through a synchronized video recording of: a stop watch and the calibrated airplane airspeed indicator. Hand-record the flight conditions and airplane configuration.	Airspeeds may be cross checked with those in the TIR and AFM.
2.d.(1) Performance. Ground. Deceleration Time, using manual application of wheel brakes and no reverse thrust.	Data may be acquired during landing tests using a stop watch, runway markers, and a synchronized video of calibrated airplane instruments, thrust lever position, and the pertinent parameters of engine power.	
2.d.(2) Performance. Ground. Deceleration Time, using reverse thrust and no wheel brakes.	Data may be acquired during landing tests using a stop watch, runway markers, and a synchronized video of calibrated airplane instruments, thrust lever position and the pertinent parameters of engine power.	
2.e.(1) Performance. Engines. Acceleration	Data may be acquired with a synchronized video recording of engine instruments and throttle position.	
2.e.(2) Performance. Engines. Deceleration	Data may be acquired with a synchronized video recording of engine instruments and throttle position.	
3.a.(1)(b) Handling Qualities. Static Control Checks. Column Position vs. Force	Force data may be acquired by using a hand held force gauge at selected, significant column positions (encompassing significant column position data points) acceptable to the NSPM.	
3.a.(2)(b) Handling Qualities. Static Control Checks. Wheel Position vs. Force	Force data may be acquired by using a hand held force gauge at selected, significant wheel positions (encompassing significant wheel position data points) acceptable to the NSPM.	
3.a.(3)(b) Handling Qualities. Static Control Checks. Rudder Pedal Position vs. Force	Force data may be acquired by using a hand held force gauge at selected, significant wheel positions (encompassing significant wheel position data points) acceptable to the NSPM.	
3.a.(4) Handling Qualities. Static Control Checks. Nosewheel Steering Force	Breakout data may be acquired with a hand held force gauge. The remainder of the force to the stops may be calculated if the force gauge and a protractor are used to measure force after breakout for at least 25% of the total displacement capability.	
3.a.(5) Handling Qualities. Static Control Checks.	Data may be acquired through the use of force pads on the rudder pedals and a pedal position measurement device, together with	

Table of Alternative Data Sources, Procedures, and Instrumentation: Level 6 FTD Only		
QPS REQUIREMENT (if this source used)		
Applicable Test and Test Number	**Alternative Data Sources, Procedures, and Instrumentation**	**Notes, Reminders, and Information**
Rudder Pedal Steering Calibration	design data for nose wheel position.	
3.a.(6) Handling Qualities. Static Control Checks. Pitch Trim Calibration (Indicator vs. Computed).	Data may be acquired through calculations.	
3.a.(7) Handling Qualities. Static Control Checks. Alignment of Power Lever Angle vs. Selected Engine Parameter (e.g., EPR, N_1, Torque, etc.)	Data may be acquired through the use of a temporary throttle quadrant scale to document throttle position. Use a synchronized video to record steady state instrument readings or hand-record steady state engine performance readings.	
3.a.(8) Handling Qualities. Static Control Checks. Brake Pedal Position vs. Force	Use of design or predicted data is acceptable. Data may be acquired by measuring deflection at “zero” and “maximum” and calculating deflections between the extremes using the airplane design data curve.	
3.b.(1) Handling Qualities. Longitudinal. Power Change Force	Data may be acquired by using an inertial measurement system and a synchronized video of the calibrated airplane instruments, throttle position, and the force/position measurements of cockpit controls.	
3.b.(2) Handling Qualities. Longitudinal. Flap/Slat Change Force	Data may be acquired by using an inertial measurement system and a synchronized video of calibrated airplane instruments, flap/slat position, and the force/position measurements of cockpit controls.	
3.c.(4) Handling Qualities. Longitudinal. Gear Change Force.	Data may be acquired by using an inertial measurement system and a synchronized video of the calibrated airplane instruments, gear position, and the force/position measurements of cockpit controls.	
3.b.(4) Handling Qualities. Longitudinal. Landing Gear and Flap/Slat Operating Times.	May use design data, production flight test schedule, or maintenance specification, together with an SOC.	
3.b.(5) Handling Qualities. Longitudinal. Longitudinal Trim	Data may be acquired through use of an inertial measurement system and a synchronized video of: the cockpit controls position (previously calibrated to show related surface position) and the engine instrument readings.	
3.b.(6) Handling Qualities. Longitudinal. Longitudinal Maneuvering Stability (Stick Force/g)	Data may be acquired through the use of an inertial measurement system and a synchronized video of the calibrated airplane instruments; a temporary, high resolution bank angle scale affixed to the attitude indicator; and a wheel and column force measurement indication.	
3.b.(7) Handling Qualities. Longitudinal.	Data may be acquired through the use of a synchronized video of the airplane flight	

Table of Alternative Data Sources, Procedures, and Instrumentation: Level 6 FTD Only		
QPS REQUIREMENT (if this source used)		
Applicable Test and Test Number	**Alternative Data Sources, Procedures, and Instrumentation**	**Notes, Reminders, and Information**
Longitudinal Static Stability	instruments and a hand held force gauge.	
3.b.(8)(b) Handling Qualities. Longitudinal. Phugoid Dynamics	Data may be acquired by using an inertial measurement system and a synchronized video of the calibrated airplane instruments and the force/position measurements of cockpit controls.	
3.c.(1) Handling Qualities. Lateral Directional. Roll Response (Rate)		
3.c.(2) Handling Qualities. Lateral Directional. **(a)** Roll Overshoot OR **(b)** Roll Response to Cockpit Roll Controller Step Input	Data may be acquired by using an inertial measurement system and a synchronized video of the calibrated airplane instruments and the force/position measurements of cockpit lateral controls.	
3.c.(4)(b) Handling Qualities. Lateral Directional. Spiral Stability	Data may be acquired by using an inertial measurement system and a synchronized video of the calibrated airplane instruments; the force/position measurements of cockpit controls; and a stop watch.	
3.c.(5)(a) Handling Qualities. Lateral Directional. Rudder Response	Data may be acquired by using an inertial measurement system and a synchronized video of the calibrated airplane instruments; the force/position measurements of rudder pedals.	
3.c.(6)(a) Handling Qualities. Lateral Directional. Dutch Roll, (Yaw Damper OFF)	Data may be acquired by using an inertial measurement system and a synchronized video of the calibrated airplane instruments and the force/position measurements of cockpit controls.	
3.c.(7) Handling Qualities. Lateral Directional. Steady State Sideslip	Data may be acquired by using an inertial measurement system and a synchronized video of the calibrated airplane instruments and the force/position measurements of cockpit controls. Ground track and wind corrected heading may be used for sideslip angle.	

Attachment 3 to Appendix B to Part 60--

FLIGHT TRAINING DEVICE (FTD) SUBJECTIVE EVALUATION

1. DISCUSSION.

Begin Information

a. The subjective tests provide a basis for evaluating the capability of the FTD to perform over a typical utilization period; determining that the FTD competently simulates each required maneuver, procedure, or task; and verifying correct operation of the FTD controls, instruments, and systems. The items listed in the Table of Functions and Subjective Tests are for FTD evaluation purposes only. They must not be used to limit or exceed the authorizations for use of a given level of FTD as described on the Statement of Qualification or as may be approved by the TPAA. All items in the following paragraphs are subject to an examination.

b. The Table of Functions and Subjective Tests in this attachment addresses pilot functions, including maneuvers and procedures (called flight tasks), and is divided by flight phases. The performance of these tasks by the NSPM includes an operational examination of special effects and any installed visual system. There are flight tasks included to address some features of advanced technology airplanes and innovative training programs. For example, "high angle-of-attack maneuvering" is included to provide a required alternative to "approach to stalls" for airplanes employing flight envelope protection functions.

c. The Table of Functions and Subjective Tests in this attachment addresses the overall function and control of the FTD including the various simulated environmental conditions; simulated airplane system operation (normal, abnormal, and emergency); and visual system displays and special effects (if either are applicable) that are used to meet flightcrew training, evaluation, or flight experience requirements.

d. All simulated airplane systems functions will be assessed for normal and, where appropriate, alternate operations. Normal, abnormal, and emergency operations associated with a flight phase will be assessed during the evaluation of flight tasks or events within that flight phase. Simulated airplane systems are listed separately under "Any Flight Phase" to ensure appropriate attention to systems checks. Operational navigation systems (including inertial navigation systems, global positioning systems, or other long-range systems) and the associated electronic display systems will be evaluated if installed. The NSP pilot will include in his report to the TPAA, the effect of the system operation and any system limitation.

e. At the request of the TPAA, the NSP Pilot may assess the FTD for a special aspect of a sponsor's training program during the functions and subjective portion of an evaluation. Such an assessment may include a portion of a Line Oriented Flight Training (LOFT) scenario or special emphasis items in the sponsor's training program. Unless directly related to a requirement for the qualification level, the results of such an evaluation would not affect the qualification of the FTD.

End Information

1. Operations: Tasks in the Operations Table are subject to evaluation if appropriate for the airplane simulated as indicated in the SOQ Configuration List and/or the level of simulator qualification involved. Items not installed or not functional on the simulator and, therefore, not appearing on the SOQ Configuration List, are not required to be listed as exceptions on the SOQ.			
a. Preparation For Flight Preflight. Accomplish a functions check of all installed switches, indicators, systems, and equipment at all crewmembers' and instructors' stations, and determine that the cockpit (or flight deck area) design and functions replicate the appropriate airplane or set of airplanes.	**X**	**X**	**X**
b. Surface Operations (Pre-Take-Off)			
(1) Engine Start			
(a) Normal start.	**X**	**X**	**X**
(b) Alternate start procedures.	**X**	**X**	**X**
(c) Abnormal starts and shutdowns (hot / hung start, etc.).	**X**	**X**	**X**
(2) Pushback/Powerback (as applicable, powerback requires visual system).	**X**	**X**	**X**
(3) Taxi			
(a) Thrust response.	**X**	**X**	**X**
(b) Power lever friction.	**X**	**X**	**X**
(c) Ground handling.	**X**	**X**	**X**
(d) Nose wheel scuffing.	**X**	**X**	**X**
(e) Brake operation (normal and alternate/emergency).	**X**	**X**	**X**
(f) Ground Hazard (if applicable) requires visual system.	**X**	**X**	**X**
(g) Surface Movement and Guidance System (if applicable) requires visual system.	**X**	**X**	**X**
c. Take-Off (1) Normal			
(a) Propulsion system checks (e.g., engine parameter relationships; propeller and mixture controls).	**X**	**X**	**X**
(b) Airplane acceleration characteristics.	**X**	**X**	**X**
(c) Nose wheel and rudder steering.	**X**	**X**	**X**
(d) Crosswind (maximum demonstrated).	**X**	**X**	**X**
(e) Special performance.	**X**	**X**	**X**
(f) Instrument.	**X**	**X**	**X**
(g) Landing gear, wing flap, leading edge device operation.	**X**	**X**	**X**
(2) Abnormal/emergency.	**X**		
(a) Rejected, with brake fade (if applicable) due to rising brake temperature.	**X**	**X**	**X**
(b) Rejected special performance.	**X**	**X**	**X**
(c) Flight control system failure modes.	**X**	**X**	**X**
d. Inflight Operations			
(1). Climb (a) Normal.	**X**	**X**	**X**
(2) Cruise.			

(a) Performance characteristics (speed vs. power). (b) Normal turns and turns with/without spoilers (speed brake) deployed. (c) High altitude handling. (d) High indicated airspeed handling, overspeed warning (e) Mach effects on control and trim. (f) Naormal and steep turns	**X** **X** **X** **X** **X** **X**	**X** **X** **X** **X** **X** **X**	**X** **X** **X** **X** **X** **X**
(g) Performance turns	**X**	**X**	**X**
(h) Approach to stalls in the following configurations: (i) cruise; (ii) takeoff or approach; and (iii) landing.	**X**	**X**	**X**
(i) High angle of attack maneuvers in the following configurations: (i) cruise; (ii) takeoff or approach; and (iii) landing.	**X**	**X**	**X**
(j) Inflight engine shutdown (as applicable, procedures only).	**X**	**X**	**X**
(k) Inflight engine restart (as applicable, procedures only).	**X**	**X**	**X**
(l) Maneuvering with one or more engines inoperative (as applicable, procedures only)..	**X**	**X**	**X**
(m) Slow flight.	**X**	**X**	**X**
(n) Specific flight characteristics.	**X**	**X**	**X**
(o) Manual flight control reversion (i.e., loss of all flight control power).	**X**	**X**	**X**
(p) Other flight control system failure modes.	**X**	**X**	**X**
(q) Holding.	**X**	**X**	**X**
(r) Airborne hazard (if applicable, requires visual system).	**X**	**X**	**X**
(s) Operations during icing conditions.	**X**	**X**	**X**
(t) Traffic alert and collision avoidance.	**X**	**X**	**X**
(u) Effects of airframe icing.	**X**	**X**	**X**
(3) Descent.			
(a) Normal.	**X**	**X**	**X**
(b) Maximum rate (clean,with speedbrake extended, etc) and recovery.	**X**	**X**	**X**
(c) Flight control system failure modes (e.g., manual flight control reversion, split controls, etc.).	**X**	**X**	**X**
(d) High rate of sink and recovery.	**X**	**X**	**X**
e. Approaches *Those instrument approach and landing tests relevant to the simulated airplane type should be selected from the following list. Some tests should be made with limiting wind velocities, under windshear conditions, and with relevant system failures, including the failure of the Flight Director.* **(1) Instrument Approach Maneuvers.**			
(a) Non-precision:	**X**	**X**	**X**
(i) Non-Directional Beacon (NDB).	**X**	**X**	**X**
(ii) VHF Omni-Range (VOR), Area Navigation (RNAV), Tactical Air Navigation (TACAN).	**X**	**X**	**X**
(iii) Distance Measuring Equipment, Arc (DME ARC).	**X**	**X**	**X**
(iv) ILS Localizer Back Course (LOC/BC).	**X**	**X**	**X**
(v) Localizer Directional Aid (LDA), ILS Front Course Localizer (LOC), Simplified Direction Facility (SDF).	**X**	**X**	**X**
(vi) Airport Surveillance Radar (ASR).	**X**	**X**	**X**

(vii) Global Positioning System (GPS).	X	X	X
(viii) Missed approach.	X	X	X
(b) Precision:	X	X	X
(i) Instrument Landing System (ILS).	X	X	X
A. Category I published.	X	X	X
(i) Manually controlled with and without flight director to 100 feet below published decision height.	X	X	X
(ii) With maximum demonstrated crosswind..	X	X	X
(iii) B. Category II published – with and without use of autopilot, autothrottle, and autoland, as applicable.	X	X	X
C. Category III published:	X	X	X
(i) With minimum/standby electrical power.	X	X	X
(ii) With generator/alternator failure (transient).	X	X	X
(iii) With 10 knot tail wind.	X	X	X
(iv) With 10 knot crosswind.	X	X	X
D. Missed approach.	X	X	X
(ii) Precision Approach Radar (PAR)	X	X	X
A. Normal.	X	X	X
B. With crosswind.	X	X	X
C. Missed approach.	X	X	X
(iii) Digital Global Positioning System (DGPS).	X	X	X
A. Normal.	X	X	X
B. With crosswind.	X	X	X
C. Missed approach.	X	X	X
(iv) Microwave Landing System (MLS).	X	X	X
A. Normal.	X	X	X
B. With crosswind.	X	X	X
C. Missed approach.	X	X	X
(v) Steep Glide Path.	X	X	X
A. Normal.	X	X	X
B. With crosswind.	X	X	X
C. Missed approach.	X	X	X
(2) Visual Approach Maneuvers (if applicable, requires visual system).			
(a) Abnormal wing flaps/slats.	X	X	X
(b) Without glide slope guidance or visual vertical flightpath aid.	X	X	X
(3) Abnormal/emergency.	X	X	X
(a) With standby (or minimum) electric/hydraulic power.	X	X	X
(b) With longitudinal trim malfunction.) Approach to land with windshear on approach.	X	X	X
(c) With jammed or mis-trimmed horizontal stabilizer.	X	X	X
(d) With lateral-directional trim malfunction.	X	X	X
(e) With worst case failure of flight control system (most significant degradation of the computer controlled airplane which is not extremely improbable).	X	X	X
(f) Other flight control system failure modes as dictated by training program	X	X	X
(g) Land and hold short operations.	X	X	X

f. Missed Approach.			
(1) Manual.	**X**	**X**	**X**
(2) Automatic (if applicable).	**X**	**X**	**X**
g. Any Flight Phase.			
(1) Air conditioning.	**X**	**X**	**X**
(2) Anti-icing/deicing.	**X**	**X**	**X**
(3) Auxiliary powerplant.	**X**	**X**	**X**
(4) Communications.	**X**	**X**	**X**
(5) Electrical.	**X**	**X**	**X**
(6) Fire detection and suppression.	**X**	**X**	**X**
(7) Flaps.	**X**	**X**	**X**
(8) Flight controls (including spoiler/speedbrake).	**X**	**X**	**X**
(9) Fuel and oil.	**X**	**X**	**X**
(10) Hydraulic.	**X**	**X**	**X**
(11) Landing gear.	**X**	**X**	**X**
(12) Oxygen.	**X**	**X**	**X**
(13) Pneumatic.	**X**	**X**	**X**
(14) Propulsion System.	**X**	**X**	**X**
(15) Pressurization.	**X**	**X**	**X**
(16) Flight management and guidance systems.	**X**	**X**	**X**
(17) Automatic landing aids.	**X**	**X**	**X**
(18) Automatic pilot.	**X**	**X**	**X**
(19) Thrust management/auto-throttle.	**X**	**X**	**X**
(20) Flight data displays.	**X**	**X**	**X**
(21) Flight management computers.	**X**	**X**	**X**
(22) Flight director/system displays.	**X**	**X**	**X**
(23) Flight instruments.	**X**	**X**	**X**
(24) Heads-up flight guidance system.	**X**	**X**	**X**
(25) Navigation systems.	**X**	**X**	**X**
(26) Weather radar system.	**X**	**X**	**X**
(27) Stall warning/avoidance.	**X**	**X**	**X**
(28) Stability and control augmentation.	**X**	**X**	**X**
(29) ACARS.	**X**	**X**	**X**
h. Engine Shutdown and Parking.			
(1) Systems operation.	**X**	**X**	**X**
(2) Parking brake operation..	**X**	**X**	**X**
i. Instructor Operating Station (IOS), as appropriate. Functions in this section are subject to evaluation only if appropriate for the airplane and/or installed on the specific FTD involved.			
(1) Power Switch(es)	**X**	**X**	**X**
(2) Airplane conditions.			
(a) Gross weight, center of gravity, fuel loading and allocation, etc	**X**	**X**	**X**
(b) Airplane systems status.	**X**	**X**	**X**
(c) Ground crew functions (e.g., ext. power, push back, etc.)	**X**	**X**	**X**
(3) Airports.			
(a) Selection.	**X**	**X**	**X**

(b) Runway selection.	**X**	**X**	**X**
(c) Preset positions (e.g. ramp, over FAF, etc.)	**X**	**X**	**X**
(4) Environmental controls.			
(a) Temperature.	**X**	**X**	**X**
(b) Climate conditions (e.g., ice, rain, etc.).	**X**	**X**	**X**
(c) Wind speed and direction.	**X**	**X**	**X**
(5) Airplane system malfunctions.			
(a) Insertion / deletion.	**X**	**X**	**X**
(b) Problem clear.	**X**	**X**	**X**
(6) Locks, Freezes, and Repositioning.			
(a) Problem (all) freeze / release.	**X**	**X**	**X**
(b) Position (geographic) freeze / release.	**X**	**X**	**X**
(c) Repositioning (locations, freezes, and releases).	**X**	**X**	**X**
(d) Ground speed control.	**X**	**X**	**X**
(7) Remote IOS.	**X**	**X**	**X**
j. Sound Controls. On / off / adjustment	**X**	**X**	**X**
k. Control Loading System (as applicable).			
(a) On / off / emergency stop.	**X**	**X**	**X**
l. Observer Stations.			
(1) Position.	**X**	**X**	**X**
(2) Adjustments.	**X**	**X**	**X**

End QPS Requirements

Attachment 4 to Appendix B to Part 60--

SAMPLE DOCUMENTS

Begin Information

Table of Contents

Title of Sample

Attachment 4 to Appendix B to Part 60—

Figure 1 – Sample Letter , Request for Initial, Upgrade, or Reinstatement Evaluation..

INFORMATION

Edward Cook, PhD.
Manager, National Simulator Program
Federal Aviation Administration
P.O. Box 20636 (AFS-205)
Atlanta, GA 30320

Dear Dr. Cook:

RE: Request for Initial [Upgrade / Reinstatement] Evaluation

(Sponsor's name) ___________________ requests your evaluation of our (make, model, series) ________ airplane FTD for Level ______ qualification, located in (City/State) at the (Facility) on (proposed evaluation date). [The proposed evaluation date must not be more than 180 days following the date of this letter.] This FTD [has / has not] been previously qualified by the FAA [and had been issued FAA identification number XXX]. Under separate cover, we have asked our Principal Operations Inspector (POI) (Training Center Program Manager, TCPM), Mr./Ms.__________________(Name), to forward to you a letter concurring with this request.

[The history of this FTD is as follows: ____.]

We agree to provide a Qualification Test Guide (QTG) to your staff not later than 45 days prior to the proposed evaluation date [if tests not run at training site, an additional "1/3 on-site" tests must be provided not later than 14 days prior the proposed evaluation date]. If we are unable to meet the above date for the evaluation, this may result in a significant delay, perhaps 45 days or more, in rescheduling and completing the evaluation. With our forwarding the QTG, we acknowledge that the FTD meets all applicable requirements of Title 14 of the Code of Federal Regulation (14 CFR) Part 60; that it meets the requirements of the Airplane Flight Training Device Qualification Performance Standards (QPS); and that appropriate hardware and software configuration control procedures have been established.

We also agree to forward to you, not later than five (5) business days prior to the scheduled evaluation of this FTD, a confirmation statement that will include the following information:

1. That (a) pilot(s) we have designated, who is(are) qualified on the (make, model, series) _______ airplane, has(have) assessed the FTD and found that the performance and flying qualities of the FTD represent the (make, model, series) _______ airplane. This determination will be made after flying all the maneuvers and procedures and exercising the tasks listed in the Table of Functions and Subjective Tests in Attachment 3 to the Airplane FTD QPS (except for those listed in the attachment to this letter).

2. That (a) pilot(s), or (an)other person(s) we have designated, has(have) found the FTD systems and sub-systems (including simulated aircraft systems) functionally represent the (make, model, series) ________ airplane. This determination will be made after having exercised the operation of the FTD

and the functions available through the Instructor Operating Station.

3. That, for type specific airplanes, (a) pilot(s), or (an)other person(s) we have designated, has(have) found the cockpit configuration represents the configuration of the (make, model, and series) ________ aircraft.

The names of the person(s) providing this information will be available to you upon your request.

[Added comments from Operator/Sponsor, if any]

Please contact (Name and Telephone Number of Sponsor's Contact) to confirm the date for this initial (upgrade / re-instatement) evaluation. We understand a member of your National Simulator Program staff will respond to this request within 14 days.

Sincerely,

(Signature –Management Representative)

Attachment 4 to Appendix B to Part 60—

Figure 2 – Sample Qualification Test Guide Cover Page

INFORMATION

SPONSOR NAME

SPONSOR ADDRESS

FAA QUALIFICATION TEST GUIDE

(SPECIFIC AIRPLANE MODEL)
for example
Stratos BA797-320A

(Type of FTD)

(FTD Identification Including Manufacturer, Serial Number, Visual System Used)

(FTD Level)

(Qualification Performance Standard Used)

(FTD Location)

FAA Initial Evaluation

Date: ______________

____________________________ Date: ____________
(Sponsor)

____________________________ Date: ____________
Manager, National
Simulator Program, FAA

Attachment 4 to Appendix B to Part 60—
Figure 3 – Sample Simulator Information Page
INFORMATION

SPONSOR NAME	
SPONSOR SIMULATOR CODE:	BA-797 #1
AIRPLANE MODEL:	Stratos BA797-320A
AERODYNAMIC DATA REVISION:	BA797-320, CPX-8D, January 1988
ENGINE MODEL(S) AND REVISION:	CPX-8D; RPT-6, January 1988 DRQ-4002, RPT-3, April 1991
FLIGHT CONTROLS DATA REVISION:	BA707-320; May 1988
FLIGHT MANAGEMENT SYSTEM:	Berry XP
FTD MODEL AND MANUFACTURER:	MTD-797, Tinker Simulators, Inc.
DATE OF FTD MANUFACTURE:	1988
FTD COMPUTER:	CIA
VISUAL SYSTEM MODEL, MANUFACTURER, and DISPLAY TYPE:	ClearView, Inc. “Real World T2;” 5 Channel, 6-window CRT display
VISUAL SYSTEM COMPUTER:	LMB-6
MOTION SYSTEM:	N/A

Information on this page must be updated and kept current with any modifications or changes made to the simulator and reflected on the log of revisions and the list of effective pages.

Attachment 4 to Appendix B to Part 60—
Figure 4 – Sample Statement of Qualification

Federal Aviation Administration
National Simulator Program

Statement
of
Qualification

This is to certify that representatives of the
National Simulator Program
Completed an evaluation of the

Go-Fast Training Center
Stratos BA-797 Flight Training Device

FAA Identification Number 721

And found it to meet the standards set forth
In the Qualification Performance Standards
For a Flight Training Device at

Level 6

____________________ (date)   ________________________ for the NSPM

Subject to the attached
Configuration List and Restrictions

Attachment 4 to Appendix B to Part 60—

Figure 4A – Sample Statement of Qualification; Configuration List

INFORMATION

STATEMENT of QUALIFICATION
CONFIGURATION LIST
Go-Fast Training Center Stratos BA-797-232 -- Level C -- FAA ID# 701

Configuration		Date Qualified
Airplane Model:.......................... Re-configurable to:..................	BA-797-232................................... BA-797-287 (see FAA ID#722)	July 12, 1988
Engine Model -- **Revision:**...	CPX-8D, RPT-6........................ DRQ-4002, RPT-3....................	July 12, 1988 April 1, 1991
Flight Management **System:**.......	Berry XP...	July 12, 1988
Visual System / Manufacturer: CRT Installation:....................	Real World T2, Clear View, Inc. 5 Channel, 6 Window....................	 July 12, 1988
Flight Instruments: Electro-Mechanical:................. Heads-Up Display..................	 .... Jones Industries..............................	 July 12, 1988 December 1, 1993
Flight Director: Dual Cue................................	 Sperry..	 July 12, 1988
Engine Instruments: Electro-Mechanical.................		 July 12, 1988
Navigation Type(s): ADF....................................... VOR/ILS............................... INS.......................................		 July 12, 1988 July 12, 1988 October 10, 1991
Weather Radar:	Jones Industries, Inc.	August 3, 1996
Windshear Equipment		July 12, 1988
TCAS		October 9, 2003
	(Continue as Necessary)	

Attachment 4 to Appendix B to Part 60—
Figure 4B – Sample Statement of Qualification
Qualified / Non-Qualified Maneuvers, Procedures, Tasks, Functions

INFORMATION

STATEMENT of QUALIFICATION

Qualified / Non-Qualified Maneuvers, Procedures, Tasks, Functions
Go-Fast Training Center
Stratos BA-797 -- Level 6 -- FAA ID# 721

The FTD is qualified to perform all of the Maneuvers, Procedures, Tasks, and Functions listed in the Table of Functions and Subjective Tests, Part 60, Appendix B, Attachment 3, In Effect on [mm/dd/yyyy] except for the following listed Tasks or Functions.

(*Example*)

Non-Qualified Operations Tasks and Functions

1.b.(2) Power Back.
1.b.(3)(g) Other (SMGCS).
1.c.(1) Normal Takeoff, Daylight Conditions.
1.g.(7) Flaps

Non-Qualified Simulator Systems:

6.g. Remote IOS

Additional Qualified Tasks or Functions in addition to those listed in the Table of Functions and Subjective Tests, Part 60, Appendix B, Attachment 3.

(None)

Attachment 4 to Appendix B to Part 60—
Figure 5 – Sample Continuing Qualification Evaluation Requirements Page Information

Recurrent Evaluation Requirements ***Completed at conclusion of Initial Evaluation***	
Recurrent Evaluations to be conducted each _(fill in)__ months Allotting ______ hours of FTD time. Signed: ________________________________ NSPM / Evaluation Team Leader	Recurrent evaluations are due as follows: _(month)__ and __(month)_ and __(month)_ (enter or strike out, as appropriate) ______________________ Date

Revision: Based on (enter reasoning):	
Recurrent Evaluations are to be conducted each _(fill in)__ months. Allotting ______ hours. Signed: ________________________________ NSPM Evaluation Team Leader	Recurrent evaluations are due as follows: _(month)__ and __(month)_ and __(month)_ (enter or strike out, as appropriate) ______________________ Date

Revision: Based on (enter reasoning):	
Recurrent Evaluations are to be conducted each _(fill in)__ months. Allotting ______ hours. Signed: ________________________________ NSPM Evaluation Team Leader	Recurrent evaluations are due as follows: _(month)__ and __(month)_ and __(month)_ (enter or strike out, as appropriate) ______________________ Date

(Repeat as Necessary)

Attachment 4 to Appendix B to Part 60—
Figure 6 – Sample MQTG Index of Effective FSTD Directives.

INFORMATION

Index of Effective FSTD Directives Filed in this Section

Notification Number	Received From: (TPAA/NSPM)	Date of Notification	Date of Modification Completion

Continue as Necessary....

Appendix C to Part 60--Qualification Performance Standards for Helicopter Flight Simulators

---

Begin Information

This appendix establishes the standards for Helicopter Flight Simulator evaluation and qualification. The Flight Standards Service, National Simulator Program (NSP) staff, under the direction of the NSP Manager (NSPM), is responsible for the development, application, and interpretation of the standards contained within this appendix. The procedures and criteria specified in this document will be used by the NSPM, or a person or persons assigned by the NSPM (e.g., FAA pilots and/or FAA aeronautical engineers, assigned to and trained under the direction of the NSP--referred to as NSP pilots or NSP engineers, other FAA personnel, etc.) when conducting helicopter flight simulator evaluations.

Table of Contents

6. Sponsor Qualification Requirements (§ 60.7).

7. Additional Responsibilities of the Sponsor (§ 60.9).

8. Simulator Use (§ 60.11).

9. Simulator Objective Data Requirements (§ 60.13).

10. Special Equipment and Personnel Requirements for Qualification of the Simulator (§ 60.14).

11. Initial (and Upgrade) Qualification Requirements (§ 60.15).

12. Additional Qualifications for a Currently Qualified Simulator (§ 60.16).

13. Previously Qualified Simulators (§ 60.17).

14. Special Equipment and Personnel Requirements for Qualification of the Simulator (§ 60.14).

15. Logging Simulator Discrepancies (§ 60.20).

16. Interim Qualification of Simulators for New Helicopter Types or Models (§ 60.21).

17. Modifications to Simulators (§ 60.23).

18. Operation with Missing, Malfunctioning, or Inoperative Components (§ 60.25).

19. Automatic Loss of Qualification and Procedures for Restoration of Qualification (§ 60.27).

20. Other Losses of Qualification and Procedures for Restoration of Qualification (§ 60.29).

21. Recordkeeping and Reporting (§ 60.31).

22. Applications, Logbooks, Reports, and Records: Fraud, Falsification, or Incorrect Statements (§ 60.33).

23. [Reserved].

24. [Reserved].

1. Introduction

Begin Information

a. This appendix contains background information as well as material that is either directive or informative in nature as described later in this section. Except for this Introduction section, the directive or the informative material is presented in sections that correspond with sections of part 60. This material provides additional requirements and/or provides information regarding that subject. Some sections will have neither additional regulatory or informational material. In these instances the corresponding section in the Table of Contents will show "(No Info)."

b. To assist the reader in determining what areas are directive or required and what areas are guiding or permissive—

(1) The text in this appendix is contained within one of two sections: regulatory requirements that are in addition to the requirements in part 60 but are found only in this appendix, referred to as “QPS Requirements;” and advisory or informative material, referred to as “Information.”

(2) The text presented between horizontal lines beginning with the heading “Begin QPS Requirements” and ending with the heading “End QPS Requirements,” contains the regulatory requirements that are in addition to the requirements in the body of the part 60 language but found only in this appendix.

(3) The text presented between horizontal lines beginning with the heading “Begin Information” and ending with the heading “End Information,” is advisory or informative.

(4) The tables in this appendix have rows across the top of each table--

(a) The data presented in columns under the heading ``QPS REQUIREMENTS'' is regulatory but is found only in this appendix.

(b) The data presented in columns under the heading ``INFORMATION'' is advisory or informative.

c. Questions regarding the contents of this publication should be sent to: U.S. Department of Transportation, Federal Aviation

Administration, Flight Standards Service, National Simulator Program Staff, AFS-205, PO Box 20636 Atlanta, Georgia 30320. Telephone contact numbers are: phone, 404-305-6100; fax, 404-305-6118. The National Simulator Program Internet Web Site address is: http://frwebgate.access.gpo.gov/cgi-bin/leaving.cgi?from=leavingFR.html&log=linklog&to=http://www.faa.gov/nsp. On this Web Site you will find an NSP personnel

list with contact information, a list of qualified flight simulation devices, advisory circulars, a description of the qualification process, NSP policy, and an NSP ``In-Works'' section. Also linked from this site are additional information sources, handbook bulletins, frequently asked questions, a listing and text of the Federal Aviation Regulations, Flight Standards Inspector's handbooks, and other FAA links.

d. The NSPM encourages the use of electronic media for communication and the gathering, storage, presentation, or transmission of any record, report, request, test, or statement required by this QPS provided the media used has adequate provision for security and is acceptable to the NSPM. The NSPM recommends inquiries on system compatibility prior to any such activity. Minimum System requirements may be found on the NSP Web site.

e. Related Reading References

(1) 14CFR part 60

(2) 14CFR part 61.

(3) 14CFR part 63.

(4) 14CFR part 119

(5) 14CFR part 121.

(6) 14CFR part 125

(7) 14CFR part 135.

(8) 14CFR part 141

(9) 14CFR part 142

(10) Advisory Circular (AC) 120-28C, Criteria for Approval of Category III Landing Weather Minima.

(11) AC 120-29, Criteria for Approving Category I and Category II Landing Minima for part 121 operators.

(12) AC 120-35B, Line Operational Simulations: Line-Oriented Flight Training, Special Purpose Operational Training, Line Operational Evaluation.

(13) AC 120-41, Criteria for Operational Approval of Airborne Wind Shear Alerting and Flight Guidance Systems.

(14) AC 120-57A, Surface Movement Guidance and Control System (SMGS).

(15) AC 150/5300-13, Airport Design.

(16) AC 150/5340-1G, Standards for Airport Markings.

(17) AC 150/5340-4C, Installation Details for Runway Centerline Touchdown Zone Lighting Systems.

(18) AC 150/5340-19, Taxiway Centerline Lighting System.

(19) AC 150/5340-24, Runway and Taxiway Edge Lighting System.

(20) AC 150/5345-28D, Precision Approach Path Indicator (PAPI) Systems

(21) International Air Transport Association document, "Flight Simulator Design and Performance Data Requirements," as amended

(22) AC 29-2B, Flight Test Guide for Certification of Transport Category Rotorcraft.

(23) AC 27-1A, Flight Test Guide for Certification of Normal Category Rotorcraft.

(24) International Civil Aviation Organization (ICAO) Manual of Criteria for the Qualification of Flight Simulators, as amended.

(25) Airplane Flight Simulator Evaluation Handbook, Volume I, as amended and Volume II, as amended, The Royal Aeronautical Society, London, UK.

(26) FAA Publication FAA-S-8081 series (Practical Test Standards for Airline Transport Pilot Certificate, Type Ratings, Commercial Pilot, and Instrument Ratings).

(27) The FAA Aeronautical Information Manual (AIM), FAA Handbook XXXXX

f. Background

(1) The FAA has been involved in flight simulator evaluation and approval for well over three decades. As far back as 1954, air carriers were allowed to perform limited proficiency check maneuvers in airplane simulators. Credit for the use of these devices was hampered by the state of the technology available in early simulator development. More recently, however, rapid technological advances have permitted and encouraged the expanded use of flight simulators in the training and checking of flightcrew members. In addition, the complexity, operating costs, and operating environment of modern aircraft have lead to the increasing use of advancing simulator technology. Extensive experience has proven that modern simulators can provide more in-depth training than can be accomplished in the aircraft as well as provide a very high transfer of learning and behavior from the simulator to the aircraft. Additionally, their use, in lieu of aircraft, results in safer flight training and cost reductions for the operators, while achieving fuel conservation and a significant reduction in environmental impact.

(2) In recognition of expanding flight simulator capabilities, as technology has progressed, regulatory revisions have been developed to permit the increased use of airplane simulators in approved training programs. However, the helicopter simulators in use today, in large part, have been evaluated and approved on a case-by-case basis. Previously, those persons using helicopter simulators had received credit for training or checking only through exemption to the regulations. While this situation is changing, the regulations regarding the use of helicopter simulators have not kept pace with their airplane counterparts--and has resulted in rather limited use of helicopter simulators to meet regulatory required training, testing, or checking activities.

(3) The same factors that have led to the widespread use and acceptance of airplane simulators, such as technological advancements, aircraft complexity, operating cost, operating environment, enhanced training, safety, environmental impact, etc. have recently spurred a dramatic increase in interest in helicopter simulators. The FAA anticipates that the use of helicopter simulators will expand rapidly and that applicable regulations will be amended to extend formal credit to the use of these simulators in FAA-approved flight training programs.

(4) For information purposes, the following is a chronological listing of the documents preceding this document that have addressed the qualification criteria for helicopter simulator evaluation and qualification by the FAA, including the effective dates of those documents:

AC 120-63--10/11/94 to (date TBD)

End Information

---

2. Applicability (§§ 60.1 & 60.2)

There is no additional regulatory or informational material that applies to § 60.1, Applicability, or to § 60.2, Applicability of sponsor rules to person who are not sponsors and who are engaged in certain unauthorized activities.

---

3. Definitions (§ 60.3)

Begin Information

See Appendix F for a list of definitions and abbreviations from part 1 and part 60, including the appropriate appendices of part 60.

End Information

---

4. Qualification Performance Standards (§ 60.4)

There is no additional regulatory or informational material that applies to § 60.4, Qualification Performance Standards.

---

5. Quality Management System (§ 60.5).

Begin Information

Additional regulatory material and informational material regarding Quality Management Systems for Flight Simulation Training Devices may be found in appendix E of this part.

End Information

---

6. Sponsor Qualification Requirements (§ 60.7).

Begin Information

a. The intent of the language used in § 60.7(b) is to have a specific simulator, identified by the sponsor, used by the sponsor at least once in the sponsor's FAA-approved flight training program for the helicopter simulated during the 12-month period described. The identification of the specific simulator may change from one 12-month period to the next 12-month period as long as that sponsor sponsors and uses at least one simulator at least once during the prescribed period. There is no minimum number of hours or minimum simulator periods required.

b. To assist in avoiding confusion regarding the requirements for use of a qualified simulator the following examples/descriptions are provided to describe acceptable operational practices:

(1) Example One.

a. A sponsor is sponsoring a single, specific simulator for their own use, in their own facility or elsewhere – this single simulator forms the basis for the sponsorship. The sponsor uses that simulator at least once in each 12-month period in that sponsor's FAA-approved flight training program for the helicopter simulated. This 12-month period is established according to the following:

(i) If the simulator was qualified prior to [insert the effective date of this rule] the 12-month period begins on the date of the first NSPM-conducted continuing qualification after [insert the effective date of this rule] and continues for each subsequent 12-month period;

(ii) If the simulator satisfactorily completes an initial or upgrade evaluation on or after [insert the effective date of this rule] the 12-month period begins on the date of that completed initial or upgrade evaluation and continues for each subsequent 12-month period.

b. There is no minimum number of hours or minimum simulator periods required.

c. The identification of the specific simulator may change from one 12-month period to the next 12-month period as long as that sponsor sponsors and uses at least one simulator at least once during the prescribed period.

(2) Example Two.

a. A sponsor sponsors an additional number of simulators, in their facility or elsewhere. Each such additionally sponsored simulator must be –

(i) Used by the sponsor in the sponsor's FAA-approved flight training program for the helicopter simulated [as described in § 60.7(d)(1)] at least once in each 12-month period in that sponsor's FAA-approved flight training program for the helicopter simulated (this 12-month period is established in the same manner as in example one);

OR

(ii) Used by another FAA certificate holder in that other certificate holder's FAA-approved flight training program for the helicopter simulated [as described in § 60.7(d)(1)] at least once in each 12-month period in that certificate holder's FAA-approved flight training program for the helicopter simulated (this 12-month period is established in the same manner as in example one);

OR

(iii) Provided a statement each year from a qualified pilot, (after having flown the helicopter, not the subject simulator or another simulator, during the preceding 12-month period) stating that the subject simulator's performance and handling qualities represent the helicopter [as described in § 60.7(d)(2)]. This statement is provided at least once in each 12-month period established in the same manner as in example one.

b. There is no minimum number of hours or minimum simulator periods required.

(3) Example Three.

a. A sponsor (in this example, a Part 142 certificate holder) in "New York" (having at least one simulator used at least once per year in the sponsor's FAA-approved flight training program) establishes a "satellite" training center in "Chicago" and/or a satellite center in "Moscow."

b. The satellite function means that the "Chicago" and/or "Moscow" center(s) must operate under the "New York" center's certificate (in accordance with all of the "New York" center's practices, procedures, and policies; e.g., instructor and/or technician training/checking requirements, record keeping, QMS program, etc.).

c. All of the simulators in the "Chicago" center and/or the "Moscow" center could be dry-leased (i.e., the certificate holder does not have and utilize FAA-approved flight training programs for the simulators in the "Chicago" and/or the "Moscow" center) because –

(i) Each simulator in the "Chicago" center and/or each simulator in the "Moscow" center is used at least once each 12-month period by another FAA certificate holder in that other certificate holder's FAA-approved flight training program for the helicopter [as described in § 60.7(d)(1)];or

(ii) A statement is obtained from a qualified pilot (having flown the helicopter, not the subject simulator or another simulator during the preceding 12-month period) stating that the performance and handling qualities of each simulator in the "Chicago" center and/or each simulator in the "Moscow" center represent the helicopter [as described in § 60.7(d)(2)].

End Information

---

7. Additional Responsibilities of the Sponsor (§ 60.9).

Begin Information

The phrase "…as soon as practicable…" as found in § 60.9(a), means without unnecessarily disrupting or delaying beyond a reasonable time the training, evaluation, or experience being conducted in the FSTD.

End Information

---

8. Simulator Use (§ 60.11).

There is no additional regulatory or informational material that applies to § 60.11, Simulator Use.

9. Simulator Objective Data Requirements

Begin QPS Requirements

a. The simulator sponsor must maintain a liaison with the manufacturer of the aircraft being simulated (or with the holder of the aircraft type certificate for the aircraft being simulated if the manufacturer is no longer in business), and/or, if appropriate, with the person having supplied the aircraft data package for the simulator in order to facilitate the notification described in this paragraph. The sponsor must immediately notify the NSPM when an addition to or a revision of the flight related data or helicopter systems related data is available if this data is used to program and/or operate a qualified simulator. The data referred to in this sub-section are those data that are used to validate the performance, handling qualities, or other characteristics of the aircraft, including data related to any relevant changes occurring after the type certification is issued. The notification must also provide technical information about this data to the NSPM relative to the data's significance for training, evaluation, or flight experience activities in the simulator.

b. Flight test data used to validate simulator performance and handling qualities must have been gathered in accordance with a flight test program containing the following:

(1) A flight test plan, that contains:

(a) The required maneuvers and procedures.

(b) For each maneuver or procedure --

(i) The procedures and control input the flight test pilot and/or engineer are to use.

(ii) The atmospheric and environmental conditions.

(iii) The initial flight conditions.

(iv) The helicopter configuration, including weight and center of gravity.

(v) The data that is to be gathered.

(vi) Any other appropriate factors.

(2) Appropriately qualified flight test personnel.

(3) An understanding of the accuracy of the data to be gathered.

(4) Appropriate and sufficient data acquisition equipment or system(s), including appropriate data reduction and analysis methods and techniques, as would be acceptable to the FAA's Aircraft Certification Service.

(5) Calibration of data acquisition equipment and helicopter performance instrumentation must be current and traceable to a recognized standard.

c. The data, regardless of source, must be presented:

(1) in a format that supports the flight simulator validation process;

(2) in a manner that is clearly readable and annotated correctly and completely;

(3) with resolution sufficient to determine compliance with the tolerances set forth in attachment 2 of this appendix.

(4) with any necessary guidance information provided; and

(5) without alteration, adjustments, or bias; however the data may be re-scaled, digitized, or otherwise manipulated to fit the desired presentation.

d. After completion of any additional flight test, a flight test report must be submitted in support of the validation data. The report must contain sufficient data and rationale to support qualification of the simulator at the level requested.

End QPS Requirements

Begin Information

e. It is the intent of the NSPM that for new aircraft entering service, at a point well in advance of preparation of the Qualification Test Guide (QTG), the sponsor should submit to the NSPM for approval, a descriptive document (a validation data roadmap) containing the plan for acquiring the validation data, including data sources. This document should clearly identify sources of data for all required tests, a description of the validity of these data for a specific engine type and thrust rating configuration, and the revision levels of all avionics affecting the performance or flying qualities of the aircraft. Additionally, this document should provide rationale or explanations for cases where data or data parameters are missing, where engineering simulation data are used, where flight test methods require further explanations, etc. and provide a brief narrative describing the cause and effect of any deviation from data requirements. This document may be provided by the aircraft manufacturer.

f. There is no requirement for any flight test data supplier to submit a flight test plan/program prior to gathering flight test data. However, the NSP staff has experience that indicates at least some data gatherers, primarily those that do not have a satisfactory "history" of supplying such data, often provide data that is irrelevant, not properly marked, without adequate justification for selection, without adequate information regarding initial conditions, without adequate information regarding the test maneuver, etc. The NSP staff has been forced to not accept such data submissions as validation data for simulator evaluation. It is for this reason that the NSP staff recommends that any data supplier not previously experienced in this area review the data necessary for programming and for validating the performance of the simulator and discuss the flight test plan anticipated for acquiring such data with the NSP staff well in advance of commencing the flight tests.

g. The NSPM will consider, on a case-by-case basis, whether or not to approve supplemental validation data derived from flight data recording systems such as a Quick Access Recorder or Flight Data Recorder.

End Information

---

10. Special Equipment and Personnel Requirements for Qualification of the Simulator (§ 60.14).

Begin Information

a. In the event that the NSPM determines that special equipment or (a) specifically qualified person(s) will be required for the conduct of any evaluation, the NSPM will make every attempt to notify the sponsor at least one (1) week, but in no case less than 72 hours, in advance of the evaluation. Examples of special equipment include spot photometers, flight control measurement devices, sound analyzer, etc. Examples of specially qualified personnel would be those specifically qualified to install or use any special equipment when its use is required.

b. Examples of a special evaluation would be an evaluation conducted after the move of a simulator; at the request of the TPAA; as a result of comments received from users of the simulator that, upon analysis and confirmation, might cause a question as to the continued qualification or use of the simulator; etc.

End Information

---

11. Initial (and Upgrade) Qualification Requirements (§ 60.15).

Begin QPS Requirements

a. The request described in § 60.15(a) must include all of the following:

(1) A statement that the FSTD meets all of the applicable provisions of this part and all applicable provisions of the QPS.

(2) A confirmation that the sponsor will forward to the NSPM the statement described in § 60.15(b) in such time as to be received no later than 5 business days prior to the scheduled evaluation and may be forwarded to the NSPM via traditional or electronic means.

(3) A qualification test guide (QTG), acceptable to the NSPM, that includes all of the following:

(i) Objective data obtained from aircraft testing or another approved source.

(ii) Correlating objective test results obtained from the performance of the FSTD as prescribed in the appropriate QPS.

(iii) The result of FSTD performance demonstrations prescribed in the appropriate QPS.

(iv) A description of the equipment necessary to perform the evaluation for initial qualification and the continuing qualification evaluations.

b. The QTG described in paragraph a(3) of this section, must provide the documented proof of compliance with the simulator objective tests in attachment 2 of this appendix.

c. The QTG is prepared and submitted by the sponsor, or the sponsor's agent on behalf of the sponsor, to the NSPM for review and approval, and must include, for each objective test:

(1) Parameters, tolerances, and flight conditions;

(2) Pertinent and complete instructions for the conduct of automatically and manually conducted tests;

(3) A means of comparing the simulator's test results to the objective data;

(4) An explanation, or other information as necessary, to assist in the evaluation of the test results;

(5) Other information appropriate to the qualification level of the simulator.

d. The QTG described in paragraphs a(3) and b of this section, must include the following:

(1) A QTG cover page with sponsor and FAA approval signature blocks (see Attachment 4, Figure 2, for a sample QTG cover page).

(2) A continuing qualification evaluation schedule requirements page – to be used by the NSPM to establish and record the frequency with which continuing qualification evaluations must be conducted and any subsequent changes that may be determined by the NSPM. See Attachment 4, Figure 4, for a sample Continuing Qualification Evaluation Schedule Requirements page.

(3) A simulator information page that provides the information listed in this paragraph (see Attachment 4, Figure 3, for a sample simulator information page). For convertible simulators, a separate page is submitted for each configuration of the simulator.

(a) The sponsor's simulator identification number or code.

(b) The helicopter model and series being simulated.

(c) The aerodynamic data revision number or reference.

(d) The engine model(s) and its data revision number or reference.

(e) The flight control data revision number or reference.

(f) The flight management system identification and revision level.

(g) The simulator model and manufacturer.

(h) The date of simulator manufacture.

(i) The simulator computer identification.

(j) The visual system model and manufacturer, including display type.

(k) The motion system type and manufacturer, including degrees of freedom.

(4) A Table of Contents.

(5) A log of revisions and a list of effective pages.

(6) List of all relevant data references.

(7) A glossary of terms and symbols used (including sign conventions and units).

(8) Statements of compliance and capability (SOC's) with certain requirements. SOC's must provide references to the sources of information for showing the capability of the simulator to comply with the requirement, a rationale explaining how the referenced material is used, mathematical equations and parameter values used, and the conclusions reached; i.e. that the simulator complies with the requirement. Refer to the "Additional Details" column in attachment 1, "Simulator Standards," or in the "Test Details" column in attachment 2, "Simulator Objective Tests," to see when SOC's are required.

(9) Recording procedures or equipment required to accomplish the objective tests.

(10) The following information for each objective test designated in attachment 2, as applicable to the qualification level sought:

(a) Name of the test.

(b) Objective of the test.

(c) Initial conditions.

(d) Manual test procedures.

(e) Automatic test procedures (if applicable).

(f) Method for evaluating simulator objective test results.

(g) List of all relevant parameters driven or constrained during the automatically conducted test(s).

(h) List of all relevant parameters driven or constrained during the manually conducted test(s).

(i) Tolerances for relevant parameters.

(j) Source of Validation Data (document and page number).

(k) Copy of the Validation Data (if located in a separate binder, a cross reference for the identification and page number for pertinent data location must be provided).

(l) Simulator Objective Test Results as obtained by the sponsor. Each test result must reflect the date completed and must be clearly labeled as a product of the device being tested.

e. Form and manner of presentation of objective test results in the QTG:

(1) The sponsor's simulator test results must be recorded in a manner, acceptable to the NSPM, that will allow easy comparison of the simulator test results to the validation data (e.g., use of a multi-channel recorder, line printer, cross plotting, overlays, transparencies, etc.).

(2) Simulator results must be labeled using terminology common to helicopter parameters as opposed to computer software identifications.

(3) Validation data documents included in a QTG may be photographically reduced only if such reduction will not alter the graphic scaling or cause difficulties in scale interpretation or resolution.

(4) Scaling on graphical presentations must provide the resolution necessary to evaluate the parameters shown in attachment 2 of this appendix.

(5) For tests involving time histories, data sheets (or transparencies thereof) and simulator test results must be clearly marked with appropriate reference points to ensure an accurate comparison between simulator and helicopter with respect to time. Time histories recorded via a line printer are to be clearly identified for cross-plotting on the helicopter data. Over-plots must not obscure the reference data.

f. The sponsor may elect to complete the QTG objective tests at the manufacturer's facility. Tests performed at this location must be conducted after assembly of the simulator has been essentially completed, the systems and sub-systems are functional and operate in an interactive manner, and prior to the initiation of disassembly for shipment. The sponsor must substantiate simulator performance at the sponsor's training facility by repeating a representative sampling of all the objective tests in the QTG and submitting these repeated test results to the NSPM. This sample must consist of at least one-third of the QTG objective tests. The QTG must be clearly annotated to indicate when and where each test was accomplished.

g. While the subjective tests are normally accomplished at the sponsor's training facility, the sponsor may elect to complete the subjective tests at the manufacturer's facility. Tests performed at this location will be conducted after assembly of the simulator has been essentially completed, the systems and sub-systems are functional and operate in an interactive manner, and prior to the initiation of disassembly for shipment. The sponsor must substantiate simulator performance at the sponsor's training facility by having the pilot(s) who performed these tests originally (or similarly qualified pilot(s)), repeat a representative sampling of these subjective tests (need not take more than one normal simulator period – e.g., 4 hours) and submit a statement to the NSPM that the simulator has not changed from the original determination. This statement must clearly indicate when and where these repeated tests were completed.

h. The sponsor must maintain a copy of the MQTG at the simulator location. j. All simulators for which the initial qualification is conducted after [insert 6 years after effective date of this rule] must have an electronic MQTG (eMQTG) including all objective data obtained from helicopter testing, or another approved source (reformatted or digitized), together with correlating objective test results obtained from the performance of the simulator (reformatted or digitized) as prescribed in this appendix, the general simulator performance or demonstration results (reformatted or digitized) prescribed in this appendix, and a description of the equipment necessary to perform the evaluation for initial qualification and the continuing qualification evaluations for continuing qualification. This eMQTG must include the original validation data used to validate simulator performance and handling qualities in either the original digitized format from the data supplier or an electronic scan of the original time-history plots that were provided by the data supplier. An eMQTG must be provided to the NSPM.

i. All other simulators (not covered in subparagraph "i") must have an electronic copy of the MQTG by and after [insert 6 years after effective date of this rule], a copy of which must be provided to the NSPM. This may be provided by an electronic scan presented in a Portable Document File (PDF), or similar format, acceptable to the NSPM.

End QPS Requirements

Begin Information

j. Only those simulators that are sponsored by a certificate holder (as defined for use in part 60 and this QPS appendix) will be evaluated by the NSPM. However, other simulator evaluations may be conducted on a case-by-case basis as the Administrator deems appropriate, but only in accordance with applicable agreements.

k. Each simulator must be evaluated as completely as possible. To ensure a thorough and uniform evaluation, each simulator is subjected to the general simulator requirements and performance demonstrations in attachment 1, the objective tests listed in attachment 2, and the subjective tests listed in attachment 3 of this appendix. The evaluation(s) described herein will include, but not necessarily be limited to the following, as appropriate, for the qualification level of the simulator:

(1) Helicopter responses, including longitudinal and lateral-directional control responses (see attachment 2 of this appendix);

(2) Performance in authorized portions of the simulated helicopter's operating envelope, to include tasks evaluated by the NSPM in the areas of ground operations, takeoff, climb, cruise, descent, approach, and landing as well as abnormal and emergency operations (see paragraph [check reference] and attachment 2 of this appendix);

(3) Control checks (see attachment 1 and attachment 2 of this appendix);

(4) Cockpit configuration (see attachment 1 of this appendix);

(5) Pilot, flight engineer, and instructor station functions checks (see attachment 1 and attachment 3 of this appendix);

(6) Helicopter systems and sub-systems (as appropriate) as compared to the helicopter simulated (see attachment 1 and attachment 3 of this appendix);

(7) Simulator systems and sub-systems, including force cueing (motion), visual, and aural (sound) systems, as appropriate (see attachment 1 and attachment 2 of this appendix); and

(8) Certain additional requirements, depending upon the complexity of the simulator qualification level sought, including equipment or circumstances that may become hazardous to the occupants. The sponsor may be subject to Occupational Safety and Health Administration requirements.

l. The NSPM administers the objective and subjective tests, which includes an examination of functions. The tests include a qualitative assessment of the simulator by an NSP pilot. The NSP evaluation team leader may assign other qualified personnel to assist in accomplishing the functions examination and/or the objective and subjective tests performed during an evaluation when required.

(1) Objective tests provide a basis for measuring and evaluating simulator performance and determining compliance with the requirements of this part.

(2) Subjective tests provide a basis for:

(a) Evaluating the capability of the simulator to perform over a typical utilization period;

(b) Determining that the simulator satisfactorily simulates each required task;

(c) Verifying correct operation of the simulator controls, instruments, and systems; and

(d) Demonstrating compliance with the requirements of this part.

m. The tolerances for the test parameters listed in attachment 2 of this appendix are the maximum acceptable to the NSPM for simulator validation and are not to be confused with design tolerances specified for simulator manufacture. In making decisions regarding tests and test results, the NSPM relies on the use of operational and engineering judgment in the application of data (including consideration of the way in which the flight test was flown and way the data was gathered and applied) data presentations, and the applicable tolerances for each test.

n. In addition to the scheduled continuing qualification evaluation (see paragraph [check reference]), each simulator is subject to evaluations conducted by the NSPM at any time with no prior notification to the sponsor. Such evaluations would be accomplished in a normal manner (i.e., requiring exclusive use of the simulator for the conduct of objective and subjective tests and an examination of functions) if the simulator is not being used for flightcrew member training, testing, or checking. However, if the simulator were being used, the evaluation would be conducted in a non-exclusive manner. This non-exclusive evaluation will be conducted by the simulator evaluator accompanying the check airman, instructor, Aircrew Program Designee (APD), or FAA inspector aboard the simulator along with the student(s) and observing the operation of the simulator during the training, testing, or checking activities.

o. Problems with objective test results are handled according to the following:

(1) If a problem with an objective test result is detected by the NSP evaluation team during an evaluation, the test may be repeated and/or the QTG may be amended.

(2) If it is determined that the results of an objective test do not support the level requested but do support a lower level, the NSPM may qualify the simulator at that lower level. For example, if a Level D evaluation is requested and the simulator fails to meet sound test tolerances, it could be qualified at Level C.

p. After the NSPM issues a statement of qualification to the sponsor when a simulator is successfully evaluated, the simulator is recommended to the TPAA, who will exercise authority on behalf of the Administrator in approving the simulator in the appropriate helicopter flight training program.

q. Under normal circumstances, the NSPM establishes a date for the initial or upgrade evaluation within ten (10) working days after determining that a complete QTG is acceptable. Unusual circumstances may warrant establishing an evaluation date before this determination is made; however, once a schedule is agreed to, any slippage of the evaluation date at the sponsor's request may result in a significant delay, perhaps 45 days or more, in rescheduling and completing the evaluation. A sponsor may commit to an initial evaluation date under this early process, in coordination with and the agreement of the NSPM, but the request must be in writing and must include an acknowledgment of the potential schedule impact if the sponsor slips the evaluation from this early-committed date. See Attachment 4, figure 5, Sample Request for Initial Evaluation Date.

r. A convertible simulator is addressed as a separate simulator for each model and series helicopter to which it will be converted and for the FAA qualification level sought. An NSP evaluation is required for each configuration. For example, if a sponsor seeks qualification for two models of a helicopter type using a convertible simulator, two QTG's, or a supplemented QTG, and two evaluations are required.

s. The numbering system used for objective test results in the QTG should closely follow the numbering system set out in attachment 2, Simulator Objective Tests.

t. If additional information is needed regarding the preferred qualifications of pilots used to meet the requirements of §60.15(e), the reader should contact the NSPM or visit the NSPM website.

u. Examples of the exclusions for which the simulator might not have been subjectively tested by the sponsor or the NSPM and for which qualification might not be sought or granted, as described in §60.15(h)(6), include windshear training, circling approaches, etc.

End Information

---

12. Additional Qualifications for a Currently Qualified Simulator (§ 60.16).

There is no additional regulatory or informational material that applies to § 60.16, Additional Qualifications for a Currently Qualified Simulator.

---

13. Previously Qualified Simulators (§ 60.17).

Begin QPS Requirements

a. In instances where a sponsor plans to remove a simulator from active status for prolonged periods, the following procedures will apply:

(1) The NSPM must be advised in writing and the advisement must include an estimate of the period that the simulator will be inactive;

(2) Continuing Qualification evaluations would not be scheduled during the inactive period;

(3) The NSPM will remove the simulator from the list of qualified FSTD's on a mutually established date not later than the date on which the first missed continuing qualification evaluation would have been scheduled;

(4) Before the simulator may be restored to qualified status, it will require an evaluation by the NSPM. The evaluation content and time required for accomplishment will be based on the number of continuing qualification evaluations and sponsor-conducted quarterly inspections missed during the period of inactivity. For example, if the simulator were out of service for a 1 year period, it would be necessary to complete the entire QTG, since all of the quarterly evaluations would have been missed;

(5) The sponsor must notify the NSPM of any changes to the original scheduled time out of service;

(6) The simulator will normally be re-qualified using the FAA-approved MQTG and the criteria that was in effect prior to its removal from qualification; however, inactive periods of 2 years or more will require a review of the qualification basis and will likely result in the re-qualification to be against the standards in effect and current at the time of re-qualification.

End QPS Requirements

Begin Information

b. Other certificate holders or persons desiring to use a flight simulator may contract with simulator sponsors to use those simulators already qualified at a particular level for a helicopter type and approved for use within an FAA-approved flight training program. Such simulators are not required to undergo an additional qualification process, except as described in paragraph 17 of this appendix.

c. Each simulator user must obtain approval from the appropriate TPAA to use any simulator in an FAA-approved flight training program.

d. The intent of the requirement listed in § 60.17(b), for each simulator to have a Statement of Qualification within 6 years, is to have the availability of that statement (including the configuration list and the limitations to authorizations) to provide a complete picture of the simulator inventory regulated by the FAA. The issuance of the statement will not require any additional evaluation or require any adjustment to the evaluation basis for the simulator.

e. Downgrading of a simulator is a permanent change in qualification level. If a temporary restriction is placed on a simulator because of a missing, malfunctioning, or inoperative component or some repair is in progress, the restriction is not a permanent change in qualification level and such a temporary restriction can, and is, removed when the reason for the restriction has been resolved. It would be inappropriate to permanently downgrade a simulator and, at some undetermined time in the future, allow that simulator to be returned to its original status (i.e., accomplish an "upgrade") using the original qualification standards.

End Information

14. Inspection, Continuing Qualification Evaluation, and Maintenance Requirements (§ 60.19).

Begin QPS Requirements

a. The sponsor must conduct a minimum of four evenly spaced inspections throughout the year. The objective test sequence and content of each inspection in this sequence will be developed by the sponsor and will be acceptable to the NSPM.

b. The description of what constitutes the functional preflight inspection will be contained in the sponsor’s QMS.

(c) Record "functional preflight" in the simulator discrepancy log book or other acceptable location, including any item found to be missing, malfunctioning, or inoperative.

End QPS Requirements

Begin Information

d. In determining the acceptability of the sponsor’s test sequence and the content of each quarterly inspection required in § 60.19(a)(1), the NSPM looks for a balance and a mix from the performance demonstrations and objective test requirement areas listed as follows:

(1) Performance.

(2) Handling qualities.

(3) Motion system (where appropriate).

(4) Visual system (where appropriate).

(5) Sound system (where appropriate).

(6) Other simulator systems.

e. If the NSP evaluator plans to accomplish specific tests during a normal continuing qualification evaluation that requires the use of special equipment or technicians, the sponsor will be notified as far in advance of the evaluation as practical; but not less than 72 hours. These tests include latencies, control dynamics, sounds and vibrations, motion, and/or some visual system tests.

f. The continuing qualification evaluations, described in § 60.19(b), normally will require 4 hours of simulator time. Flexibility is necessary to address those situations that are not normal or those that involve aircraft with additional levels of complexity (e.g. computer controlled aircraft) and may require additional time. The continuing qualification evaluations will consist of the following:

(1) Review of the results of the objective tests and all the designated simulator performance demonstrations (quarterly inspections) conducted by the sponsor since the last scheduled continuing qualification evaluation.

(2) At the discretion of the evaluator, a selection of approximately 8 to 15 objective tests from the MQTG, that will, in the opinion of the evaluator, provide an adequate opportunity to evaluate, first hand, the performance of the simulator. The tests chosen will be performed either automatically or manually, at the discretion of the evaluator and should be able to be conducted within approximately one-third (1/3) of the allotted simulator time.

(3) A subjective evaluation of the simulator to perform a representative sampling of the tasks set out in attachment 3 of this appendix, selected at the discretion of the evaluator. This portion of the evaluation should take approximately two-thirds (2/3) of the allotted simulator time.

(4) An examination of the functions of the simulator, to include, but not necessarily limited to, the motion system, visual system, sound system, instructor operating station,

and the normal functions and simulated malfunctions of the simulated helicopter systems. This examination is normally accomplished simultaneously with the subjective evaluation requirements noted in subparagraph d(3).

g. The requirement established in § 60.19(b)(4) regarding the frequency of NSPM-conducted continuing qualification evaluations for each simulator is typically 12 months. However, the establishment and satisfactory operation of an approved quality management system for a sponsor will provide a basis for adjusting the interval between evaluations on some simulators at a given sponsor's location to exceed this 12-month interval.

End Information

---

15. Logging Simulator Discrepancies (§ 60.20).

There is no additional regulatory or informational material that applies to § 60.20. Logging Simulator Discrepancies.

---

16. Interim Qualification of Simulators for New Helicopter Types or Models (§ 60.21).

There is no additional regulatory or informational material that applies to § 60.21, Interim Qualification of Simulators for New Helicopter Types or Models.

---

17. Modifications to Simulators (§ 60.23).

Begin QPS Requirements

a. The notification described in § 60.23(c)(2) must include a complete description of the planned modification, with a description of the operational and engineering effect the proposed modification will have on the operation of the FFS and the results that are expected with the modification incorporated.

b. Prior to using the modified FFS:

(i) All the applicable objective tests that have been run with the modification incorporated, including any necessary updates to the MQTG must be acceptable to the NSPM; and

(ii) The sponsor must provide the NSPM with a statement signed by the MR that the factors cited in § 60.15(b) are addressed by the appropriate personnel as described in that section.

End QPS Requirements

Begin Information

c. See Attachment 4 for a sample Index of Effective FSTD Directives.

End Information

---

18. Operation with Missing, Malfunctioning, or Inoperative Components (§ 60.25).

Begin Information

a. Once the sponsor fairly and accurately advises the user of a simulator's current status, including any missing, malfunctioning, or inoperative (MMI) component(s), the sponsor's responsibility with respect to § 60.25(a) will have been satisfied.

b. If the 29th or 30th day of the 30-day period described in § 60.25(b) is on a Saturday, a Sunday, or a holiday, the intent of the FAA is to automatically extend the deadline until the next business day.

c. In accordance with the authorization described in § 60.25(b), the NSPM may find as acceptable a discrepancy prioritizing system wherein the length of time authorized to repair or replace any given MMI component is based on the level of impact on the capability of the simulator to provide the required training, evaluation, or flight experience, with the larger impact on this capability associated with a higher priority for repair or replacement.

End Information

---

19. Automatic Loss of Qualification and Procedures for Restoration of Qualification (§ 60.27).

Begin Information

If the sponsor provides a plan for how the simulator is to be maintained during its out-of-service period (e.g., periodic exercise of mechanical, hydraulic, and electrical systems; routine replacement of hydraulic fluid; control of the environmental factors in which the simulator is to be maintained, etc.) there is a greater likelihood of being able to determine the amount of testing that would be required for re-qualification.

End Information

20. Other Losses of Qualification and Procedures for Restoration of Qualification (§ 60.29)

Begin Information

If the sponsor provides a plan for how the simulator is to be maintained during its out-of-service period (e.g., periodic exercise of mechanical, hydraulic, and electrical systems; routine replacement of hydraulic fluid; control of the environmental factors in which the simulator is to be maintained, etc.) there is a greater likelihood of being able to determine the amount of testing that would be required for re-qualification.

End Information

---

21. Recordkeeping and Reporting (§ 60.31).

Begin QPS Requirements

a. The minimally acceptable record of programming changes, as described in § 60.31(a)(2), must consist of the name of the aircraft system software, aerodynamic model, or engine model change, the date of the change, a summary of the change, and the reason for the change.

b. If a coded form for record keeping is used, it must provide for the preservation and retrieval of information with appropriate security or controls to prevent the illegal or inappropriate alteration of such records after the fact.

End QPS Requirements

---

22. Applications, Logbooks, Reports, and Records: Fraud, Falsification, or Incorrect Statements (§ 60.33).

There are no additional QPS requirements or informational material that apply to § 60.33, Applications, Logbooks, Reports, and Records: Fraud, Falsification, or Incorrect Statements.

---

23. [Reserved].

---

24. [Reserved].

---

25. Simulator Qualification on the Basis of a Bilateral Aviation Safety Agreement (BASA) (§ 60.37).

There are no additional QPS requirements or informational material that apply to § 60.37, Simulator Qualification on the Basis of a Bilateral Aviation Safety Agreement (BASA).

Attachment 1 to Appendix C to Part 60--

GENERAL SIMULATOR REQUIREMENTS

Begin QPS Requirements

1. Requirements.

Certain requirements included in this appendix must be supported with a Statement of Compliance and Capability (SOC) and/or, in some designated cases, an Objective Test. The SOC will describe how the requirement was met, such as gear modeling approach, coefficient of friction sources, etc. The test results must show that the requirement has been attained. Other requirements are satisfied by either a Subjective Test or a Subjective Test. In the following tabular listing, requirements for SOCs and tests are indicated in the "Additional Details" column.

End QPS Requirements

Begin Information

2. Discussion.

a. This attachment describes the minimum general simulator requirements for qualifying helicopter full flight simulators (FFS). To determine the complete requirements for a specific level simulator the objective tests in attachment 2 and the examination of functions and subjective tests listed in attachment 3 must also be consulted.

b. The material contained in this attachment is divided into the following categories:

(1) General cockpit configuration.

(2) Simulator programming.

(3) Equipment operation.

(4) Equipment and facilities for instructor/evaluator functions.

(5) Motion system.

(6) Visual system.

(7) Sound system.

End Information

Begin QPS Requirements

TABLE OF MINIMUM SIMULATOR REQUIREMENTS							
QPS REQUIREMENTS							INFORMATION
General Simulator Requirements	Simulator Levels				Additional Details		
	A	B	C	D			
1. General Cockpit Configuration.							
a. The simulator must have a cockpit that is a full-scale replica of the helicopter simulated with controls, equipment, observable cockpit indicators, circuit breakers, and bulkheads properly located, functionally accurate and replicating the helicopter. The direction of movement of controls and switches must be identical to that in the helicopter.		X	X	X	An SOC is required. Pilot seats must afford the capability for the occupant to be able to achieve the design “eye position” established for the helicopter being simulated. Equipment for the operation of the cockpit windows and doors must be included, but they need not be operable. Fire axes, extinguishers, spare light bulbs, etc., must be available in the flight simulator but may be relocated to a suitable location as near as practical to the original position. Fire axes, landing gear pins, and any similar purpose instruments need only be represented in silhouette.		For simulator purposes, the cockpit consists of all that space forward of a cross section of the fuselage at the most extreme aft setting of the pilots' seats including additional, required crewmember duty stations and those required bulkheads aft of the pilot seats. For clarification, bulkheads containing only items such as landing gear pin storage compartments, fire axes or extinguishers, spare light bulbs, aircraft documents pouches etc., are not considered essential and may be omitted.
b. Those circuit breakers that affect procedures and/or result in observable cockpit indications must be properly located and functionally accurate.		X	X	X	An SOC is required.		
2. Programming.							
a. A flight dynamics model that accounts for various combinations of drag and thrust normally encountered in flight must correspond to actual flight conditions, including the effect of change in helicopter attitude, thrust, drag, altitude, temperature, gross weight, moments of inertia, center of gravity location, and configuration.		X	X	X	An SOC is required.		
b. The simulator must have the computer capacity, accuracy, resolution, and dynamic response needed to meet the qualification level sought.		X	X	X	An SOC is required.		

TABLE OF MINIMUM SIMULATOR REQUIREMENTS							
QPS REQUIREMENTS							INFORMATION
General Simulator Requirements	Simulator Levels				Additional Details		
	A	B	C	D			
c. Ground handling and aerodynamic programming must include the following:					An SOC is required. Level B does not require hover programming.		
(1) Ground effect.		X	X	X	Flare and touch down from a running landing as well as for in-ground-effect (IGE) hover.		
(2) Ground reaction.		X	X	X	Data is required to identify the flight condition and helicopter configuration		Reaction of the helicopter upon contact with the landing surface during landing, (e.g., strut deflection, tire or skid friction, side forces, etc.) and may differ with changes in gross weight, airspeed, rate of descent on touchdown, etc.
(3) Ground handling characteristics.		X	X	X	Control inputs required during operations in crosswind, during braking and deceleration, and for turning radius.		
d. The simulator must provide for manual and automatic testing of simulator hardware and software programming to determine compliance with simulator objective tests as prescribed in Attachment 2.			X	X	An SOC is required.		This may include an automated system, which could be used for conducting at least a portion of the QTG tests. Automatic “flagging” of out-of-tolerance situations is encouraged.
e. Relative responses of the motion system, visual system, and cockpit		X			Response must be within 150 milliseconds of the helicopter response. Objective Tests are required.		
instruments must be coupled closely to provide integrated sensory cues.			X	X	Response must be within 100 milliseconds of the helicopter response. Objective Tests are required.		
Visual change may start before motion response, but motion acceleration must be initiated before					Visual scene changes from steady state disturbance (i.e., the start of the scan of the		

TABLE OF MINIMUM SIMULATOR REQUIREMENTS							
QPS REQUIREMENTS							**INFORMATION**
General Simulator Requirements	**Simulator Levels**				**Additional Details**		
	A	**B**	**C**	**D**			
completion of the visual scan of the first video field containing different information.					first video field containing different information) and motion system onset must occur within the system dynamic response limit of 100/150 milliseconds.		
(1) Latency: These systems must respond to abrupt input at the pilot's position. The response must not be prior to that time when the helicopter responds and may respond up to 100/150 milliseconds after that time under the same conditions.					Simultaneously record: 1) the output from the pilot's controller(s); 2) the output from an accelerometer attached to the motion system platform located at an acceptable location near the pilots' seats; 3) the output signal to the visual system display (including visual system analog delays); and 4) the output signal to the pilot's attitude indicator or an equivalent test approved by the Administrator. Simulator performance must be recorded and the results must be compared to helicopter response data in the hover (for levels C and D only), climb, cruise, and autorotation. The results must be recorded in the QTG.		The intent is to verify that the simulator provides instrument, motion, and visual cues that are, within the stated time delays, like the helicopter responses. For helicopter response, acceleration in the appropriate, corresponding rotational axis is preferred. Simulator Latency is measured from the start of a control input to the appropriate perceivable change in flight instrument indication; visual system response; or motion system response (this does not include helicopter response time as per the manufacturer's data).
(2) Transport Delay: (As an alternative to the Latency requirement, above, a transport delay objective test may be used to demonstrate that the simulator system does not exceed the specified limit. The sponsor must measure all the delay encountered by a step signal migrating from the pilot's control through the control loading electronics and interfacing through all the simulation software modules in the correct order, using a handshaking protocol, finally through the normal output interfaces to the					An SOC is required. A recordable start time for the test must be provided with the pilot flight control input. The migration of the signal must permit normal computation time to be consumed and must not alter the flow of information through the hardware/software system. While transport delay need only be measured once in each axis, independent of flight condition,		The transport delay is the time between the control input and the individual hardware (i.e., instruments, motion system, visual system) responses. If Transport Delay is the chosen method to demonstrate relative responses, it is expected that, when reviewing those existing tests where latency

TABLE OF MINIMUM SIMULATOR REQUIREMENTS						
QPS REQUIREMENTS						INFORMATION
General Simulator Requirements	Simulator Levels				Additional Details	
	A	B	C	D		
instrument displays, the motion system, and the visual system.)					if this method is chosen, the sponsor must also demonstrate the latency of the simulator with respect to that of the helicopter with at least one demonstration in pitch, in roll, and in yaw as described above. Simulator performance must be recorded and the results must be recorded in the QTG.	can be identified the sponsor and the NSPM will apply additional scrutiny to ensure proper simulator response.
f. The simulator must accurately reproduce the stopping and directional control forces for at least, the following landing surface conditions for a running landing: (1) Dry; (2) Wet; (3) Icy; (4) Patchy Wet. (5) Patchy Icy.			X	X	An SOC is required. Objective tests are required only for dry, wet, and icy runway conditions; see Attachment 2.	
g. The simulator must accurately simulate: 1) brake and tire failure dynamics (including antiskid failure). 2) decreased brake efficiency due to high brake temperatures, if applicable.			X	X	An SOC is required.	Simulator pitch, side loading, and directional control characteristics should be representative of the helicopter.
h. The modeling in the simulator must include: (1) Ground effect, (2) Effects of airframe icing (if applicable), (3) Aerodynamic interference effects between the rotor wake and fuselage, (4) Influence of the rotor on control and stabilization systems, and (5) Representations of nonlinearities due to			X	X	An SOC is required and must include references to computations of aeroelastic representations and of nonlinearities due to sideslip. An SOC and a demonstration of icing effects (if applicable) are required.	See Attachment 2, paragraph 4, for further information on ground effect.

TABLE OF MINIMUM SIMULATOR REQUIREMENTS							
QPS REQUIREMENTS							INFORMATION
General Simulator Requirements	Simulator Levels				Additional Details		
	A	B	C	D			
sideslip.							
i. The simulator must provide for realistic mass properties, including gross weight, center of gravity, and moments of inertia as a function of payload and fuel loading.		X	X	X	An SOC is required and must include a range of tabulated target values to enable a subjective test of the mass properties model to be conducted from the instructor's station.		
							.
3. Equipment Operation.							
a. All relevant instrument indications involved in the simulation of the helicopter must automatically respond to control movement or external disturbances to the simulated helicopter; e.g., turbulence or windshear.		X	X	X	Numerical values must be presented in the appropriate units. A subjective test is required.		
b. Communications, navigation, caution, and warning equipment must be installed and operate within the tolerances applicable for the helicopter.		X	X	X	A subjective test is required.		See Attachment 3, paragraph 1d for further information regarding long-range navigation equipment.
c. Simulator systems must operate as the helicopter systems would operate under normal, abnormal, and emergency operating conditions on the ground and in flight.		X	X	X	A subjective test is required.		
d. The simulator must provide pilot controls with control forces and control travel that correspond to the simulated helicopter. The simulator must also react in the same manner as in the helicopter under the same flight conditions.		X	X	X	An objective test is required.		
4. Instructor or Evaluator Facilities.							
a. In addition to the flight crew member stations, the simulator must have at least two suitable seats for the instructor/check airman and FAA inspector. These seats must provide adequate vision to the pilot's panel and forward windows.		X	X	X	All seats other than flight crew seats need not represent those found in the helicopter but must be adequately secured to the floor and equipped with similar positive restraint devices. A subjective test is required.		The NSPM will consider alternatives to this standard for additional seats based on unique cockpit configurations.
b. The simulator must have controls that enable the instructor/evaluator to control all required system variables and insert all abnormal or emergency conditions into the simulated helicopter		X	X	X	A subjective test is required.		

TABLE OF MINIMUM SIMULATOR REQUIREMENTS							
QPS REQUIREMENTS							INFORMATION
General Simulator Requirements	Simulator Levels				Additional Details		
	A	B	C	D			
systems as described in the sponsor's FAA-approved training program; or as described in the relevant operating manual as appropriate.							
c. The simulator must have instructor controls for environmental conditions including wind speed and direction.		X	X	X	A subjective test is required.		
d. The simulator must provide the instructor or evaluator the ability to present ground and air hazards.			X	X	A subjective test is required.		For example, another aircraft crossing the active runway and converging airborne traffic; etc.
5. Motion System.							
a. The simulator must have motion (force) cues perceptible to the pilot that are representative of the motion in an helicopter.		X	X	X	A subjective test is required.		For example, touchdown cues should be a function of the rate of descent (RoD) of the simulated helicopter.
b. The simulator must have a motion (force cueing) system with a minimum of three degrees of freedom (at least pitch, roll, and heave).		X			An SOC is required.		
c. The simulator must have a motion (force cueing) system that produces cues at least equivalent to those of a six-degrees-of-freedom, synergistic platform motion system (i.e., pitch, roll, yaw, heave, sway, and surge).			X	X	An SOC is required.		
d. The simulator must provide for the recording of the motion system response time.		X	X	X	An SOC is required.		
e. The simulator must provide motion effects programing to include: (1) Runway rumble, oleo deflections, effects of ground speed, uneven runway, characteristics. (2) Buffets due to transverse flow effects, (3) Buffet during extension and retraction of landing gear.. (4) Buffet due to retreating blade		X	X	X	A subjective test is required.		

TABLE OF MINIMUM SIMULATOR REQUIREMENTS							
QPS REQUIREMENTS							INFORMATION
General Simulator Requirements	Simulator Levels				Additional Details		
	A	B	C	D			
stall.. (5) Buffet due to settling with power.. (6) Representative cues resulting from touchdown.. (7) Rotor vibrations.							
(8) Tire failure dynamics. (9) Engine malfunction and engine damage. (10) Airframe (e.g., tail, flap, engine pod) ground strike.			X	X	A subjective test is required.		
(11) Motion vibrations that result from atmospheric disturbances.				X	For air turbulence, general purpose disturbance models that approximate demonstrable flight test data are acceptable.		
f. The simulator must provide characteristic motion vibrations that result from operation of the helicopter, (for example, retreating blade stall, extended landing gear, settling with power) in so far as vibration marks an event or helicopter state, which can be sensed in the cockpit.				X	An objective test is required.		The simulator should be programmed and instrumented in such a manner that the characteristic buffet modes can be measured and compared to helicopter data.
6. Visual System.							
a. The simulator must have a visual system providing an out-of-the-cockpit view.		X	X	X	A subjective test is required.		
b. The simulator must provide a continuous minimum collimated field of view of 75° horizontally and 30° vertically per pilot seat. Both pilot seat visual systems must be operable simultaneously.		X			An SOC is required.		
c. The simulator must provide a continuous minimum collimated visual field of view of 150° horizontally and 40° vertically per pilot seat. Both pilot seat visual systems must be operable			X		An SOC is required. Horizontal field of view is centered on the zero degree azimuth line relative to the aircraft fuselage.		Optimization of the vertical field of view may be considered with

QPS REQUIREMENTS							INFORMATION
General Simulator Requirements	Simulator Levels				Additional Details		
	A	B	C	D			
simultaneously.							respect to the specific helicopter cockpit cut-off angle.
d. The simulator must provide a continuous minimum collimated visual field of view of 180° horizontally and 60° vertically for each pilot. Both pilot seat visual systems must be operable simultaneously.				X	An SOC and an Objective Test is required. Horizontal field of view is centered on the zero degree azimuth line relative to the aircraft fuselage.		Optimization of the vertical field of view may be considered with respect to the specific helicopter cockpit cut-off angle.
e. The visual system must be free from optical discontinuities and artifacts that create non-realistic cues.		X	X	X	A subjective test is required.		Non-realistic cues might include image swimming and image roll-off, that may lead a pilot to make incorrect assessments of speed, acceleration and/or situational awareness.
f. The simulator must have operational landing lights for night scenes.		X	X	X	A subjective test is required Where used, dusk (or twilight) scenes require operational landing lights.		
g. The simulator must have instructor controls for the following: (1) Cloudbase. (2) Visibility in statute miles (km) and runway visual range (RVR) in ft. (m). (3) Airport or landing area selection. (4) Airport or landing area lighting.		X	X	X	A subjective test is required.		
h. Each airport scene displayed must include the following: (1) Airport runways and taxiways. (2) Runway definition. (i) Runway surface and markings. (ii) Lighting for the runway in use, including runway threshold, edge, centerline, touchdown zone, VASI (or PAPI), and approach lighting of		X	X	X	A subjective test is required.		

TABLE OF MINIMUM SIMULATOR REQUIREMENTS						
QPS REQUIREMENTS						INFORMATION
General Simulator Requirements	Simulator Levels				Additional Details	
	A	B	C	D		
appropriate colors, as appropriate. (iii) Taxiway lights.						
i. The distances at which runway features are visible, as measured from runway threshold to an helicopter aligned with the runway on an extended 3° glide slope must not be less than listed below: (1) Runway definition, strobe lights, approach lights, runway edge white lights and Visual Approach Slope Indicator (VASI) or Precision Approach Path Indicator (PAPI) system lights from 5 statute miles (8 kilometers (km)) of the runway threshold. (2) Runway centerline lights and taxiway definition from 3 statute miles (4.8 km). (3) Threshold lights and touchdown zone lights from 2 statute miles (3.2 km). (4) Runway markings within range of landing lights for night scenes and as required by three (3) arc-minutes resolution on day scenes.		X	X	X	A funtional test is required.	
j. The simulator must provide visual system compatibility with dynamic response programming.		X	X	X	A Subjective Test is required.	
k. The simulator must be verified for visual ground segment and visual scene content for the helicopter in landing configuration and a main wheel (or landing skid) height of 100 feet (30 meters) above the touchdown zone. Data submitted must include at least the following: (1) Static helicopter dimensions as follows: (i) Horizontal and vertical distance from main landing gear (MLG) or landing skids to glideslope reception antenna. (ii) Horizontal and vertical distance from MLG or skids to pilot's eyepoint. (iii) Static cockpit cutoff angle.		X	X	X	An SOC is required. The QTG must contain appropriate calculations and a drawing showing the pertinent data used to establish the helicopter location and the segment of the ground that is visible considering the helicopter attitude (cockpit cut-off angle) and a runway visual range of 1,200 feet or 350 meters. Simulator performance must be measured against the QTG calculations. Sponsors must provide this data for each simulator (regardless of previous qualification standards) to qualify the simulator for all precision instrument approaches.	The test should be conducted in the landing configuration, trimmed for appropriate airspeed, at 100 ft (30m) above the touchdown zone, on glide slope with an RVR value set at 1,200 ft (350m). This will show the modeling accuracy of RVR, glideslope, and localizer for a given weight, configuration and speed within the helicopter's operational envelope for a

TABLE OF MINIMUM SIMULATOR REQUIREMENTS						
QPS REQUIREMENTS						INFORMATION
General Simulator Requirements	Simulator Levels				Additional Details	
	A	B	C	D		
(2) Approach data as follows: (i) Identification of runway. (ii) Horizontal distance from runway threshold to glideslope intercept with runway. (iii) Glideslope angle. (iv) Helicopter pitch angle on approach. (3) Helicopter data for manual testing: (i) Gross weight. (ii) Helicopter configuration. (iii) Approach airspeed.					At the near end of the visual ground segment, lights and ground objects computed to be visible from the helicopter cockpit must be visible in the flight simulator. The far end of the visual ground segment must be at the computed end of the segment ±20% of the computed visible segment distance.	normal approach and landing. If non-homogenous fog is used, the vertical variation in horizontal visibility should be described and be included in the slant range visibility calculation used in the computations.
l. The simulator must provide visual cues necessary to assess rate of change of height, height AGL, as well as translational displacement and rates during takeoffs and landings.		X			A subjective test is required.	
m. The simulator must have night and dusk (or twilight) visual scene capability, including general terrain characteristics and significant landmarks, free from apparent quantization.			X	X	A subjective test is required. Dusk (or twilight) scene must enable identification of a visible horizon and general terrain characteristics.	Examples of general terrain characteristics are fields, roads, and bodies of water.
n. The simulator must provide visual cues necessary to assess rate of change of height, height AGL, as well as translational displacement and rates during takeoff, low altitude/low airspeed maneuvering, hover, and landing.			X	X	A subjective test is required.	
o. The simulator must provide for (2) Accurate portrayal of the environment relating to the simulator attitude.		X	X	X	A subjective test is required.	Visual attitude vs. simulator attitude is a comparison of pitch and roll of the horizon as displayed in the visual scene compared to the display on the attitude indicator.
(2) Quick confirmation of visual system color, RVR, focus, and intensity.			X	X	An SOC is required. A subjective test is required.	
p. The simulator must provide a minimum of three			X	X	A subjective test is required.	

TABLE OF MINIMUM SIMULATOR REQUIREMENTS							
QPS REQUIREMENTS							INFORMATION
General Simulator Requirements	Simulator Levels				Additional Details		
	A	B	C	D			
airport (or landing area) scenes including: (1) Surfaces on landing areas. (2) Lighting of appropriate color for all landing surfaces, including, for runways, runway threshold, edge, centerline, VASI (or PAPI), and approach lighting for the runway in use. (3) Airport taxiway lighting. (4) Terrain, including ramps and buildings that correspond to the sponsor's Line Oriented scenarios, as appropriate.							
q. The simulator must be capable of producing at least 10 levels of occulting.			X	X	A subjective test is required.		
r. The simulator must be able to provide weather representations including the following: (1) Variable cloud density. (2) Partial obscuration of ground scenes; i.e., the effect of a scattered to broken cloud deck. (3) Gradual break out. (4) Patchy fog. (5) The effect of fog on airport lighting.			X	X	A subjective test is required. The weather representations must be provided at and below an altitude of 2,000 ft (610 m) height above the airport and within a radius of 10 miles (16 km) from the airport.		
s. When used in training, testing, or checking activities, the simulator must provide night visual scenes with sufficient scene content to recognize the airport, the terrain, and major landmarks around the airport. The scene content must allow a pilot to successfully accomplish a visual landing.		X	X	X	Night scenes, as a minimum, must provide presentations of sufficient surfaces with appropriate textural cues that include self-illuminated objects such as road networks, ramp lighting and airport signage, to conduct a visual approach, a landing, and airport movement (taxi). Scenes must include a definable horizon and typical terrain characteristics such as fields, roads and bodies of water and surfaces illuminated by helicopter landing lights.		
t. When used in training, testing, or checking activities, the simulator must provide dusk (or twilight) visual scenes with sufficient scene content to recognize the airport, the terrain, and			X	X	An SOC is required. Dusk (or twilight) scenes, as a minimum, must provide full color presentations of reduced ambient intensity, sufficient surfaces with appropriate textural		

TABLE OF MINIMUM SIMULATOR REQUIREMENTS							
QPS REQUIREMENTS							INFORMATION
General Simulator Requirements	**Simulator Levels**				**Additional Details**		
	A	**B**	**C**	**D**			
major landmarks around the airport. The scene content must allow a pilot to successfully accomplish a visual landing.					cues that include self-illuminated objects such as road networks, ramp lighting and airport signage, to conduct a visual approach, landing and airport movement (taxi). Scenes must include a definable horizon and typical terrain characteristics such as fields, roads and bodies of water and surfaces illuminated by representative aircraft lighting (e.g. landing lights). If provided, directional horizon lighting must have correct orientation and be consistent with surface shading effects. Total scene content must be comparable in detail to that produced by 10,000 visible textured surfaces and 15,000 visible lights with sufficient system capacity to display 16 simultaneously moving objects		
u. The simulator must have daylight, night, and either dusk or twilight visual scenes with sufficient scene content to recognize the airport, the terrain, and major landmarks around the airport. The scene content must allow a pilot to successfully accomplish a visual landing.				X	An SOC is required. A subjective test is required. Any ambient lighting must not “washout” the displayed visual scene. Total scene content must be comparable in detail to that produced by 10,000 visible textured surfaces and 6,000 visible lights with sufficient system capacity to display 16 simultaneously moving objects. The visual display must be free of apparent quantization and other distracting visual effects while the simulator is in motion. These requirements are applicable to any level of simulator equipped with a “daylight” visual system.		Brightness capability may be demonstrated with a test pattern of white light using a spot photometer. Daylight visual system is defined as a visual system capable of producing, at a minimum, full color presentations, scene content comparable in detail to that produced by 4,000 edges or 1,000 surfaces for daylight and 4,000 lightpoints for night and dusk scenes, 6 foot-lamberts (20 cd/m^2) of light measured at the pilot's eye position (highlight brightness) and a display which is free of apparent quantization and other distracting visual effects

TABLE OF MINIMUM SIMULATOR REQUIREMENTS							
QPS REQUIREMENTS							INFORMATION
General Simulator Requirements	Simulator Levels				Additional Details		
	A	B	C	D			
							while the simulator is in motion.
v. The simulator must provide operational visual scenes that portray physical relationships known to cause landing illusions to pilots.				X	A subjective test is required.		For example: short runways, landing approaches over water, uphill or downhill runways, rising terrain on the approach path, unique topographic features, etc.
w. The simulator must provide special weather representations of light, medium, and heavy precipitation near a thunderstorm on takeoff and during approach and landing.				X	A subjective test is required. Representations need only be presented at and below an altitude of 2,000 ft. (610 m) above the airport surface and within 10 miles (16 km) of the airport.		
x. The simulator must present visual scenes of wet and snow-covered landing areas, including lighting reflections for wet conditions, partially obscured lights for snow conditions, or suitable alternative effects.				X	A subjective test is required.		
y. The simulator must present realistic color and directionality of all airport lighting.				X	A subjective test is required.		
7. Sound System.							
a. The simulator must provide cockpit sounds that result from pilot actions that correspond to those that occur in the helicopter.		X	X	X			
b. The simulator must accurately simulate the sound of precipitation, windshield wipers, and other significant helicopter noises perceptible to the pilot during normal and abnormal operations, and include the sound of a crash (when the simulator is landed in an unusual attitude or in excess of the structural gear limitations); normal engine and thrust reversal sounds; and the sounds of flap, gear, and spoiler extension and retraction.			X	X	An SOC is required. A subjective test is required.		
c. The simulator must provide realistic amplitude				X	Simulator performance must be recorded,		

TABLE OF MINIMUM SIMULATOR REQUIREMENTS							
QPS REQUIREMENTS							INFORMATION
General Simulator Requirements	Simulator Levels				Additional Details		
	A	B	C	D			
and frequency of cockpit noises and sounds.					compared to amplitude and frequency of the same sounds recorded in the helicopter, and be made a part of the QTG. .		
d. Volume control, if installed, must have an indication of the sound level setting.		X	X	X			

Attachment 2 to Appendix C to Part 60--

SIMULATOR OBJECTIVE TESTS

1. General

Begin QPS Requirements

a. Test Requirements.

(1) The ground and flight tests required for qualification are listed in the following Table of Objective Tests. Computer generated simulator test results must be provided for each test. If a flight condition or operating condition is required for the test but which does not apply to the helicopter being simulated or to the qualification level sought, it may be disregarded (for example: an engine out missed approach for a single-engine helicopter; a hover test for a Level B simulator; etc.). Each test result is compared against Flight Test Data described in § 60.13, and Paragraph 9 in the main body of this appendix. Although use of a driver program designed to automatically accomplish the tests is encouraged for all simulators and required for Level C and Level D simulators, each test must be able to be accomplished manually while recording all appropriate parameters. The results must be produced on an appropriate recording device acceptable to the NSPM and must include simulator number, date, time, conditions, tolerances, and appropriate dependent variables portrayed in comparison to the validation data. Time histories are required unless otherwise indicated in the Table of Objective Tests. All results must be labeled using the tolerances and units given.

(2) The Table of Objective Tests in this attachment sets out the test results required, including the parameters, tolerances, and flight conditions for simulator validation. Tolerances are provided for the listed tests because mathematical modeling and acquisition/development of reference data are often inexact. All tolerances listed in the following tables are applied to simulator performance. When two tolerance values are given for a parameter, the less restrictive may be used unless otherwise indicated.

(3) Certain tests included in this attachment must be supported with a Statement of Compliance and Capability (SOC). In the following tabular listing of simulator tests, requirements for SOC's are indicated in the ``Test Details'' column.

(4) When operational or engineering judgment is used in making assessments for flight test data applications for simulator validity, such judgment must not be limited to a single parameter. For example, data that exhibit rapid variations of the measured parameters may require interpolations or a ``best fit'' data selection. All relevant parameters related to a given maneuver or flight condition must be provided to allow overall interpretation. When it is difficult or impossible to match simulator to helicopter data throughout a time history, differences must be justified by providing a comparison of other related variables for the condition being assessed.

(5) Unless noted otherwise, simulator tests must represent helicopter performance and handling qualities at operating weights and centers of gravity (CG) typical of normal operation. If a test is supported by helicopter data at one extreme weight or CG, another test supported by helicopter data at mid-conditions or as close as possible to the other extreme must be included, except as may be authorized by the NSPM. Tests of handling qualities must include validation of augmentation devices.

(6) When comparing the parameters listed to those of the helicopter, sufficient data must also be provided to verify the correct flight condition and helicopter configuration changes. For example: to show that control force is within +/-0.5 pounds (0.22 daN) in a static stability test, data to show the correct airspeed, power, thrust or torque, helicopter configuration, altitude, and other appropriate datum identification parameters must also be given. For example: if comparing short period dynamics, normal acceleration may be used to establish a match to the helicopter, but airspeed, altitude, control input, helicopter configuration, and other appropriate data must also be given. All airspeed values must be clearly annotated as to indicated, calibrated, etc., and like values used for comparison.

(7) The QTG provided by the sponsor must describe clearly and distinctly how the simulator will be set up and operated for each test. Overall integrated testing of the simulator must be accomplished to assure that the total simulator system meets the prescribed standards; i.e., it is not acceptable to test only each simulator subsystem independently. A manual test procedure with explicit and detailed steps for completion of each test must also be provided.

(8) In those cases where the objective test results authorize a snapshot" result in lieu of a time-history result, the sponsor must ensure that a steady state condition exists from 5 seconds prior to, through 2 seconds after, the instant of time captured by the ``snapshot."

(9) For previously qualified simulators, the tests and tolerances of this attachment may be used in subsequent recurrent evaluations for any given test providing the sponsor has submitted a proposed MQTG revision to the NSPM and has received NSPM approval.

(10) Motion System Tests:

(a) The minimum excursions, accelerations, and velocities for pitch, roll, and yaw must be measurable about a single, common reference point and must be achieved by driving one degree of freedom at a time.

(b) The minimum excursions, accelerations, and velocities for heave, sway, and surge may be measured about different but identifiable reference points and must also be achieved by driving one degree of freedom at a time.

(11) Simulators for augmented helicopters will be validated both in the unaugmented configuration (or failure state with the maximum permitted degradation in handling qualities) and the augmented configuration. Where various levels of handling qualities result from failure states, validation of the effect of the failure is necessary. For those performance and static handling qualities tests where the primary concern, in the unaugmented configuration, is control position, unaugmented data are not required if the design of the system precludes any affect on control position. In those instances where the unaugmented helicopter response is divergent and non-repeatable, it may not be feasible to meet the specified tolerances. Alternative requirements for testing will be mutually agreed to between the sponsor and the NSPM on a case-by-case basis.

(12) For highly augmented helicopters using helicopter hardware (i.e., ``helicopter modular controllers") in the simulator cockpit, some tests will not be required. Those tests are annotated in the “Additional Requirements” column. However, in these cases the sponsor must supply a statement that the helicopter hardware meets and will continue to meet the appropriate manufacturer's specifications and the sponsor must have supporting information to that fact available for NSPM review.

(13) For objective test purposes, “Near maximum” gross weight is a weight chosen by the sponsor or data provider that is not less than the basic operating weight (BOW) of the helicopter being simulated plus 80% of the difference between the maximum certificated gross weight (either takeoff weight or landing

weight, as appropriate for the test) and the BOW. “Light” gross weight is a weight chosen by the sponsor or data provider that is not more than 120% of the BOW of the helicopter being simulated or as limited by the minimum practical operating weight of the test helicopter. “Medium” gross weight is a weight chosen by the sponsor or data provider that is approximately ±10% of the average of the numerical values of the BOW and the maximum certificated gross weight. (Note: BOW is the empty weight of the aircraft plus the weight of the following: normal oil quantity; lavatory servicing fluid; potable water; required crewmembers and their baggage; and emergency equipment. (References: Advisory Circular 120-27, “Aircraft Weight and Balance;” and FAA- H-8083-1, “Aircraft Weight and Balance Handbook.”)

End QPS Requirements

Begin Information

b. Discussion

(1) If relevant winds are present in the objective data, the wind vector (magnitude and direction) should be clearly noted as part of the data presentation, expressed in conventional terminology, and related to the runway being used for the test.

(2) The NSPM will not evaluate any simulator unless the required SOC indicates that the motion system is designed and manufactured to safely operate within the simulator's maximum excursion, acceleration, and velocity capabilities (see paragraph 4, Motion System, in the following table).

End Information

Begin QPS Requirements

TABLE OF OBJECTIVE TESTS									
QPS REQUIREMENTS >>>									INFORMATION
TEST	TOLERANCE	FLIGHT CONDITIONS	SIMULATOR LEVEL				TEST DETAILS		NOTES
			A	B	C	D			
1. Performance									
a. Engine Assessment									
(1) Start Operations (a) Engine start and acceleration (transient).	Light Off Time - ±10% or ±1 sec., Torque - ±5%, Rotor Speed - ±3%, Fuel Flow -±10%, Gas Generator Speed - ±5%, Power Turbine Speed - ±5%, Gas Turbine Temp. - ±30°C	Ground with the Rotor Brake Used and Not Used		X	X	X	Record each engine start from the initiation of the start sequence to steady state idle and from steady state idle to operating RPM.		
(b) Steady State Idle and Operating RPM conditions.	Torque - ±3%, Rotor Speed - ±1.5%, Fuel Flow - ±5%, Gas Generator Speed - ±2%, Power Turbine Speed - ±2%, Turbine Gas Temp. - ±20°C	Ground		X	X	X	Record both steady state idle and operating RPM conditions. May be a series of snapshot tests.		
(2) Power Turbine Speed Trim	±10% of total change of power turbine speed.	Ground		X	X	X	Record engine response to trim system actuation in both directions.		
(3) Engine and Rotor Speed Governing	Torque - ±5%, Rotor Speed - 1.5%	Climb, descent		X	X	X	Record results using a step input to the collective. May be conducted concurrently with climb and descent performance tests.		
b. Ground Operations									
(1) Minimum Radius Turn	±3 ft. (0.9m) or 20% of helicopter turn radius.	Ground		X	X	X	If brakes are used, brake force must be matched to the helicopter flight test value.		

TABLE OF OBJECTIVE TESTS								
QPS	**REQUIREMENTS**		>>>					**INFORMATION**
TEST	**TOLERANCE**	**FLIGHT CONDITIONS**	**SIMULATOR LEVEL**				**TEST DETAILS**	**NOTES**
			A	**B**	**C**	**D**		
(2) Rate of Turn vs. Pedal Deflection or Nosewheel Angle	±10% or ±2º/sec. Turn Rate	Ground Takeoff		X	X	X		
(3) Taxi	Pitch Angle - ±1.5º, Torque - ±3%, Longitudinal Control Position - ±5%, Lateral Control Position - ±5%, Directional Control Position ±5%, Collective Control Position - ±5%	Ground		X	X	X	Record results for control position and pitch attitude during ground taxi for a specific ground speed, wind speed and direction, and density altitude.	
(4) Brake Effectiveness	±10% of time and distance.	Ground		X	X	X		
c. Takeoff								
(1) All Engines	Airspeed - ±3 kt, Altitude - ±20 ft (6.1m), Torque - ±3%, Rotor Speed - ±1.5%, Vertical Velocity - ±100 fpm (0.50m/sec) or 10%, Pitch Attitude - ±1.5º, Bank Attitude - ±2º, Heading - ±2º, Longitudinal Control Position - ±10%, Lateral Control Position - ±10%, Directional Control Position - ±10%, Collective Control Position - ±10%,	Ground/Takeoff and Initial Segment of Climb		X	X	X	Record results of takeoff flight path as appropriate to helicopter model simulated (running takeoff for Level B, takeoff from a hover for Level C and D). For Level B, the criteria apply only to those segments at airspeeds above effective translational lift. Results must be recorded from the initiation of the takeoff to at least 200 ft (61m) AGL.	
(2) One Engine	Airspeed - ±3 kt,	Ground/Takeoff;		X	X	X	Record takeoff flight path as	

TABLE OF OBJECTIVE TESTS									
QPS	**REQUIREMENTS >>>**								**INFORMATION**
TEST	**TOLERANCE**	**FLIGHT CONDITIONS**	**SIMULATOR LEVEL**				**TEST DETAILS**		**NOTES**
			A	**B**	**C**	**D**			
Inoperative.	Altitude - ±20 ft (6.1m), Torque - ±3%, Rotor Speed - ±1.5%, Vertical Velocity - ±100 fpm (0.50m/sec) or 10%, Pitch Attitude - ±1.5º, Bank Attitude - ±2º, Heading - ±2º, Longitudinal Control Position - ±10% Lateral Control Position - ±10%, Directional Control Position - ±10%, Collective Control Position - ±10%,	and Initial Segment of Climb					appropriate to helicopter model simulated. Results must be recorded from the initiation of the takeoff to at least 200 ft (61m) AGL.		
d. Hover									
Performance	Torque - ±3%, Pitch Attitude - ±1.5º, Bank Attitude - ±1.5º, Longitudinal Control Position - ±5%, Lateral Control Position - ±5%, Directional Control Position - ±5%, Collective Control Position - ±5%,	In Ground Effect (IGE); and Out of Ground Effect (OGE)			X	X	Record results for light and heavy gross weights. May be a series of snapshot tests.		
e. Vertical Climb									
Performance	Vertical Velocity - ±100 fpm (0.50 m/sec) or ±10%, Directional Control Position - ±5%, Collective Control Position - ±5%	From OGE Hover			X	X	Record results for light and heavy gross weights. May be a series of snapshot tests.		.

TABLE OF OBJECTIVE TESTS									
QPS	REQUIREMENTS >>>								INFORMATION
TEST	TOLERANCE	FLIGHT CONDITIONS	SIMULATOR LEVEL				TEST DETAILS		NOTES
			A	B	C	D			
f. Level Flight									
Performance and Trimmed Flight Control Positions.	Torque - ±3%, Pitch Attitude - ±1.5º, Sideslip Angle - ±2º, Longitudinal Control Position - ±5%, Lateral Control Position - ±5%, Directional Control Position - ±5%, Collective Control Position - ±5%	Cruise (Augmentation On and Off)		X	X	X	Record results for two gross weight and CG combinations with varying trim speeds throughout the airspeed envelope. May be a series of snapshot tests.		
g. Climb									
Performance and Trimmed Flight Control Positions.	Vertical Velocity - ±100 fpm (61m/sec) or ±10%, Pitch Attitude - ±1.5º, Sideslip Angle - ±2º, Longitudinal Control Position - ±5%, Lateral Control Position - ±5%, Directional Control Position - ±5%, Collective Control Position - ±5%	All engines operating; One engine inoperative; Augmentation System(s) On and Off		X	X	X	Record results for two gross weight and CG combinations. The data presented must be for normal climb power conditions. May be a series of snapshot tests.		
h. Descent.									
(1) Descent Performance and Trimmed Flight Control Positions.	Torque - ±3%, Pitch Attitude - ±1.5º, Sideslip Angle - ±2, º Longitudinal Control Position - ±5%, Lateral Control Position - ±5%, Directional Control Position - ±5%, Collective Control Position - ±5%	At or near 1,000 fpm rate of descent (RoD) at normal approach speed. Augmentation System(s) On and Off		X	X	X	Results must be recorded for two gross weight and CG combinations. May be a series of snapshot tests.		

TABLE OF OBJECTIVE TESTS									
QPS	REQUIREMENTS >>>								INFORMATION
TEST	TOLERANCE	FLIGHT CONDITIONS	SIMULATOR LEVEL				TEST DETAILS		NOTES
			A	B	C	D			
(2) Autorotation Performance and Trimmed Flight Control Positions.	Torque - ±3%, Pitch Attitude - ±1.5º, Sideslip Angle - ±2º, Longitudinal Control Position - ±5%, Lateral Control Position - ±5%, Directional Control Position - ±5%, Collective Control Position - ±5% Vertical Velocity ±100 fpm or 19%, Rotor Speed ±1.5%	Steady descents. Augmentation System(s) On and Off		X	X	X	Record results for two gross weight conditions. Data must be recorded for normal operating RPM. (Rotor speed tolerance applies only if collective control position is full down.) Data must be recorded for speeds from approximately 50 kts. through at least maximum glide distance airspeed. May be a series of snapshot tests.		
i. Autorotation.									
Entry**.**	Rotor Speed - ±3% Pitch Attitude ±2º Roll Attitude - ±3º Yaw Attitude - ±5º Airspeed - ±5 kts. Vertical Velocity - ±200 fpm (1.00 m/sec) or 10%	Cruise or Climb			X	X	Record results of a rapid throttle reduction to idle. If the cruise condition is selected, comparison must be made for the maximum range airspeed. If the climb condition is selected, comparison must be made for the maximum rate of climb airspeed at or near maximum continuous power.		
j. Landing.									
(1) All Engines.	Airspeed - ±3 kts., Altitude - ±20 ft. (6.1m), Torque - ±3%, Rotor Speed - ±1.5%, Pitch Attitude - ±1.5º, Bank Attitude - ±1.5º, Heading - ±2º, Longitudinal Control Position -±10%, Lateral Control Position	Approach		X	X	X	Record results of the approach and landing profile as appropriate to the helicopter model simulated (running landing for Level B, or approach to a hover for Level C and D). For Level B, the criteria apply only to those segments at airspeeds above		

TABLE OF		OBJECTIVE TESTS							
QPS	REQUIREMENTS		>>>						INFORMATION
TEST	TOLERANCE	FLIGHT CONDITIONS	SIMULATOR LEVEL				TEST DETAILS		NOTES
			A	B	C	D			
	- ±10%, Directional Control Position - ±10%, Collective Control Position - ±10%						effective translational lift.		
(2) One Engine Inoperative.	Airspeed - ±3 kts., Altitude - ±20 ft. (6.1m), Torque - ±3%, Rotor Speed - ±1.5%, Pitch Attitude - ±1.5º, Bank Attitude - ±1.5º, Heading - ±2º, Longitudinal Control Position - ±10%, Lateral Control Position - ±10%, Directional Control Position - ±10%, Collective Control Position - ±10%.	Approach		X	X	X	Record results for both Category A and Category B approaches and landing as appropriate to helicopter model simulated. For Level B, the criteria apply only to those segments at airspeeds above effective translational lift.		
(3) Balked Landing	Airspeed - ±3 kts, Altitude - ±20 ft. (6.1m), Torque - ±3%, Rotor Speed - ±1.5%, Pitch Attitude - ±1.5º, Bank Attitude - ±1.5º, Heading - ±2º, Longitudinal Control Position - ±10%, Lateral Control Position - ±10%, Directional Control Position - ±10%, Collective Control Position - ±10%.	Approach		X	X	X	Record the results for the maneuver initiated from a stabilized approach at the landing decision point (LDP).		
(4) Autorotational Landing.	Torque - ±3%, Rotor Speed - ±3%, Vertical Velocity - ±100 fpm (0.50m/sec) or 10%,	Landing			X	X	Record the results of an autorotational deceleration and landing from a stabilized autorotational descent, to touch		

TABLE OF		OBJECTIVE	TESTS						
QPS	REQUIREMENTS		>>>						INFORMATION
TEST	TOLERANCE	FLIGHT CONDITIONS	SIMULATOR LEVEL				TEST DETAILS		NOTES
			A	B	C	D			
	Pitch Attitude - ±2º, Bank Attitude - ±2º, Heading - ±5º, Longitudinal Control Position - ±10%, Lateral Control Position - ±10%, Directional Control Position - ±10%, Collective Control Position - ±10%						down.		
2. Handling Qualities.									
a. Control System Mechanical Characteristics.									
For simulators requiring Static or Dynamic tests at the controls (i.e., cyclic, collective, and pedal), special test fixtures will not be required during initial or upgrade evaluations if the sponsor's QTG/MQTG shows both test fixture results **and** the results of an alternative approach, such as computer plots produced concurrently, that show satisfactory agreement. Repeat of the alternative method during the initial or upgrade evaluation would then satisfy this test requirement. For initial and upgrade evaluations, the control dynamic characteristics must be measured at and recorded directly from the cockpit controls, and must be accomplished in hover, climb, cruise, and autorotation.									Contact the NSPM for clarification of any issue regarding helicopters with reversible controls.
(1) Cyclic	Breakout - ±0.25 lbs. (0.112 daN) or 25%; Force - ±1.0 lb. (0.224 daN) or 10%.	Ground; Static conditions. Trim On and Off. Friction Off Augmentation On and .ff		X	X	X	Record results for an uninterrupted control sweep to the stops. (This test does not apply if aircraft hardware modular controllers are used.)		
(2) Collective/Pedals	Breakout - ±0.5 lb. (0.224 daN) or 25%; Force - ±1.0 lb. (0.224 daN) or 10%.	Ground; Static conditions. Trim On and Off. Friction Off. Augmentation On and Off.		X	X	X	Record results for an uninterrupted control sweep to the stops.		

TABLE OF		OBJECTIVE	TESTS						
QPS	REQUIREMENTS		>>>						INFORMATION
TEST	TOLERANCE	FLIGHT CONDITIONS	SIMULATOR LEVEL				TEST DETAILS		NOTES
			A	B	C	D			
(3) Brake Pedal Force vs. Position.	±5 lbs. (2.224 daN) or 10%	Ground; Static conditions.		X	X	X			
(4) Trim System Rate (all applicable systems)	Rate - ±10%	Ground; Static conditions. Trim On, Friction Off		X	X	X	The tolerance applies to the recorded value of the trim rate.		
(5) Control Dynamics (all axes)	±10% of time for first zero crossing and ±10 (N+1)% of period thereafter, ±10% of amplitude of first overshoot, 20% of amplitude of 2^{nd} and subsequent overshoots greater than 5% of initial displacement, ±1 overshoot.	Hover/Cruise, Trim On, Friction Off			X	X	Results must be recorded for a normal control displacement in both directions in each axis (approximately 25% to 50% of full throw).		Control Dynamics for irreversible control systems may be evaluated in a ground/static condition. Refer to paragraph 5 of this attachment for additional information. "N" is the sequential period of a full cycle of oscillation.
(6) Freeplay	±0.10 in.	Ground; Static conditions.		X	X	X	Record and compare results for all controls.		
b. Low Airspeed Handling Qualities.									
(1) Trimmed Flight Control Positions.	Torque - ±3% Pitch Attitude - ±1.5º Bank Attitude - ±2º Longitudinal Control Position - ±5% Lateral Control Position - ±5% Directional Control Position - ±5% Collective Control Position - ±5%	Translational Flight IGE - Sideward, rearward, and forward flight. Augmentation On and Off.			X	X	Record results for several airspeed increments to the translational airspeed limits and for 45 kts. forward airspeed. May be a series of snapshot tests.		
(2) Critical Azimuth	Torque - ±3% Pitch Attitude - ±1.5º, Bank Attitude - ±2º,	Stationary Hover. Augmentation On and Off.			X	X	Record results for three relative wind directions (including the most critical case) in the critical		

TABLE OF OBJECTIVE TESTS									
QPS	REQUIREMENTS >>>								INFORMATION
TEST	TOLERANCE	FLIGHT CONDITIONS	SIMULATOR LEVEL				TEST DETAILS		NOTES
			A	B	C	D			
	Longitudinal Control Position - ±5%, Lateral Control Position - ±5%, Directional Control Position - ±5%, Collective Control Position - ±5%						quadrant. May be a series of snapshot tests.		
(3) Control Response									
(a) Longitudinal	Pitch Rate - ±10% or ±2º/sec. Pitch Attitude Change - ±10% or 1.5º.	Hover. Augmentation On and Off.			X	X	Record results for a step control input. The Off-axis response must show correct trend for unaugmented cases.		
(b) Lateral	Roll Rate - ±10% or ±3º/sec. Roll Attitude Change - ±10% or ±3º.	Hover Augmentation On and Off.			X	X	Record results for a step control input. The Off-axis response must show correct trend for unaugmented cases.		
(c) Directional	Yaw Rate - ±10% or ±2º/sec. Heading Change - ±10% or ±2º.	Hover Augmentation On and Off.			X	X	Record results for a step control input. The Off-axis response must show correct trend for unaugmented cases.		
(d) Vertical	Normal Acceleration - ±0.1 g.	Hover			X	X	Record results for a step control input. The Off-axis response must show correct trend for unaugmented cases.		
c. Longitudinal Handling Qualities.									
(1) Control Response	Pitch Rate - ±10% or ±2º/sec., Pitch Attitude Change - ±10% or ±1.5º.	Cruise Augmentation On and Off.		X	X	X	Results must be recorded for two cruise airspeeds to include minimum power required speed. Record data for a step control input. The Off-axis response must show correct trend for unaugmented cases.		

TABLE OF OBJECTIVE TESTS									
QPS	**REQUIREMENTS**		**>>>**						**INFORMATION**
TEST	**TOLERANCE**	**FLIGHT CONDITIONS**	**SIMULATOR LEVEL**				**TEST DETAILS**		**NOTES**
			A	**B**	**C**	**D**			
(2) Static Stability	Longitudinal Control Position: ±10% of change from trim or ±0.25 in. (6.3 mm) or Longitudinal Control Force : ±0.5 lb. (0.223 daN) or ±10%.	Cruise or Climb. Autorotation. Augmentation On and Off.		**X**	**X**	**X**	Record results for a minimum of two speeds on each side of the trim speed. May be a series of snapshot tests.		
(3) Dynamic Stability									
(a) Long Term Response.	±10% of calculated period, ±10% of time to ½ or double amplitude, or ±0.02 of damping ratio.	Cruise Augmentation On and Off.		**X**	**X**	**X**	Record results for three full cycles (6 overshoots after input completed) or that sufficient to determine time to ½ or double amplitude, whichever is less. For non-periodic responses, the time history must be matched.		
(b) Short Term Response.	±1.5º Pitch or ±2º/sec. Pitch Rate. ±0.1 g Normal Acceleration.	Cruise or Climb. Augmentation On and Off.		**X**	**X**	**X**	Record results for at least two airspeeds.		
(4) Maneuvering Stability.	Longitudinal Control Position - ±10% of change from trim or ±0.25 in. (6.3mm) or Longitudinal Control Forces - ±0.5 lb. (0.223 daN) or ±10%.	Cruise or Climb. Augmentation On and Off.		**X**	**X**	**X**	Record results for at least two airspeeds. Record results for Approximately 30º-45º bank angle. The force may be shown as a cross plot for irreversible systems. May be a series of snapshot tests.		
(5) Landing Gear Operating Times	±1 sec.	Takeoff (Retraction) Approach (Extension)		**X**	**X**	**X**			
d. Lateral and Directional Handling Qualities.									

TABLE OF	OBJECTIVE	TESTS							
QPS	**REQUIREMENTS**	**>>>**							**INFORMATION**
TEST	**TOLERANCE**	**FLIGHT CONDITIONS**	**SIMULATOR LEVEL**				**TEST DETAILS**		**NOTES**
			A	**B**	**C**	**D**			
(1)Control Response.									
(a) Lateral	Roll Rate - ±10% or ±3º/sec., Roll Attitude Change - ±10% or ±3º.	Cruise Augmentation On and Off.		**X**	**X**	**X**	Record results for at least two airspeeds, including the speed at or near the minimum power required airspeed. Record results for a step control input. The Off-axis response must show correct trend for unaugmented cases.		
(b) Directional	Yaw Rate - ±10% or ±2º/sec., Yaw Attitude Change - ±10% or ±2º.	Cruise Augmentation On and Off.		**X**	**X**	**X**	Record data for at least two Airspeeds, including the speed at or near the minimum power required airspeed. Record results for a step control input. The Off-axis response must show correct trend for unaugmented cases.		
(2) Directional Static Stability.	Lateral Control Position - ±10% of change from trim or ±0.25 in. (6.3mm) or Lateral Control Force - ±0.5 lb. (0.223 daN) or 10%, Roll Attitude - ±1.5, Directional Control Position - ±10% of change from trim or ±0.25 in. (6.3mm) or Directional Control Force - ±1 lb. (0.448 daN) or 10%., Longitudinal Control	Cruise; or Climb (may use Descent instead of Climb if desired), Augmentation On and Off.		**X**	**X**	**X**	Record results for at least two sideslip angles on either side of the trim point. The force may be shown as a cross plot for irreversible systems. May be a series of snapshot tests.		This is a steady heading sideslip test.

TABLE OF OBJECTIVE TESTS									
QPS	REQUIREMENTS >>>								INFORMATION
TEST	TOLERANCE	FLIGHT CONDITIONS	SIMULATOR LEVEL				TEST DETAILS		NOTES
			A	B	C	D			
	Position - ±10% of change from trim or ±0.25 in. (6.3mm), Vertical Velocity - ±100 fpm (0.50m/sec) or 10%.								
(3) Dynamic Lateral and Directional Stability									
(a) Lateral-Directional Oscillations.	±0.5 sec. or ±10% of period , ±10% of time to ½ or double amplitude or ±0.02 of damping ratio, ±20% or ±1 sec of time difference between peaks of bank and sideslip.	Cruise or Climb. Augmentation On/Off		X	X	X	Record results for at least two airspeeds. The test must be initiated with a cyclic or a pedal doublet input. Record results for six full cycles (12 overshoots after input completed) or that sufficient to determine time to ½ or double amplitude, whichever is less. For non-periodic response, the time history must be matched.		
(b) Spiral Stability	Correct Trend, ±2º bank or ±10% in 20 sec.	Cruise or Climb. Augmentation On and Off.		X	X	X	Record the results of a release from pedal only or cyclic only turns. Results must be recorded from turns in both directions.		
(c) Adverse/Proverse Yaw	Correct Trend, ±2º transient sideslip angle.	Cruise or Climb. Augmentation On and Off.		X	X	X	Record the time history of initial entry into cyclic only turns, using only a moderate rate for cyclic input. Results must be recorded for turns in both directions.		
3. Motion System									
a. Motion Envelope									
(1) Pitch									
(a) Displacement - TBDº				X					

	TABLE OF	OBJECTIVE	TESTS					
QPS	**REQUIREMENTS**		>>>					**INFORMATION**
TEST	**TOLERANCE**	**FLIGHT CONDITIONS**	**SIMULATOR LEVEL**				**TEST DETAILS**	**NOTES**
			A	**B**	**C**	**D**		
±25º					**X**	**X**		
(b) Velocity - TBDº/sec				**X**				
±20º/sec					**X**	**X**		
(c) Acceleration - TBDº/sec^2				**X**				
±100º/sec^2					**X**	**X**		
(2) Roll								
(a) Displacement - TBDº				**X**				
±25º					**X**	**X**		
(b) Velocity - TBDº/sec				**X**				
±20º/sec					**X**	**X**		
(c) Acceleration - TBDº/sec^2				**X**				
±100º/sec^2					**X**	**X**		
(3) Yaw								
(a) Displacement - ±25º					**X**	**X**		
(b) Velocity - ±20º/sec					**X**	**X**		
(c) Acceleration - ±100º/sec^2					**X**	**X**		
(4) Vertical								
(a) Displacement - TBD in.				**X**				
±34 in.					**X**	**X**		
(b) Velocity - TBD in.				**X**				
±24 in.					**X**	**X**		
(c) Acceleration - TBD g.				**X**				
±0.8 g.					**X**	**X**		
(5) Lateral								

TABLE OF OBJECTIVE TESTS									
QPS	**REQUIREMENTS**		**>>>**						**INFORMATION**
TEST	**TOLERANCE**	**FLIGHT CONDITIONS**	**SIMULATOR LEVEL**				**TEST DETAILS**		**NOTES**
			A	**B**	**C**	**D**			
Displacement: ±45 in.					**X**	**X**			
Velocity: ±28 in/sec.					**X**	**X**			
Acceleration: ±0.6 g.					**X**	**X**			
(6) Longitudinal									
Displacement: ±34 in					**X**	**X**			
Velocity: ±28 in/sec.					**X**	**X**			
Acceleration: ±0.6 g.					**X**	**X**			
(7) Initial Rotational Acceleration Ratio.									
All axes: TBD°/sec^2/sec				**X**					
All axes: 300°/ sec^2/sec					**X**	**X**			
(8) Initial Linear Acceleration Ratio.									
Vertical: ±TBD g/sec				**X**					
±6g/sec					**X**	**X**			
Lateral: ±3g/sec					**X**	**X**			
Longitudinal: ±3g/sec					**X**	**X**			
b. Frequency Response									
Band, Hz Phase, deg. 0.10 to 0.5 -15 to -20 0.51 to 1.0 -15 to -20 1.1 to 2.0 -20 to -40	Amplitude Ratio, db ±2 ±2 ±4			**X**	**X**	**X**			

TABLE OF		OBJECTIVE	TESTS						
QPS	REQUIREMENTS		>>>						INFORMATION
TEST	TOLERANCE	FLIGHT CONDITIONS	SIMULATOR LEVEL				TEST DETAILS		NOTES
			A	B	C	D			
2.1 to 5.0 -20 to -40	±4								
c. Leg Balance.									
Leg Balance	1.5º			X	X	X	The phase shift between a datum jack and any other jack must be measured using a heave (vertical) signal of 0.5 Hz. at ±0.25 g.		
d. Turn Around.									
Turn Around	0.05 g.			X	X	X	The motion base must be driven sinusoidally in heave through a displacement of 6 inches (150mm) peak to peak at a frequency of 0.5 Hz. Deviation from the desired sinusoidal acceleration must be measured.		
4. Visual System Display Tests									
a. Field of View									
(1) Continuous collimated visual field of view	Minimum continuous collimated field of view providing 75° horizontal and 30° vertical field of view for each pilot simultaneously.	N/A		X			An SOC is required. Horizontal field of view is centered on the zero degree azimuth line relative to the aircraft fuselage.		A vertical field of view of 30° may be insufficient to meet visual ground segment requirements. Field of view should be measured using a visual test pattern filling the entire visual scene (all channels) with a matrix of black and white 5° squares. The installed alignment should be
(2) Continuous collimated visual field of view	Minimum continuous collimated field of view providing 150°	N/A			X		An SOC is required. Horizontal field of view is centered on the zero degree		Field of view should be measured using a visual test pattern filling the

TABLE OF OBJECTIVE TESTS									
QPS	REQUIREMENTS >>>								INFORMATION
TEST	TOLERANCE	FLIGHT CONDITIONS	SIMULATOR LEVEL				TEST DETAILS		NOTES
			A	B	C	D			
	horizontal and 40° vertical field of view for each pilot simultaneously.						azimuth line relative to the aircraft fuselage.		entire visual scene (all channels) with a matrix of black and white 5° squares. The installed alignment should be
(3) Continuous collimated visual field of view	Minimum continuous collimated field of view providing 180° horizontal and 60° vertical field of view for each pilot simultaneously.	N/A				X	An SOC is required. Horizontal field of view is centered on the zero degree azimuth line relative to the aircraft fuselage.		Field of view should be measured using a visual test pattern filling the entire visual scene (all channels) with a matrix of black and white 5° squares. The installed alignment should be addressed in the SOC.
c. Surface contrast ratio.	Not less than 5:1	N/A				X	The ratio is calculated by dividing the brightness level of the center, bright square (providing at least 2 foot-lamberts or 7 cd/m2) by the brightness level of any adjacent dark square.		Measurements should be made using a 1° spot photometer and a raster drawn test pattern filling the entire visual scene (all channels) with a test pattern of black and white squares, 5 per square, with a white square in the center of each channel. During contrast ratio testing, simulator aft-cab and flight deck ambient light levels should be zero.
d. Highlight brightness	Not less than six (6) foot-lamberts (20 cd/m^2)	N/A				X	Measure the brightness of the center, white square while superimposing a highlight on		Measurements should be made using a 1° spot photometer and a raster

TABLE OF OBJECTIVE TESTS									
QPS	**REQUIREMENTS**		**>>>**						**INFORMATION**
TEST	**TOLERANCE**	**FLIGHT CONDITIONS**	**SIMULATOR LEVEL**				**TEST DETAILS**		**NOTES**
			A	**B**	**C**	**D**			
							that white square. The use of calligraphic capabilities to enhance the raster brightness is acceptable; however, measuring light points is not acceptable.		drawn test pattern filling the entire visual scene (all channels) with a test pattern of black and white squares, 5 per square, with a white square in the center of each channel.
e. Vernier resolution (surface resolution)	Not greater than 3 arc minutes	N/A			X	X	An SOC is required and must include the appropriate calculations and an explanation of those calculations.		
f. Light point size	Not greater than six (6) arc-minutes.	N/A			**X**	**X**	An SOC is required and must include the relevant calculations and an explanation of those calculations.		Light point size should be measured using a test pattern consisting of a centrally located single row of light points reduced in length until modulation is just discernible in each visual channel. A row of 48 lights will form a 4° angle or less.
g. Light point contrast ratio	Not less than 25:1	N/A			X	X	An SOC is required and must include the relevant calculations.		A 1° spot photometer is used to measure a square of at least 1° filled with light points (where light point modulation is just discernible) and compare the results to the measured adjacent background. During

	TABLE OF	OBJECTIVE	TESTS						
QPS	REQUIREMENTS		>>>						INFORMATION
TEST	TOLERANCE	FLIGHT CONDITIONS	SIMULATOR LEVEL				TEST DETAILS		NOTES
			A	B	C	D			
									contrast ratio testing, simulator aft-cab and flight deck ambient light levels should be zero.

Begin Information

2. Control Dynamics.

a. The characteristics of a helicopter flight control system have a major effect on the handling qualities. A significant consideration in pilot acceptability of a helicopter is the ``feel'' provided through the cockpit controls. Considerable effort is expended on helicopter feel system design in order to deliver a system with which pilots will be comfortable and consider the helicopter desirable to fly. In order for a simulator to be representative, it too must present the pilot with the proper feel; that of the respective helicopter

b. Recordings such as free response to an impulse or step function are classically used to estimate the dynamic properties of electromechanical systems. In any case, it is only possible to estimate the dynamic properties as a result of only being able to estimate true inputs and responses. Therefore, it is imperative that the best possible data be collected since close matching of the simulator control loading system to the helicopter systems is essential. The required control feel dynamic tests are described in this attachment. This is usually accomplished by measuring the free response of the controls using a step or pulse input to excite the system.

c. For helicopters with irreversible control systems, measurements may be obtained on the ground. However, proper pitot-static inputs (if applicable) must be provided to represent conditions typical of those encountered in flight. Likewise, it may be shown that for some helicopters, hover, climb, cruise, and autorotation have like effects. Thus, one may suffice for another. If either or both considerations apply, engineering validation or helicopter manufacturer rationale must be submitted as justification for ground tests or for eliminating a configuration.

(1) Control Dynamics Evaluations. The dynamic properties of control systems are often stated in terms of frequency, damping, and a number of other classical measurements, which can be found in texts on control systems. In order to establish a consistent means of validating test results for simulator control loading, criteria are needed that will clearly define the interpretation of the measurements and the tolerances to be applied. Criteria are needed for both the underdamped system and the overdamped system, including the critically damped case. In the case of an underdamped system with very light damping, the system may be quantified in terms of frequency and damping. In critically damped or overdamped systems, the frequency and damping is not readily measured from a response time history. Therefore, some other measurement must be used.

(2) For Levels C and D Simulators. Tests to verify that control feel dynamics represent the helicopter show that the dynamic damping cycles (free response of the control) match that of the helicopter within the specified tolerances. An acceptable method of evaluating the response and the tolerance to be applied are described below for the underdamped and critically damped cases.

d. Tolerances: (1) Underdamped Response. (a) Two measurements are required for the period, the time to first zero crossing (in case a rate limit is present) and the subsequent frequency of oscillation. It is necessary to measure cycles on an individual basis in case there are nonuniform periods in the response. Each period will be independently compared to the respective period of the helicopter control system and, consequently, will enjoy the full tolerance specified for that period.

(b) The damping tolerance will be applied to overshoots on an individual basis. Care must be taken when applying the tolerance to small overshoots since the significance of such overshoots becomes questionable. Only those overshoots larger than 5 percent of the total initial displacement will be considered significant. The residual band, labeled T(Ad) on Figure 1 of this attachment is +/-5 percent of the initial displacement amplitude Ad from the steady state value of the oscillation. Oscillations within the residual band are considered insignificant. When comparing simulator data to helicopter data, the process would begin by overlaying or aligning the simulator and helicopter steady state values and then comparing amplitudes of oscillation peaks, the time of the first zero crossing, and individual periods of oscillation. To be satisfactory, the simulator would show the same number of significant overshoots to within one when compared against the helicopter data. This procedure for evaluating the response is illustrated in Figure 1 of this attachment.

(2) Critically Damped and Overdamped Response. Due to the nature of critically damped responses (no overshoots), the time to reach 90 percent of the steady state (neutral point) value should be the same as the helicopter within +/-10 percent. The simulator response must be critically damped also. Figure 2 of this attachment illustrates the procedure.

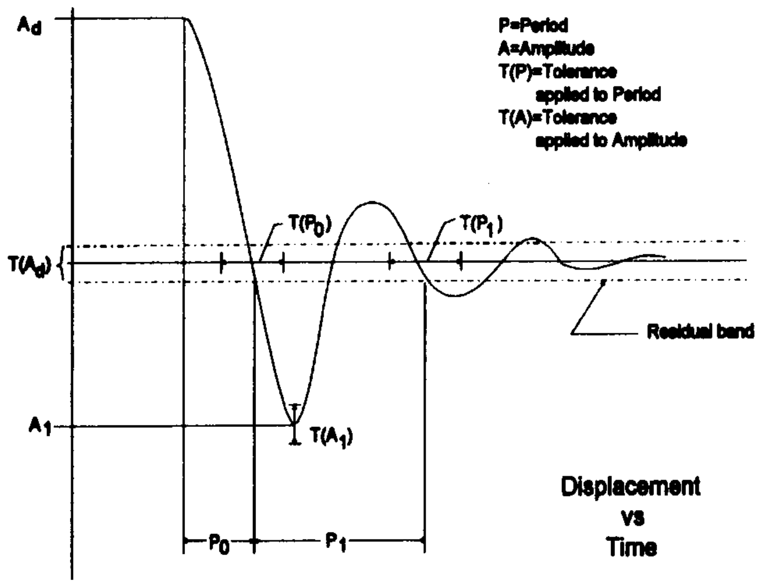
(3) (a) The following summarizes the tolerances, T, for an illustration of the referenced measurements (See Figures 1 and 2 of this attachment):

T(P0) +/-10% of P0
T(P1) +/-20% of P1
T(A) +/-10% of A1, +/-20% of Subsequent Peaks
T(Ad) +/-10% of Ad = Residual Band
Overshoots +/-1

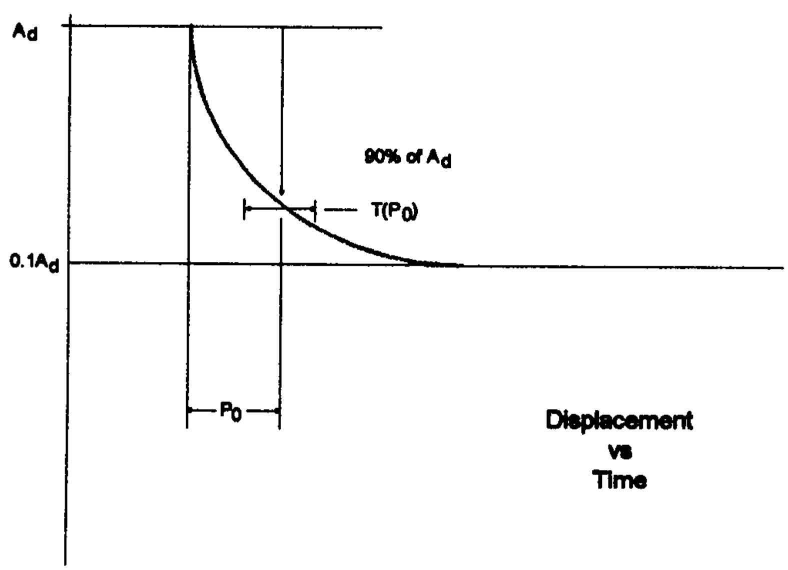
(b) In the event the number of cycles completed outside of the residual band, and thereby significant, exceeds the number depicted in figure 1 of this attachment, the following tolerances (T) will apply:

T(Pn) +/-10%(n+1)% of Pn, where ``n'' is the next in sequence.

Attachment 2 to Appendix C to Part 60—
Figure 1. Under-Damped Step Response



Attachment 2 to Appendix C to Part 60—
Figure 2. Critically-Damped Step Response



3. Motion Cue Repeatability Testing.

a. The motion system characteristics in the Table of Objective
Tests address basic system capability, but not pilot cueing capability. Until there is an objective procedure for determination of the motion cues necessary to support pilot tasks and stimulate the pilot response which occurs in a helicopter for the same tasks, motion systems will continue to be ``tuned'' subjectively. Having tuned a motion system, however, it is important to involve a test to ensure that the system continues to perform as originally qualified.
Any motion performance change from the initially qualified baseline can be measured objectively.

b. An objective assessment of motion performance change is accomplished at lease annually using the following testing procedure:

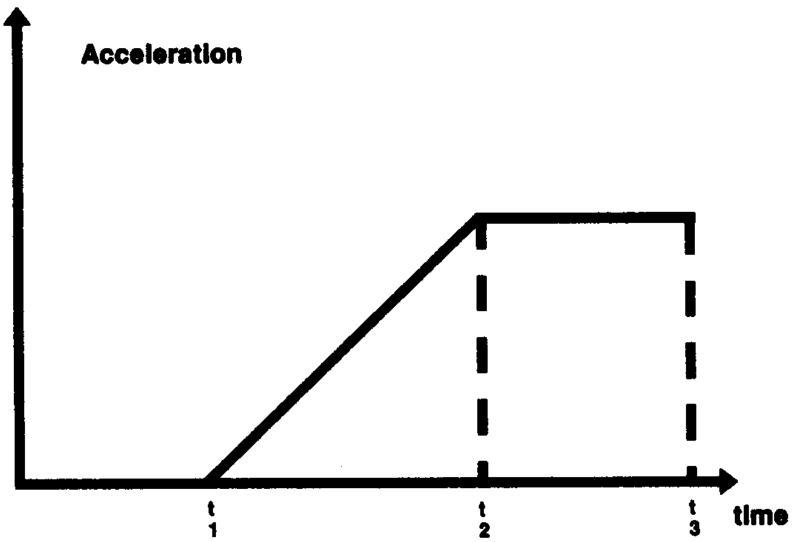
(1) The current performance of the motion system is assessed by comparison with the initial recorded test data.

(2) The parameters to be recorded are the outputs of the motion drive algorithms and the jack position transducers.

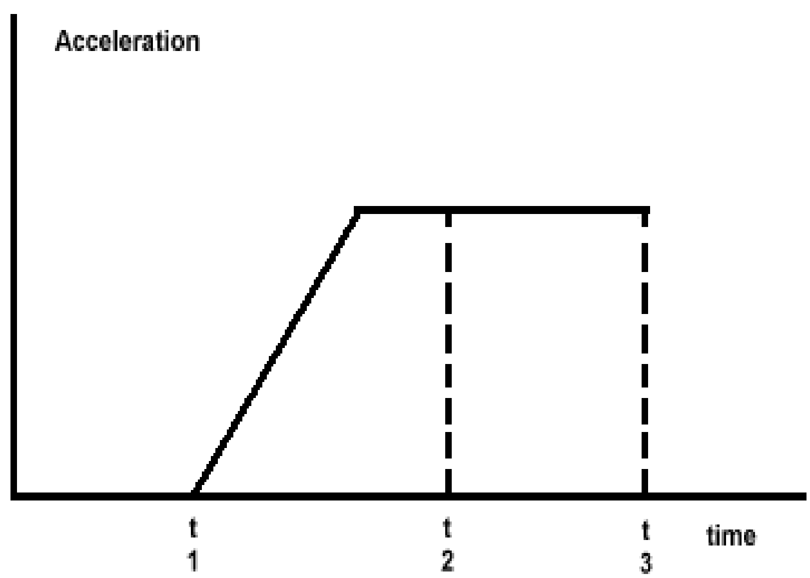
(3) The test input signals are inserted at an appropriate point prior to the integrations in the equations of motion (see figure 3 of this attachment).

(4) The characteristics of the test signal (see figure 4 of this attachment) are adjusted to ensure that the motion is exercised through approximately 2/3 of the maximum displacement capability in each axis. The time segment T0--T1 , must be of sufficient duration to ensure steady initial conditions.

Attachment 2 to Appendix C to Part 60—
Figure 3. Acceleration Test Signals



Attachment 2 to Appendix C to Part 60—
Figure 4. Test Signal Characteristics



NOTE: If the simulator weight changes for any reason (i.e., visual change, or structural change), then the motion system baseline performance repeatability tests must be rerun and the new results used for future comparison.

End Information

Attachment 3 to Appendix C to Part 60—
SIMULATOR SUBJECTIVE TESTS

1. Requirements

Begin QPS Requirements

Airports represented in visual scenes required by this part must be representations of real-world, operational airports, helipads, or other designated landing areas, or representations of fictional airports, helipads, or other designated landing areas. In the remainder of this part, the use of the designation 'airport' shall be considered to include helipads, or other designated landing areas.

a. If real-world, operational airports are simulated, the visual representation and scene content is compared to that of the actual airport. This comparison requires accurate simulation of that airport to the extent required by this part and as required by the qualification level sought. It also requires the visual scene to be modified when the airport is modified; e.g., when additional runways or taxiways are added; when existing runway(s) are lengthened or permanently closed; when magnetic bearings to or from a runway or helipad are changed; when significant and recognizable changes are made to the terminal, other airport buildings, or surrounding terrain; etc.

b. If fictional airports are used, the navigational aids and all appropriate maps, charts, and other navigational reference material for such airports (and surrounding areas as necessary), are evaluated for compatibility, completeness, and accuracy. These items are compared to the visual presentation and scene content of the fictional airport and require simulation to the extent set out in this document and as required by the qualification level sought. An SOC must be submitted that addresses navigation aid installation and performance (including obstruction clearance protection, etc.) and other criteria for all instrument approaches that are available in the simulator. The SOC must reference and account for information in the Terminal Instrument Procedures Manual ("Terps" Manual, FAA Handbook 8260.3, as amended) and the construction and availability of the required maps, charts, and other navigational material. This material must be appropriately marked "for training purposes only."

End QPS Requirements

2. Discussion

Begin Information

a. The subjective tests provide a basis for evaluating the capability of the simulator to perform over a typical utilization period; determining that the simulator competently simulates each required maneuver, procedure, or task; and verifying correct operation of the simulator controls, instruments, and systems. The items listed in the Table of Functions and Subjective Tests are for simulator evaluation purposes only. They must not be used to limit or exceed the authorizations for use of a given level of simulator as described on the Statement of Qualification or as may be approved by the TPAA. All items in the following paragraphs are subject to an examination.

b. The Table of Functions and Subjective Tests in this attachment addresses pilot functions, including maneuvers and procedures (called flight tasks), and is divided by flight phases. The performance of these tasks by the NSPM includes an operational examination of the visual system and special effects. There are flight tasks included to address some features of advanced technology helicopters and innovative training programs.

c. The Table of Functions and Subjective Tests in this attachment addresses the overall function and control of the simulator including the various simulated environmental conditions; simulated helicopter system operation (normal, abnormal, and emergency); visual system displays; and special effects necessary to meet flightcrew training, evaluation, or flight experience requirements.

d. All simulated helicopter systems functions will be assessed for normal and, where appropriate, alternate operations. Normal, abnormal, and emergency operations associated with a flight phase will be assessed during the evaluation of flight tasks or events within that flight phase. Simulated helicopter systems are listed separately under "Any Flight Phase" to ensure appropriate attention to systems checks. Operational navigation systems (including inertial navigation systems, global positioning systems, or other long-range systems) and the associated electronic display systems will be evaluated if installed. The NSP pilot will include in his report to the TPAA, the effect of the system operation and any system limitation.

e. Simulators demonstrating a satisfactory circling approach will be qualified for the circling approach maneuver and may be approved for such use by the TPAA in the sponsor's FAA-approved flight training program. To be considered satisfactory, the circling approach will be flown at maximum gross weight for landing, with minimum visibility for the helicopter approach category, and must allow proper alignment with a landing runway at least 90° different from the instrument approach course while allowing the pilot to keep an identifiable portion of the airport in sight throughout the maneuver (reference - 14CFR, §91.175(e)).

f. At the request of the TPAA, the NSP Pilot may assess the simulator for a special aspect of a sponsor's training program during the functions and subjective portion of an evaluation. Such an assessment may include a portion of a Line Oriented Flight Training (LOFT) scenario or special emphasis items in the sponsor's training program. Unless directly related to a requirement for the qualification level, the results of such an evaluation would not affect the qualification of the simulator.

End Information

TABLE OF FUNCTIONS AND SUBJECTIVE TESTS
Begin QPS Requirements

The NSP pilot, or the pilot designated by the NSPM, will evaluate the FTD in the following Operations Tasks, as applicable to the helicopter and FTD level, using the sponsor's approved manuals and checklists.

a. Preparation for Flight.
(1) Preflight. Accomplish a functions check of all switches, indicators, systems, and equipment at all cockpit crewmembers' and instructors' stations, and determine that the cockpit design and functions are identical to that of the helicopter simulated.
(2) APU/Engine start and run-up.
- (a) Normal start procedures.
- (b) Alternate start procedures.
- (c) Abnormal starts and shutdowns (hot start, hung start, etc.)
- (d) Rotor engagement.
- (e) System checks.
- (f) Other.

b. Takeoff.
(1) Normal.
- (a) From ground.
- (b) From hover.
  - (i) Cat A.
  - (ii) Cat B.
- (c) Running.
- (d) Crosswind/tailwind.
- (e) Maximum performance.
- (f) Instrument.

(2) Abnormal/emergency procedures:
- (a) Takeoff with engine failure after critical decision point (CDP).
  - (i) Cat A.
  - (ii) Cat B.
- (b) Other

c. Climb.
(1) Normal.
(2) One engine inoperative.
(3) Other.

d. Cruise.
(1) Performance.
(2) Flying qualities.
(3) Turns.
- (a) Timed.
- (b) Normal.
- (c) Steep.

(4) Accelerations and decelerations.
(5) High speed vibrations.
(6) Abnormal/emergency procedures, for example:
- (a) Engine fire.
- (b) Engine failure.
- (c) Inflight engine shutdown and restart.
- (d) Fuel governing system failures.
- (e) Directional control malfunction.
- (f) Hydraulic failure.

(g) Stability system failure.
(h) Rotor vibrations.
(i) Other.

e. Descent.
(1) Normal.
(2) Maximum rate.
(3) Other.

f. Approach.
(1) Non-precision.
- (a) All engines operating.
- (b) One or more engines inoperative.
- (c) Approach procedures:
  - (i) NDB
  - (ii) VOR, RNAV, TACAN
  - (iii) ASR
  - (iv) Helicopter only.
  - (v) Other.
- (d) Missed approach.
  - (i) All engines operating.
  - (ii) One or more engines inoperative.

(2) Precision.
- (a) All engines operating.
- (b) One or more engines inoperative.
- (c) Approach procedures:
  - (i) PAR
  - (ii) MLS
  - (iii) ILS
  - (iv) Manual (raw data).
  - (v) Flight director only.
  - (vi) Autopilot coupled.
    - A Cat I
    - B Cat II
  - (vii) Other.
- (d) Missed approach.
  - (i) All engines operating.
  - (ii) One or more engines inoperative.
  - (iii) Stability system failure.
- (e) Other

g. Any Flight Phase.
(1) Helicopter and powerplant systems operation.
- (a) Air conditioning.
- (b) Anti-icing/deicing.
- (c) Auxiliary power plant.
- (d) Communications.
- (e) Electrical.
- (f) Fire detection and suppression.
- (g) Stabilizer.
- (h) Flight controls.
- (i) Fuel and oil.
- (j) Hydraulic.
- (k) Landing gear.
- (l) Oxygen.
- (m) Pneumatic.

(n) Powerplant.
(o) Flight control computers.
(p) Stability and control augmentation.
(q) Other.

(2) Flight management and guidance system.
(a) Airborne radar.
(b) Automatic landing aids.
(c) Autopilot.
(d) Collision avoidance system.
(e) Flight data displays.
(f) Flight management computers.
(g) Head-up displays.
(h) Navigation systems.
(i) Other.

(3) Airborne procedures.
(a) Holding.
(b) Air hazard avoidance.
(c) Retreating blade stall recovery.
(d) Mast bumping.
(e) Other.

h. Engine Shutdown and Parking.

(1) Engine and systems operation.
(2) Parking brake operation.
(3) Rotor brake operation.
(4) Abnormal/emergency procedures.

End QPS Requirements

3. SIMULATOR SYSTEMS.

Begin QPS Requirements

a. Instructor Operating Station (IOS).

(1) Power switch(es).

(2) Helicopter conditions.
(a) Gross weight, center of gravity, fuel loading and allocation, etc.
(b) Helicopter systems status.
(c) Ground crew functions (e.g., external power connections, push back, etc.)
(d) Other.

(3) Airports or Landing Areas.
(a) Number and selection.
(b) Runway or landing area selection.
(c) Landing surface condition (e.g., rough, smooth, icy, wet, dry, etc.)
(d) Preset positions (e.g. ramp, gate, #1 for takeoff, takeoff position, over FAF, etc.)
(e) Lighting controls.
(f) Other.

(4) Environmental controls.
(a) Temperature.
(b) Climate conditions (e.g., ice, snow, rain, etc.).
(c) Wind speed and direction.
(d) Other.

(5) Helicopter system malfunctions.
(a) Insertion / deletion.
(b) Problem clear.
(c) Other

(6) Locks, freezes, and repositioning.
   (a) Problem (all) freeze / release.
   (b) Position (geographic) freeze / release.
   (c) Repositioning (locations, freezes, and releases).
   (d) Two times or one-half ground speed control.
   (e) Other
(7) Remote IOS.
(8) Other.

b Sound Controls. On / off / rheostat

c. Control Loading System. On / off / emergency stop.

d. Observer Stations.
(1) Position.
(2) Adjustments.

End QPS Requirements

Attachment 4 to Appendix C to Part 60—

SAMPLE DOCUMENTS

Table of Contents

Title of Sample

ATTACHMENT 4 TO APPENDIX A TO PART 60—
Figure 1 – Sample Letter , Request for Initial, Upgrade, or Reinstatement Evaluation..
INFORMATION

Edward Cook, PhD.
Manager, National Simulator Program
Federal Aviation Administration
P.O. Box 20636 (AFS-205)
Atlanta, GA 30320

Dear Dr. Cook:

RE: Request for Initial [Upgrade / Reinstatement] Evaluation

(Sponsor's name) ___________________ requests your evaluation of our (make, model, series) ________ helicopter simulator for Level ______ qualification, located in (City/State) at the (Facility) on (proposed evaluation date). [The proposed evaluation date must not be more than 180 days following the date of this letter.] This simulator [has / has not] been previously qualified by the FAA [and had been issued FAA identification number XXX]. Under separate cover, we have asked our Principal Operations Inspector (POI) (Training Center Program Manager, TCPM), Mr./Ms.__________________(Name), to forward to you a letter concurring with this request.

[The history of this simulator is as follows: ____.]

We agree to provide a Qualification Test Guide (QTG) to your staff not later than 45 days prior to the proposed evaluation date [if tests not run at training site, an additional "1/3 on-site" tests must be provided not later than 14 days prior the proposed evaluation date]. If we are unable to meet the above date for the evaluation, this may result in a significant delay, perhaps 45 days or more, in rescheduling and completing the evaluation. With our forwarding the QTG, we acknowledge that the simulator meets all applicable requirements of Title 14 of the Code of Federal Regulation (14 CFR) Part 60; that it meets the requirements of the Helicopter Flight Simulator Qualification Performance Standards (QPS); and that appropriate hardware and software configuration control procedures have been established.

We also agree to forward to you, not later than five (5) business days prior to the scheduled evaluation of this simulator, a confirmation statement that will include the following information:

1. That (a) pilot(s) we have designated, who is(are) qualified on the (make, model, series) _______ helicopter, has(have) assessed the simulator and found that the performance and flying qualities of the simulator represent the (make, model, series) _______ helicopter. This determination will be made after flying all the maneuvers and procedures and exercising the tasks listed in the Table of Functions and Subjective Tests in Attachment 3 to the Helicopter Simulator QPS (except for those listed in the attachment to this letter).

2. That (a) pilot(s), or (an)other person(s) we have designated, has(have) found the simulator systems

and sub-systems (including simulated aircraft systems) functionally represent the (make, model, series) ________ helicopter. This determination will be made after having exercised the operation of the simulator and the functions available through the Instructor Operating Station.

3. That, for type specific helicopters, (a) pilot(s), or (an)other person(s) we have designated, has(have) found the cockpit configuration represents the configuration of the (make, model, and series) ________ aircraft.

The names of the person(s) providing this information will be available to you upon your request.

[Added comments from Operator/Sponsor, if any]

Please contact <u>(Name and Telephone Number of Sponsor's Contact)</u> to confirm the date for this initial (upgrade / re-instatement) evaluation. We understand a member of your National Simulator Program staff will respond to this request within 14 days.

Sincerely,

(Signature –Management Representative)

ATTACHMENT 4 TO APPENDIX A TO PART 60--

Figure 2 – Sample Qualification Test Guide Cover Page

INFORMATION

SPONSOR NAME

SPONSOR ADDRESS

FAA QUALIFICATION TEST GUIDE

(SPECIFIC HELICOPTER MODEL)
(*for example*)
(Vertiflite AB-320)

(Simulator Identification Including Manufacturer, Serial Number, Visual System Used)

(Simulator Level)

(Qualification Performance Standard Used)

(Simulator Location)

FAA Initial Evaluation

Date: _____________

_________________________ Date: ___________
(Sponsor)

_________________________ Date: ___________
Manager, National
Simulator Program, FAA

Attachment 4 to Appendix C to Part 60—
Figure 3 – Sample Simulator Information Page

INFORMATION

SPONSOR NAME	
SPONSOR SIMULATOR CODE:	AB-320 #1
HELICOPTER MODEL:	Vertiflite AB-320
AERODYNAMIC DATA REVISION:	AB-320, CPX-8D, January 1988
ENGINE MODEL(S) AND REVISION:	CPX-8D; RPT-6, January 1988 DRQ-4002, RPT-3, April 1991
FLIGHT CONTROLS DATA REVISION:	AB-320MMM; May 1988
FLIGHT MANAGEMENT SYSTEM:	Berry XP
SIMULATOR MODEL AND MANUFACTURER:	VTF-320, Tinker Simulators, Inc.
DATE OF SIMULATOR MANUFACTURE:	1988
SIMULATOR COMPUTER:	CIA
VISUAL SYSTEM MODEL, MANUFACTURER, and DISPLAY TYPE:	ClearView, Inc. “Real World H6;” Projected Visual System
VISUAL SYSTEM COMPUTER:	LMB-H6
MOTION SYSTEM:	Tinker 6 DOF

Information on this page must be updated and kept current with any modifications or changes made to the simulator and reflected on the log of revisions and the list of effective pages.

Federal Aviation Administration

National Simulator Program

Statement
of
Qualification

This is to certify that representatives of the
National Simulator Program
completed an evaluation of the

Go-Fast Training Center

Vertiflite AB-320 Flight Simulator

FAA Identification Number 888

and found it to meet the standards set forth
in the Qualification Performance Standards
for a simulator at

Level C

(date) **for the NSPM**

Subject to the attached
Configuration List and Restrictions

Attachment 4 to Appendix C to Part 60—
Figure 4A – Sample Statement of Qualification; Configuration List

INFORMATION

STATEMENT of QUALIFICATION
CONFIGURATION LIST
Go-Fast Training Center Vertiflite AB-320 -- Level C -- FAA ID# 888

Configuration		Date Qualified
Helicopter Model:......................	AB-320..	July 12, 1988
Engine Model(s) and Revision:...	CPX-8D, RPT-6........................	July 12, 1988
	DRQ-4002, RPT-3....................	April 1, 1991
Flight Management System:.......	Berry XP..	July 12, 1988
Visual System / Manufacturer:	Real World H6, Clear View, Inc.	
CRT Installation:....................	....	
Projected System:....................	210° Horizontal Viewing Angle.......	July 12, 1988
Flight Instruments:		
Display (CRT, LCD, etc.).......	....	July 12, 1988
Flight Director:		
Single Cue..............................	Sperry..	July 12, 1988
Engine Instruments:		
Display (CRT, LCD, etc.).......	....	July 12, 1988
Navigation Type(s):		
ADF.......................................	....	July 12, 1988
VOR/ILS...............................	....	July 12, 1988
GPS......................................	....	July 12, 1988
Weather Radar:	Jones Industries, Inc.	July 12, 1988
ACARS	……………………………………	April 1, 1991

Attachment 4 to Appendix C to Part 60—
Figure 4B – Sample Statement of Qualification
Non-Qualified Maneuvers, Procedures, and Tasks
INFORMATION

STATEMENT of QUALIFICATION

Non-Qualified Maneuvers, Procedures, and Tasks

Go-Fast Training Center Vertiflite AB-320 -- Level C -- FAA ID# 888

The FFS is qualified to perform all of the Maneuvers, Procedures, Tasks, and Functions listed in the Table of Functions and Subjective Tests, Part 60, Appendix C, Attachment 3, In Effect on [mm/dd/yyyy] except for the following listed Tasks or Functions.

(*Example*)

Non-Qualified Operations Tasks and Functions

Normal Takeoff, Daylight Conditions.
Precision Approaches, Precision Approach Radar (PAR)
Communications (ACARS)

Non-Qualified Simulator Systems:

Remote IOS

Additional Qualified Tasks or Functions in addition to those listed in the Table of Functions and Subjective Tests, Part 60, Appendix C, Attachment 3.

(None)

Attachment 4 to Appendix C to Part 60—
Figure 5 – Sample Recurrent Evaluation Requirements Page

Recurrent Evaluation Requirements ***Completed at conclusion of Initial Evaluation***	
Recurrent Evaluations to be conducted each _(fill in)__ months Allotting ______ hours of FTD time. Signed: ________________________________ NSPM / Evaluation Team Leader	Recurrent evaluations are due as follows: _(month)__ and __(month)_ and __(month)_ (enter or strike out, as appropriate) ______________________ Date

Revision: Based on (enter reasoning):	
Recurrent Evaluations are to be conducted each _(fill in)__ months. Allotting ______ hours. Signed: ________________________________ NSPM Evaluation Team Leader	Recurrent evaluations are due as follows: _(month)__ and __(month)_ and __(month)_ (enter or strike out, as appropriate) ______________________ Date

Revision: Based on (enter reasoning):	
Recurrent Evaluations are to be conducted each _(fill in)__ months. Allotting ______ hours. Signed: ________________________________ NSPM Evaluation Team Leader	Recurrent evaluations are due as follows: _(month)__ and __(month)_ and __(month)_ (enter or strike out, as appropriate) ______________________ Date

(Repeat as Necessary)

Attachment 4 to Appendix C to Part 60—
Figure 6 – Sample MQTG Index of Effective FSD Directives

INFORMATION

Index of Effective FSD Directives
Filed in this Section

Notification Number	Received From: (TPAA/NSPM)	Date of Notification	Date of Modification Completion

Continue as Necessary....

Appendix D to Part 60--Qualification Performance Standards for Helicopter Flight Training Devices

---

Begin Information

This appendix establishes the standards for Helicopter Flight Training Device (FTD) evaluation and qualification. The Flight Standards Service, National Simulator Program (NSP) staff, under the direction of the NSP Manager (NSPM), is responsible for the development, application, and interpretation of the standards contained within this appendix.

The procedures and criteria specified in this document will be used by the NSPM, or a person or persons assigned by the NSPM (e.g., FAA pilots and/or FAA aeronautical engineers, assigned to and trained under the direction of the NSP--referred to as NSP pilots or NSP engineers, other FAA personnel, etc.) when conducting helicopter FTD flight simulator evaluations.

Table of Contents

7. Additional Responsibilities of the Sponsor (§ 60.9).

8. FTD Use (§ 60.11).

9. FTD Objective Data Requirements (§ 60.13)

10. Special Equipment and Personnel Requirements for Qualification of the FTD (§ 60.14).

11. Initial (and Upgrade) Qualification Requirements (§ 60.15).

12. Additional Qualifications for a Currently Qualified FTD (§ 60.16).

13. Previously Qualified FTDs (§ 60.17).

14. Inspection, Continuing Qualification Evaluation, and Maintenance Requirements (§ 60.19).

15. . Logging FTD Discrepancies (§ 60.20).

16. Interim Qualification of FTDs for New Helicopter FTD Types or Models (§ 60.21).

17. Modifications to FTDs (§ 60.23).

18. Operation with Missing, Malfunctioning, or Inoperative Components (§ 60.25).

19. Automatic Loss of Qualification and Procedures for Restoration of Qualification (§ 60.27).

20. Other Losses of Qualification and Procedures for Restoration of Qualification (§ 60.29).

21. Recordkeeping and Reporting (§ 60.31).

22. Applications, Logbooks, Reports, and Records: Fraud, Falsification, or Incorrect Statements (§ 60.33).

23. [Reserved].

24.[Reserved].

25. FTD Qualification on the Basis of a Bilateral Aviation Safety Agreement (BASA) (§ 60.37).

Attachment 1 to Appendix D to Part 60--General FTD Requirements.

Attachment 2 to Appendix D to Part 60--FTD Objective Tests.

Attachment 3 to Appendix D to Part 60--FTD Subjective Evaluation.

Attachment 4 to Appendix D to Part 60--Sample Documents.

1. Introduction

Begin Information

a. This appendix contains background information as well as material that is either directive or informative in nature as described later in this section. Except for this Introduction section, the directive or the informative material is presented in sections that correspond with sections of part 60. This material provides additional requirements and/or provides information regarding that subject. Some sections will have neither additional regulatory or informational material. In these instances the corresponding section in the Table of Contents will show "(No Info)."

b. To assist the reader in determining what areas are directive or required and what areas are guiding or permissive—

(1) The text in this appendix is contained within one of two sections: regulatory requirements that are in addition to the requirements in part 60 but are found only in this appendix, referred to as “QPS Requirements;” and advisory or informative material, referred to as “Information.”

(2) The text presented between horizontal lines beginning with the heading “Begin QPS Requirements” and ending with the heading “End QPS Requirements,” contains the regulatory requirements that are in addition to the requirements in the body of the part 60 language but found only in this appendix.

(3) The text presented between horizontal lines beginning with the heading “Begin Information” and ending with the heading “End Information,” is advisory or informative.

(4) The tables in this appendix have rows across the top of each table--

(a) The data presented in columns under the heading ``QPS REQUIREMENTS'' is regulatory but is found only in this appendix.

(b) The data presented in columns under the heading ``INFORMATION'' is advisory or informative.

c. Questions regarding the contents of this publication should be sent to: U.S. Department of Transportation, Federal Aviation Administration, Flight Standards Service, National Simulator Program Staff, AFS-205, PO Box 20636 Atlanta, Georgia 30320. Telephone

contact numbers are: phone, 404-305-6100; fax, 404-305-6118. The

National Simulator Program Internet Web Site address is:

http://frwebgate.access.gpo.gov/cgi-bin/leaving.cgi?from=leavingFR.html&log=linklog&to=http://www.faa.gov/nsp. On this Web Site you will find an NSP personnel list with contact information, a list of qualified flight simulation devices, advisory circulars, a description of the qualification process, NSP policy, and an NSP ``In-Works'' section. Also linked from this site are additional information sources, handbook bulletins, frequently asked questions, a listing and text of the Federal Aviation Regulations, Flight Standards Inspector's handbooks, and other FAA links.

d. The NSPM encourages the use of electronic media for communication and the gathering, storage, presentation, or transmission of any record, report, request, test, or statement required by this QPS provided the media used has adequate provision or security and is acceptable to the NSPM. The NSPM recommends inquiries on system compatibility prior to any such activity. Minimum System requirements may be found on the NSP Web site.

e. Related Reading References

(1) 14CFR part 60

(2) 14CFR part 61.

(3) 14CFR part 63.

(4) 14CFR part 119

(5) 14CFR part 121.

(6) 14CFR part 125

(7) 14CFR part 135.

(8) 14CFR part 141

(9) 14CFR part 142

(10) Advisory Circular (AC) 120-28C, Criteria for Approval of Category III Landing Weather Minima.

(11) AC 120-29, Criteria for Approving Category I and Category II Landing Minima for part 121 operators.

(12) AC 120-35B, Line Operational Simulations: Line-Oriented Flight Training, Special Purpose Operational Training, Line Operational Evaluation.

(13) AC 120-41, Criteria for Operational Approval of Airborne Wind Shear Alerting and Flight Guidance Systems.

(14) AC 120-57A, Surface Movement Guidance and Control System (SMGS).

(15) AC 150/5300-13, Airport Design.

(16) AC 150/5340-1G, Standards for Airport Markings.

(17) AC 150/5340-4C, Installation Details for Runway Centerline Touchdown Zone Lighting Systems.

(18) AC 150/5340-19, Taxiway Centerline Lighting System.

(19) AC 150/5340-24, Runway and Taxiway Edge Lighting System.

(20) AC 150/5345-28D, Precision Approach Path Indicator (PAPI) Systems

(21) International Air Transport Association document, "Flight Simulator Design and Performance Data Requirements," as amended

(22) AC 29-2B, Flight Test Guide for Certification of Transport Category Rotorcraft.

(23) AC 27-1A, Flight Test Guide for Certification of Normal Category Rotorcraft.

(24) International Civil Aviation Organization (ICAO) Manual of Criteria for the Qualification of Flight Simulators, as amended.

(25) Airplane Flight Simulator Evaluation Handbook, Volume I, as amended and Volume II, as amended, The Royal Aeronautical Society, London, UK.

(26) FAA Publication FAA-S-8081 series (Practical Test Standards for Airline Transport Pilot Certificate, Type Ratings, Commercial Pilot, and Instrument Ratings).

(27) The FAA Aeronautical Information Manual (AIM), FAA Handbook XXXXX

f. Background. Reserved

End Information

---

2. Applicability (§§ 60.1 & 60.2)

There is no additional regulatory or informational material that applies to § 60.1, Applicability, or to § 60.2, Applicability of sponsor rules to person who are not sponsors and who are engaged in certain unauthorized activities.

---

3. Definitions (§ 60.3)

Begin Information

See Appendix F for a list of definitions and abbreviations from part 1 and part 60, including the appropriate appendices of part 60.

End Information

---

4. Qualification Performance Standards (§ 60.4)

There is no additional regulatory or informational material that applies to § 60.4, Qualification Performance Standards.

---

5. Quality Management System (§ 60.5).

Begin Information

Additional regulatory material and informational material regarding Quality Management Systems for Flight Simulation Training Devices may be found in appendix E of this part.

End Information

---

6. Sponsor Qualification Requirements (§ 60.7).

Begin Information

a. The intent of the language used in § 60.7(b) is to have a specific FTD, identified by the sponsor, used by the sponsor at least once in the sponsor's FAA-approved flight training program for the helicopter FTD simulated during the 12-month period described. The identification of the specific FTD may change from one 12-month period to the next 12-month period as long as that sponsor sponsors and uses at least one FTD at least once during the prescribed period. There is no minimum number of hours or minimum FTD periods required.

b. To assist in avoiding confusion regarding the requirements for use of a qualified FTD the following examples/descriptions are provided to describe acceptable operational practices:

(1) Example One.

a. A sponsor is sponsoring a single, specific FTD for their own use, in their own facility or elsewhere – this single FTD forms the basis for the sponsorship. The sponsor uses that FTD at least once in each 12-month period in that sponsor's FAA-approved flight training program for the helicopter FTD simulated. This 12-month period is established according to the following:

(i) If the FTD was qualified prior to [insert the effective date of this rule] the 12-month period begins on the date of the first NSPM-conducted continuing qualification after [insert the effective date of this rule] and continues for each subsequent 12-month period;

(ii) If the FTD satisfactorily completes an initial or upgrade evaluation on or after [insert the effective date of this rule] the 12-month period begins on the date of that completed initial or upgrade evaluation and continues for each subsequent 12-month period.

b. There is no minimum number of hours or minimum FTD periods required.

c. The identification of the specific FTD may change from one 12-month period to the next 12-month period as long as that sponsor sponsors and uses at least one FTD at least once during the prescribed period.

(2) Example Two.

a. A sponsor sponsors an additional number of FTDs, in their facility or elsewhere. Each such additionally sponsored FTD must be –

(i) Used by the sponsor in the sponsor's FAA-approved flight training program for the helicopter FTD simulated [as described in § 60.7(d)(1)] at least once in each 12-month period in that sponsor's FAA-approved flight training program for the helicopter FTD simulated (this 12-month period is established in the same manner as in example one);

OR

(ii) Used by another FAA certificate holder in that other certificate holder's FAA-approved flight training program for the helicopter FTD simulated [as described in § 60.7(d)(1)] at least once in each 12-month period in that certificate holder's FAA-approved flight training program for the helicopter FTD simulated (this 12-month period is established in the same manner as in example one);

OR

(iii) Provided a statement each year from a qualified pilot, (after having flown the helicopter FTD, not the subject FTD or another FTD, during the preceding 12-month period) stating that the subject FTD's performance and handling qualities represent the helicopter FTD [as described in § 60.7(d)(2)]. This statement is provided at least once in each 12-month period established in the same manner as in example one.

b. There is no minimum number of hours or minimum FTD periods required.

(3) Example Three.

a. A sponsor (in this example, a Part 142 certificate holder) in "New York" (having at least one FTD used at least once per year in the sponsor's FAA-approved flight training program) establishes a "satellite" training center in "Chicago" and/or a satellite center in "Moscow."

b. The satellite function means that the "Chicago" and/or "Moscow" center(s) must operate under the "New York" center's certificate (in accordance with all of the "New York" center's practices, procedures, and policies; e.g., instructor and/or technician training/checking requirements, record keeping, QMS program, etc.).

c. All of the FTDs in the "Chicago" center and/or the "Moscow" center could be dry-leased (i.e., the certificate holder does not have and utilize FAA-approved flight training programs for the FTDs in the "Chicago" and/or the

“Moscow” center) because –

(i) Each FTD in the “Chicago” center and/or each FTD in the “Moscow” center is used at least once each 12-month period by another FAA certificate holder in that other certificate holder’s FAA-approved flight training program for the helicopter FTD [as described in § 60.7(d)(1)];or

(ii) A statement is obtained from a qualified pilot (having flown the helicopter FTD, not the subject FTD or another FTD during the preceding 12-month period) stating that the performance and handling qualities of each FTD in the “Chicago” center and/or each FTD in the “Moscow” center represent the helicopter FTD [as described in § 60.7(d)(2)].

End Information

---

7. Additional Responsibilities of the Sponsor (§ 60.9).

Begin Information

The phrase “…as soon as practicable…” as found in § 60.9(a), means without unnecessarily disrupting or delaying beyond a reasonable time the training, evaluation, or experience being conducted in the FSTD.

End Information

---

8. FTD Use (§ 60.11).

There is no additional regulatory or informational material that applies to § 60.11, FTD Use.

---

9. FTD Objective Data Requirements (§ 60.13)

Begin QPS Requirements

a. The FTD sponsor must maintain a liaison with the manufacturer of the aircraft being simulated (or with the holder of the aircraft type certificate for the aircraft being simulated if the manufacturer is no longer in business), and/or, if appropriate, with the person having supplied the aircraft data package for the FTD in order to facilitate the notification described in this paragraph. The sponsor must immediately notify the NSPM when an addition to or a revision of the flight related data or helicopter FTD systems related data is available if this data is used to program and/or operate a qualified FTD. The data referred to in this sub-section are those data that are used to validate the performance, handling qualities, or other characteristics of the aircraft, including data related to any relevant changes occurring after the type certification is issued. The notification must also provide technical information about this data to the NSPM relative to the data's significance for training, evaluation, or flight experience activities in the FTD.

b. Flight test data used to validate FTD performance and handling qualities must have been gathered in accordance with a flight test program containing the following:

(1) A flight test plan, that contains:

(a) The required maneuvers and procedures.

(b) For each maneuver or procedure --

(i) The procedures and control input the flight test pilot and/or engineer are to use.

(ii) The atmospheric and environmental conditions.

(iii) The initial flight conditions.

(iv) The helicopter FTD configuration, including weight and center of gravity.

(v) The data that is to be gathered.

(vi) Any other appropriate factors.

(2) Appropriately qualified flight test personnel.

(3) An understanding of the accuracy of the data to be gathered.

(4) Appropriate and sufficient data acquisition equipment or system(s), including appropriate data reduction and analysis methods and techniques, as would be acceptable to the FAA's Aircraft Certification Service.

(5) Calibration of data acquisition equipment and helicopter FTD performance instrumentation must be current and traceable to a recognized standard.

c. The data, regardless of source, must be presented:

(1) in a format that supports the flight FTD validation process;

(2) in a manner that is clearly readable and annotated correctly and completely;

(3) with resolution sufficient to determine compliance with the tolerances set forth in attachment 2 of this appendix.

(4) with any necessary guidance information provided; and

(5) without alteration, adjustments, or bias; however the data may be re-scaled, digitized, or otherwise manipulated to fit the desired presentation.

d. After completion of any additional flight test, a flight test report must be submitted in support of the validation data. The report must contain sufficient data and rationale to support qualification of the FTD at the level requested.

End QPS Requirements

Begin Information

e. It is the intent of the NSPM that for new aircraft entering service, at a point well in advance of preparation of the Qualification Test Guide (QTG), the sponsor should submit to the NSPM for approval, a descriptive document (a validation data roadmap) containing the plan for acquiring the validation data, including data sources. This document should clearly identify sources of data for all required tests, a description of the validity of these data for a specific engine type and thrust rating configuration, and the revision levels of all avionics affecting the performance or flying qualities of the aircraft. Additionally, this document should provide rationale or explanations for cases where data or data parameters are missing, where engineering simulation data are used, where flight test methods require further explanations, etc. and provide a brief narrative describing the cause and effect of any deviation from data requirements. This document may be provided by the aircraft manufacturer.

f. There is no requirement for any flight test data supplier to submit a flight test plan/program prior to gathering flight test data. However, the NSP staff has experience that indicates at least some data gatherers, primarily those that do not have a satisfactory “history” of supplying such data, often provide data that is irrelevant, not properly marked, without adequate justification for selection, without adequate information regarding initial conditions, without adequate information regarding the test maneuver, etc. The NSP staff has been forced to not accept such data submissions as validation data for FTD evaluation. It is for this reason that the NSP staff recommends that any data supplier not previously experienced in this area review the data necessary for programming and for validating the performance of the FTD and discuss the flight test plan anticipated for acquiring such data with the NSP staff well in advance of commencing the flight tests.

g. The NSPM will consider, on a case-by-case basis, whether or not to approve supplemental validation data derived from flight data recording systems such as a Quick Access Recorder or Flight Data Recorder.

End Information

---

10. Special Equipment and Personnel Requirements for Qualification of the FTD (§ 60.14).

Begin Information

a. In the event that the NSPM determines that special equipment or (a) specifically qualified person(s) will be required for the conduct of any evaluation, the NSPM will make every attempt to notify the sponsor at least one (1) week, but in no case less than 72 hours, in advance of the evaluation. Examples of special equipment include spot photometers, flight control measurement devices, sound analyzer, etc. Examples of specially qualified personnel would be those specifically qualified to install or use any special equipment when its use is required.

b. Examples of a special evaluation would be an evaluation conducted after the move of a FTD; at the request of the TPAA; as a result of comments received from users of the FTD that, upon analysis and confirmation, might cause a question as to the continued qualification or use of the FTD; etc.

End Information

---

11. Initial (and Upgrade) Qualification Requirements (§ 60.15).

Begin QPS Requirements

a. The request described in § 60.15(a) must include all of the following:

(1) A statement that the FSTD meets all of the applicable provisions of this part and all applicable provisions of the QPS.

(2) A confirmation that the sponsor will forward to the NSPM the statement described in § 60.15(b) in such time as to be received no later than 5 business days prior to the scheduled evaluation and may be forwarded to the NSPM via traditional or electronic means.

(3) A qualification test guide (QTG), acceptable to the NSPM, that includes all of the following:

(i) Objective data obtained from aircraft testing or another approved source.

(ii) Correlating objective test results obtained from the performance of the FSTD as prescribed in the appropriate QPS.

(iii) The result of FSTD performance demonstrations prescribed in the appropriate QPS.

(iv) A description of the equipment necessary to perform the evaluation for initial qualification and the continuing qualification evaluations.

b. The QTG described in paragraph a (3) of this section, must provide the documented proof of compliance with the FTD objective tests in attachment 2 of this appendix.

c. The QTG is prepared and submitted by the sponsor, or the sponsor's agent on behalf of the sponsor, to the NSPM for review and approval, and must include, for each objective test:

(1) Parameters, tolerances, and flight conditions;

(2) Pertinent and complete instructions for the conduct of automatically and manually conducted tests;

(3) A means of comparing the FTD's test results to the objective data;

(4) An explanation, or other information as necessary, to assist in the evaluation of the test results;

(5) Other information appropriate to the qualification level of the FTD.

d. The QTG described in paragraphs a(3) and b of this section, must include the following:

(1) A QTG cover page with sponsor and FAA approval signature blocks (see Attachment 4, Figure 2, for a sample QTG cover page).

(2) A continuing qualification evaluation schedule requirements page – to be used by the NSPM to establish and record the frequency with which continuing qualification evaluations must be conducted and any subsequent changes that may be determined by the NSPM. See Attachment 4, Figure 4, for a sample Continuing Qualification Evaluation Schedule Requirements page.

(3) A FTD information page that provides the information listed in this paragraph (see Attachment 4, Figure 3, for a sample FTD information page). For convertible FTDs, a separate page is submitted for each configuration of the FTD.

(a) The sponsor's FTD identification number or code.

(b) The helicopter FTD model and series being simulated.

(c) The aerodynamic data revision number or reference.

(d) The engine model(s) and its data revision number or reference.

(e) The flight control data revision number or reference.

(f) The flight management system identification and revision level.

(g) The FTD model and manufacturer.

(h) The date of FTD manufacture.

(i) The FTD computer identification.

(j) The visual system model and manufacturer, including display type.

(k) The motion system type and manufacturer, including degrees of freedom.

(4) A Table of Contents.

(5) A log of revisions and a list of effective pages.

(6) List of all relevant data references.

(7) A glossary of terms and symbols used (including sign conventions and units).

(8) Statements of compliance and capability (SOC's) with certain requirements. SOC's must provide references to the sources of information for showing the capability of the FTD to comply with the requirement, a rationale explaining how the referenced material is used, mathematical equations and parameter values used, and the conclusions reached; i.e. that the FTD complies with the requirement. Refer to the "Additional Details" column in attachment 1, "FTD Standards," or in the “Test Details” column in attachment 2, “FTD Objective Tests,” to see when SOC's are required.

(9) Recording procedures or equipment required to accomplish the objective tests.

(10) The following information for each objective test designated in attachment 2, as applicable to the qualification level sought:

(a) Name of the test.

(b) Objective of the test.

(c) Initial conditions.

(d) Manual test procedures.

(e) Automatic test procedures (if applicable).

(f) Method for evaluating FTD objective test results.

(g) List of all relevant parameters driven or constrained during the automatically conducted test(s).

(h) List of all relevant parameters driven or constrained during the manually conducted test(s).

(i) Tolerances for relevant parameters.

(j) Source of Validation Data (document and page number).

(k) Copy of the Validation Data (if located in a separate binder, a cross reference for the identification and page number for pertinent data location must be provided).

(l) FTD Objective Test Results as obtained by the sponsor. Each test result must reflect the date completed and must be clearly labeled as a product of the device being tested.

e. Form and manner of presentation of objective test results in the QTG:

(1) The sponsor's FTD test results must be recorded in a manner, acceptable to the NSPM, that will allow easy comparison of the FTD test results to the validation data (e.g., use of a multi-channel recorder, line printer, cross plotting, overlays, transparencies, etc.).

(2) FTD results must be labeled using terminology common to helicopter FTD parameters as opposed to computer software identifications.

(3) Validation data documents included in a QTG may be photographically reduced only if such reduction will not alter the graphic scaling or cause difficulties in scale interpretation or resolution.

(4) Scaling on graphical presentations must provide the resolution necessary to evaluate the parameters shown in attachment 2 of this appendix.

(5) For tests involving time histories, data sheets (or transparencies thereof) and FTD test results must be clearly marked with appropriate reference points to ensure an accurate comparison between FTD and helicopter FTD with respect to time. Time histories recorded via a line printer are to be clearly identified for cross-plotting on the helicopter FTD data. Over-plots must not obscure the reference data.

f. The sponsor may elect to complete the QTG objective tests at the manufacturer's facility. Tests performed at this location must be conducted after assembly of the FTD has been essentially completed, the systems and sub-systems are functional and operate in an interactive manner, and prior to the initiation of disassembly for shipment. The sponsor must substantiate FTD performance at the sponsor's training facility by repeating a representative sampling of all the objective tests in the QTG and submitting these repeated test results to the NSPM. This sample must consist of at least one-third of the QTG objective tests. The QTG must be clearly annotated to indicate when and where each test was accomplished.

g. While the subjective tests are normally accomplished at the sponsor's training facility, the sponsor may elect to complete the subjective tests at the manufacturer's facility. Tests performed at this location will be conducted after assembly of the FTD has been essentially completed, the systems and sub-systems are functional and operate in an interactive manner, and prior to the initiation of disassembly for shipment. The sponsor must substantiate FTD performance at the sponsor's training facility by having the pilot(s) who performed these tests originally (or similarly qualified pilot(s)), repeat a representative sampling of these subjective tests (need not take more than one normal FTD period – e.g., 4 hours) and submit a statement to the NSPM that the FTD has not changed from the original determination. This statement must clearly indicate when and where these repeated tests were completed.

h. The sponsor must maintain a copy of the MQTG at the FTD location. j. All FTDs for which the initial qualification is conducted after [insert 6 years after effective date of this rule] must have an electronic MQTG (eMQTG) including all objective data obtained from helicopter FTD testing, or another approved source (reformatted or digitized), together with correlating objective test results obtained from the performance of the FTD (reformatted or digitized) as prescribed in this appendix, the general FTD performance or demonstration results (reformatted or digitized) prescribed in this appendix, and a description of the equipment necessary to perform the evaluation for initial qualification and the continuing qualification evaluations for continuing qualification. This eMQTG must include the original validation data used to validate FTD performance and handling qualities in either the original digitized format from the data supplier or an electronic scan of the original time-history plots that were provided by the data supplier. An eMQTG must be provided to the NSPM.

i. All other FTDs (not covered in subparagraph “i”) must have an electronic copy of the MQTG by and after [insert 6 years after effective date of this rule], a copy of which must be provided to the NSPM. This may be provided by an electronic scan presented in a Portable Document File (PDF), or similar format, acceptable to the NSPM.

End QPS Requirements

Begin Information

j. Only those FTDs that are sponsored by a certificate holder (as defined for use in part 60 and this QPS appendix) will be evaluated by the NSPM. However, other FTD evaluations may be conducted on a case-by-case basis as the Administrator deems appropriate, but only in accordance with applicable agreements.

k. Each FTD must be evaluated as completely as possible. To ensure a thorough and uniform evaluation, each FTD is subjected to the general FTD requirements and performance demonstrations in attachment 1, the objective tests listed in attachment 2, and the subjective tests listed in attachment 3 of this appendix. The evaluation(s) described herein will include, but not necessarily be limited to the following, as appropriate, for the qualification level of the FTD:

(1) Helicopter FTD responses, including longitudinal and lateral-directional control responses (see attachment 2 of this appendix);

(2) Performance in authorized portions of the simulated helicopter FTD's operating envelope, to include tasks evaluated by the NSPM in the areas of ground operations, takeoff, climb, cruise, descent, approach, and landing as well as abnormal and emergency operations (see paragraph [check reference] and attachment 2 of this appendix);

(3) Control checks (see attachment 1 and attachment 2 of this appendix);

(4) Cockpit configuration (see attachment 1 of this appendix);

(5) Pilot, flight engineer, and instructor station functions checks (see attachment 1 and attachment 3 of this appendix);

(6) Helicopter FTD systems and sub-systems (as appropriate) as compared to the helicopter FTD simulated (see attachment 1 and attachment 3 of this appendix);

(7) FTD systems and sub-systems, including force cueing (motion), visual, and aural (sound) systems, as appropriate (see attachment 1 and attachment 2 of this appendix); and

(8) Certain additional requirements, depending upon the complexity of the FTD qualification level sought, including equipment or circumstances that may become hazardous to the occupants. The sponsor may be subject to Occupational Safety and Health Administration requirements.

l. The NSPM administers the objective and subjective tests, which includes an examination of functions. The tests include a qualitative assessment of the FTD by an NSP pilot. The NSP evaluation team leader may assign other qualified personnel to assist in accomplishing the functions examination and/or the objective and subjective tests performed during an evaluation when required.

(1) Objective tests provide a basis for measuring and evaluating FTD performance and determining compliance with the requirements of this part.

(2) Subjective tests provide a basis for:

(a) Evaluating the capability of the FTD to perform over a typical utilization period;

(b) Determining that the FTD satisfactorily simulates each required task;

(c) Verifying correct operation of the FTD controls, instruments, and systems; and

(d) Demonstrating compliance with the requirements of this part.

m. The tolerances for the test parameters listed in attachment 2 of this appendix are the maximum acceptable to the NSPM for FTD validation and are not to be confused with design tolerances specified for FTD manufacture. In making decisions regarding tests and test results, the NSPM relies on the use of operational and engineering judgment in the application of data (including consideration of the way in which the flight test was flown and way the data was gathered and applied) data presentations, and the applicable tolerances for each test.

n. In addition to the scheduled continuing qualification evaluation (see paragraph [check reference]), each FTD is subject to evaluations conducted by the NSPM at any time with no prior notification to the sponsor. Such evaluations would be accomplished in a normal manner (i.e., requiring exclusive use of the FTD for the conduct of objective and subjective tests and an examination of functions) if the FTD is not being used for flight crew member training, testing, or checking. However, if the FTD were being used, the evaluation would be conducted in a non-exclusive manner. This non-exclusive evaluation will be conducted by the FTD evaluator accompanying the check airman, instructor, Aircrew Program Designee (APD), or FAA inspector aboard the FTD along with the student(s) and observing the operation of the FTD during the training, testing, or checking activities.

o. Problems with objective test results are handled according to the following:

(1) If a problem with an objective test result is detected by the NSP evaluation team during an evaluation, the test may be repeated and/or the QTG may be amended.

(2) If it is determined that the results of an objective test do not support the level requested but do support a lower level, the NSPM may qualify the FTD at that lower level.

p. After the NSPM issues a statement of qualification to the sponsor when a FTD is successfully evaluated, the FTD is recommended to the TPAA, who will exercise authority on behalf of the Administrator in approving the FTD in the appropriate helicopter FTD flight training program.

q. Under normal circumstances, the NSPM establishes a date for the initial or upgrade evaluation within ten (10) working days after determining that a complete QTG is acceptable. Unusual circumstances may warrant establishing an evaluation date before this determination is made; however, once a schedule is agreed to, any slippage of the evaluation date at the sponsor's request may result in a significant delay, perhaps 45 days or more, in rescheduling and completing the evaluation. A sponsor may commit to an initial evaluation date under this early process, in coordination with and the agreement of the NSPM, but the request must be in writing and must include an acknowledgment of the potential schedule impact if the sponsor slips the evaluation from this early-committed date. See Attachment 4, figure 5, Sample Request for Initial Evaluation Date.

r. A convertible FTD is addressed as a separate FTD for each model and series helicopter FTD to which it will be converted and for the FAA qualification level sought. An NSP evaluation is required for each configuration. For example, if a sponsor seeks qualification for two models of a helicopter FTD type using a convertible FTD, two QTG's, or a supplemented QTG, and two evaluations are required.

s. The numbering system used for objective test results in the QTG should closely follow the numbering system set out in attachment 2, FTD Objective Tests.

t. If additional information is needed regarding the preferred qualifications of pilots used to meet the requirements of §60.15(e), the reader should contact the NSPM or visit the NSPM website.

u. Examples of the exclusions for which the FTD might not have been subjectively tested by the sponsor or the NSPM and for which qualification might not be sought or granted, as described in §60.15(h)(6), include windshear training, circling approaches, etc.

End Information

---

12. Additional Qualifications for a Currently Qualified FTD (§ 60.16).

There is no additional regulatory or informational material that applies to § 60.16, Additional Qualifications for a Currently Qualified FTD.

---

13. Previously Qualified FTDs (§ 60.17).

Begin QPS Requirements

a. In instances where a sponsor plans to remove a FTD from active status for prolonged periods, the following procedures will apply:

(1) The NSPM must be advised in writing and the advisement must include an estimate of the period that the FTD will be inactive;

(2) Continuing Qualification evaluations would not be scheduled during the inactive period;

(3) The NSPM will remove the FTD from the list of qualified FSTD’s on a mutually established date not later than the date on which the first missed continuing qualification evaluation would have been scheduled;

(4) Before the FTD may be restored to qualified status, it will require an evaluation by the NSPM. The evaluation content and time required for accomplishment will be based on the number of continuing qualification evaluations and sponsor-conducted quarterly inspections missed during the period of inactivity. For example, if the FTD were out of service for a 1 year period, it would be necessary to complete the entire QTG, since all of the quarterly evaluations would have been missed;

(5) The sponsor must notify the NSPM of any changes to the original scheduled time out of service;

(6) The FTD will normally be re-qualified using the FAA-approved MQTG and the criteria that was in effect prior to its removal from qualification; however, inactive periods of 2 years or more will require a review of the qualification basis and will likely result in the re-qualification to be against the standards in effect and current at the time of re-qualification.

End QPS Requirements

Begin Information

b. Other certificate holders or persons desiring to use a flight FTD may contract with FTD sponsors to use those FTDs already qualified at a particular level for a helicopter FTD type and approved for use within an FAA-approved flight training program. Such FTDs are not required to undergo an additional qualification process, except as described in paragraph 12 of this appendix.

c. Each FTD user must obtain approval from the appropriate TPAA to use any FTD in an FAA-approved flight training program.

d. The intent of the requirement listed in § 60.17(b), for each FTD to have a Statement of Qualification within 6 years, is to have the availability of that statement (including the configuration list and the limitations to authorizations) to provide a complete picture of the FTD inventory regulated by the FAA. The issuance of the statement will not require any additional evaluation or require any adjustment to the evaluation basis for the FTD.

e. Downgrading of a FTD is a permanent change in qualification level. If a temporary restriction is placed on a FTD because of a missing, malfunctioning, or inoperative component or some repair is in progress, the restriction is not a permanent change in qualification level and such a temporary restriction can, and is, removed when the reason for the restriction has been resolved. It would be inappropriate to permanently downgrade a FTD and, at some undetermined time in the future, allow that FTD to be returned to its original status (i.e., accomplish an "upgrade") using the original qualification standards.

End Information

---

14. Inspection, Continuing Qualification Evaluation, and Maintenance Requirements (§ 60.19).

Begin QPS Requirements

a. The sponsor must conduct a minimum of four evenly spaced inspections throughout the year. The objective test sequence and content of each inspection in this sequence will be developed by the sponsor and will be acceptable to the NSPM.

b. The description of what constitutes the functional preflight inspection will be contained in the sponsor's QMS.

(c) Record "functional preflight" in the FTD discrepancy log book or other acceptable location, including any item found to be missing, malfunctioning, or inoperative.

End QPS Requirements

Begin Information

d. In determining the acceptability of the sponsor's test sequence and the content of each quarterly inspection required in § 60.19(a)(1), the NSPM looks for a balance and a mix from the performance demonstrations and objective test requirement areas listed as follows:

(1) Performance.

(2) Handling qualities.

(3) Motion system (where appropriate).

(4) Visual system (where appropriate).

(5) Sound system (where appropriate).

(6) Other FTD systems.

e. If the NSP evaluator plans to accomplish specific tests during a normal continuing qualification evaluation that requires the use of special equipment or technicians, the sponsor will be notified as far in advance of the evaluation as practical; but not less than 72 hours. These tests include latencies, control dynamics, sounds and vibrations, motion, and/or some visual system tests.

f. The continuing qualification evaluations, described in § 60.19(b), normally will require 4 hours of FTD time. Flexibility is necessary to address those situations that are not normal or those that involve aircraft with additional levels of complexity (e.g. computer controlled aircraft) and may require additional time. The continuing qualification evaluations will consist of the following:

(1) Review of the results of the objective tests and all the designated FTD performance demonstrations (quarterly inspections) conducted by the sponsor since the last scheduled continuing qualification evaluation.

(2) At the discretion of the evaluator, a selection of approximately 8 to 15 objective tests from the MQTG, that will, in the opinion of the evaluator, provide an adequate opportunity to evaluate, first hand, the performance of the FTD. The tests chosen will be performed either automatically or manually, at the discretion of the evaluator and should be able to be conducted within approximately one-third (1/3) of the allotted FTD time.

(3) A subjective evaluation of the FTD to perform a representative sampling of the tasks set out in attachment 3 of this appendix, selected at the discretion of the evaluator. This portion of the evaluation should take approximately two-thirds (2/3) of the allotted FTD time.

(4) An examination of the functions of the FTD, to include, but not necessarily limited to, the motion system, visual system, sound system, instructor operating station, and the normal functions and simulated malfunctions of the simulated helicopter FTD systems. This examination is normally accomplished simultaneously with the subjective evaluation requirements noted in subparagraph d(3).

g. The requirement established in § 60.19(b)(4) regarding the frequency of NSPM-conducted continuing qualification evaluations for each FTD is typically 12 months. However, the establishment and satisfactory operation of an approved quality management system for a sponsor will provide a basis for adjusting the interval between evaluations on some FTDs at a given sponsor's location to exceed this 12-month interval.

End Information

---

15. Logging FTD Discrepancies (§ 60.20).

There is no additional regulatory or informational material that applies to § 60.20. Logging FTD Discrepancies.

---

16. Interim Qualification of FTDs for New Helicopter FTD Types or Models (§ 60.21).

There is no additional regulatory or informational material that applies to § 60.21, Interim Qualification of FTDs for New Helicopter FTD Types or Models.

---

17. Modifications to FTDs (§ 60.23).

Begin QPS Requirements

a. The notification described in § 60.23(c)(2) must include a complete description of the planned modification, with a description of the operational and engineering effect the proposed modification will have on the operation of the FFS and the results that are expected with the modification incorporated.

b. Prior to using the modified FFS:

(i) All the applicable objective tests that have been run with the modification incorporated, including any necessary updates to the MQTG must be acceptable to the NSPM; and

(ii) The sponsor must provide the NSPM with a statement signed by the MR that the factors cited in § 60.15(b) are addressed by the appropriate personnel as described in that section.

End QPS Requirements

---

18. Operation with Missing, Malfunctioning, or Inoperative Components (§ 60.25).

Begin Information

a. Once the sponsor fairly and accurately advises the user of a FTD's current status, including any missing, malfunctioning, or inoperative (MMI) component(s), the sponsor's responsibility with respect to § 60.25(a) will have been satisfied.

b. If the 29th or 30th day of the 30-day period described in § 60.25(b) is on a Saturday, a Sunday, or a holiday, the intent of the FAA is to automatically extend the deadline until the next business day.

c. In accordance with the authorization described in § 60.25(b), the NSPM may find as acceptable a discrepancy prioritizing system wherein the length of time authorized to repair or replace any given MMI component is based on the level of impact on the capability of the FTD to provide the required training, evaluation, or flight experience, with the larger impact on this capability associated with a higher priority for repair or replacement.

End Information

---

19. Automatic Loss of Qualification and Procedures for Restoration of Qualification (§ 60.27).

Begin Information

If the sponsor provides a plan for how the FTD is to be maintained during its out-of-service period (e.g., periodic exercise of mechanical, hydraulic, and electrical systems; routine replacement of hydraulic fluid; control of the environmental factors in which the FTD is to be maintained, etc.) there is a greater likelihood of being able to determine the amount of testing that would be required for re-qualification.

End Information

---

20. Other Losses of Qualification and Procedures for Restoration of Qualification (§ 60.29).

Begin Information

If the sponsor provides a plan for how the FTD is to be maintained during its out-of-service period (e.g., periodic exercise of mechanical, hydraulic, and electrical systems; routine replacement of hydraulic fluid; control of the environmental factors in which the FTD is to be maintained, etc.) there is a greater likelihood of being able to determine the amount of testing that would be required for re-qualification.

End Information

---

21. Recordkeeping and Reporting (§ 60.31).

Begin QPS Requirements

a. The minimally acceptable record of programming changes, as described in § 60.31(a)(2), must consist of the name of the aircraft system software, aerodynamic model, or engine model change, the date of the change, a summary of the change, and the reason for the change.

b. If a coded form for record keeping is used, it must provide for the preservation and retrieval of information with appropriate security or controls to prevent the illegal or inappropriate alteration of such records after the fact.

End QPS Requirements

---

22. Applications, Logbooks, Reports, and Records: Fraud, Falsification, or Incorrect Statements (§ 60.33).

There are no additional QPS requirements or informational material that apply to § 60.33, Applications, Logbooks, Reports, and Records: Fraud, Falsification, or Incorrect Statements.

---

23. [Reserved].

---

24. [Reserved].

---

25. FTD Qualification on the Basis of a Bilateral Aviation Safety Agreement (BASA) (§ 60.37).

There are no additional QPS requirements or informational material that apply to § 60.37, FTD Qualification on the Basis of a Bilateral Aviation Safety Agreement (BASA).

Attachment 1 to Appendix D to Part 60--

FTD STANDARDS

1. General
a. Requirements

Begin QPS Reqirements

Certain FTD requirements included in this appendix must be supported with a Statement of Compliance and Capability (SOC) and, in designated cases, FTD performance must be recorded and the results made part of the QTG. In the following tabular listing of FTD standards, requirements for SOC's are indicated in the "Additional Details" column.

End QPS Requirements

b. Discussion

Begin Information

(1) This attachment describes the minimum requirements for qualifying Level 2 through Level 6 flight training devices. To determine the complete requirements for a specific level FTD, the objective tests in attachment 2 of this appendix and the subjective tests listed in attachment 3 of this appendix for this QPS must be consulted.

(2) The material contained in this attachment is divided into the following categories:

(a) General cockpit configuration.

(b) Simulator programming.

(c) Equipment operation.

(d) Equipment and facilities for instructor/evaluator functions.

(e) Sound system.

End Information

< < QPS Requirement > >	> > >			> >		< INFORMATION >
General FTD Standards	**FTD Level**			**Additional Details**		**Notes**
	4	**5**	**6**			
2. General Cockpit Configuration.						
a. The FTD must have a cockpit that is a full-scale replica of the helicopter, or set of helicopters, simulated with controls, equipment, observable cockpit indicators, circuit breakers, and bulkheads properly located, functionally accurate and replicating the helicopter or set of helicopters. The direction of movement of controls and switches must be identical to that in the helicopter or set of helicopters.			**X**	Crewmember seats must afford the capability for the occupant to be able to achieve the design "eye position" for specific helicopters, or to approximate such a position for a generic set of helicopters.		For FTD purposes, the cockpit consists of all that space forward of a cross section of the fuselage at the most extreme aft setting of the pilots' seats including additional, required crewmember duty stations and those required bulkheads aft of the pilot seats.
b. The FTD must have equipment (i.e., instruments, panels, systems, and controls) simulated sufficiently for the authorized training/checking events to be accomplished. The installed equipment, must be located in a spatially correct configuration, and may be in a cockpit or an open flight deck area. Actuation of this equipment must replicate the appropriate function in the helicopter.	**X**	**X**				
c. Circuit breakers must function accurately when they are involved in operating procedures or malfunctions requiring or involving flight crew response.		**X**	**X**	Level 6 devices must have installed circuit breakers properly located in the FTD cockpit.		
3. Programming.						
a. The FTD must provide the proper effect of aerodynamic changes for the combinations of drag and thrust normally encountered in flight. This must include the effect of change in helicopter attitude, thrust, drag, altitude, temperature, and configuration.		**X**	**X**	Levels 6 additionally requires the effects of change in gross weight and center of gravity. Level 5 requires only generic aerodynamic programming.		
b. The FTD must have the computer (analog or digital) capability (i.e., capacity, accuracy, resolution, and dynamic response) needed to meet	**X**	**X**	**X**			

< < QPS Requirement > >	>	> >		> >	< INFORMATION >
General FTD Standards	**FTD Level**			**Additional Details**	**Notes**
	4	**5**	**6**		
the qualification level sought.					
c. The FTD hardware and programming must be updated within 6 months of any helicopter modifications or data releases (or any such modification or data releases applicable to the set of helicopters) unless, with prior coordination, the NSPM authorizes otherwise.	**X**	**X**	**X**		
d. Relative responses of the cockpit instruments (and the visual and motion systems, if installed and training, testing, or checking credits are being sought) must be coupled closely to provide integrated sensory cues. The instruments (and the visual and motion systems, if installed, and training, testing, or checking credits are being sought) must respond to abrupt input at the pilot's position within the allotted time, but not before the time, when the helicopter or set of helicopters would respond under the same conditions. (If a visual system is installed and training, testing, or checking credits are sought, the visual scene changes from steady state disturbance must occur within the appropriate system dynamic response limit but not before the instrument response (and not before the motion system onset if a motion system is installed)).		**X**	**X**	A demonstration is required and must simultaneously record: the analog output from the pilot's control column, wheel, and pedals; and the output signal to the pilot's attitude indicator. These recordings must be compared to helicopter response data in the following configurations: takeoff, cruise, and approach or landing. The results must be recorded in the QTG. Additionally, if a visual system is installed and training, testing, or checking credits are sought, the output signal to the visual system display (including visual system analog delays must be recorded); and if a motion system is installed and training, testing, or checking credits are sought, the output from an accelerometer attached to the motion system platform located at an acceptable location near the pilots' seats is also required.	

< < QPS Requirement > >	>	>	>	>	>		< INFORMATION >
General FTD Standards	**FTD Level**			**Additional Details**			**Notes**
	4	**5**	**6**				
4. Equipment Operation.							
a. All relevant instrument indications involved in the simulation of the helicopter (or set of helicopters) must automatically respond to control movement or external disturbances to the simulated helicopter or set of helicopters; e.g., turbulence or winds.		**X**	**X**				
b. Navigation equipment must be installed and operate within the tolerances applicable for the helicopter or set of helicopters.		**X**	**X**	Level 5 only needs that navigation equipment necessary to fly an instrument approach. Level 6 must also include communication equipment (inter-phone and air/ground) like that in the helicopter, or set of helicopters, and, if appropriate to the operation being conducted, an oxygen mask microphone system.			
c. Installed systems must simulate the applicable helicopter (or set of helicopters) system operation, both on the ground and in flight. At least one helicopter system must be represented. Systems must be operative to the extent that applicable normal, abnormal, and emergency operating procedures included in the sponsor's training programs can be accomplished.	**X**	**X**	**X**	Level 6 must simulate all applicable helicopter flight, navigation, and systems operation. Level 5 must have functional flight and navigational controls, displays, and instrumentation.			
d. The lighting environment for panels and instruments must be sufficient for the operation being conducted.	**X**	**X**	**X**				
e. The FTD must provide control forces and control travel that correspond to the replicated helicopter, or set of helicopters. Control forces must react in the same manner as in the helicopter, or set of helicopters, under the same flight			**X**				

< < QPS Requirement > >	> > >			> >	< INFORMATION >
General FTD Standards	**FTD Level**			**Additional Details**	**Notes**
	4	**5**	**6**		
conditions.					
f. The FTD must provide control forces and control travel of sufficient precision to manually fly an instrument approach. The control forces must react in the same manner as in the helicopter, or set of helicopters, under the same flight conditions.		X			
5. Instructor or Evaluator Facilities.					
a. In addition to the flight crewmember stations, suitable seating arrangements for an instructor/check airman and FAA Inspector must be available. These seats must provide adequate view of crewmember's panel(s).	X	X	X		These seats need not be a replica of an aircraft seat and may be as simple as an office chair placed in an appropriate position.
b. The FTD must have instructor controls that permit activation of normal, abnormal, and emergency conditions, as may be appropriate. Once activated, proper system operation must result from system management by the crew and not require input from the instructor controls.	X	X	X		
6. Motion System.					
a. The FTD may have a motion system; if desired, although it is not required.	X	X	X	If installed, the motion system operation may not be distracting. The motion system standards set out in QPS FAA-S-120-40C for at least Level A simulators is acceptable.	
7. Visual System.					
a. The FTD may have a visual system; if desired, although it is not required. If a visual system is installed, it must meet the following criteria: (1) Single channel, uncollimated display is acceptable. (2) Minimum field of view: 18° vertical / 24° horizontal for the pilot flying.	X	X	X	A statement of capability is required. A demonstration of latency or through-put is required. Visual system standards set out in QPS FAA-S-120-40C, for at least Level A simulators is	.

< < QPS Requirement > >	> > >			> >		< INFORMATION >
General FTD Standards	**FTD Level**			**Additional Details**		**Notes**
	4	**5**	**6**			
(3) Maximum paralax error: 10° per pilot. (4) Scene content may not be distracting. (5) Minimum distance from the pilot's eye position to the surface of a direct view display may not be less than the distance to any front panel instrument. (6) Minimum resolution of 5 arc-min. for both computed and displayed pixel size. (7) Maximum latency or through-put must not exceed 300 milliseconds.				acceptable. However, if additional authorizations (training, testing, or checking credits) are sought that require the use of a visual system, the Level A simulator visual system standards apply.		
8. Sound System.						
a. The FTD must simulate significant cockpit sounds resulting from pilot actions that correspond to those heard in the helicopter.			**X**			

Attachment 2 to Appendix D to Part 60--
FLIGHT TRAINING DEVICE (FTD) OBJECTIVE TESTS

1. General

a. Test Requirements.

Begin QPS Requirements

(1) The ground and flight tests required for qualification are listed in the following Table of Objective Tests. Computer generated FTD test results must be provided for each test. If a flight condition or operating condition is required for the test but which does not apply to the helicopter being simulated or to the qualification level sought, it may be disregarded (for example: an engine out climb capability for a single-engine helicopter; etc.). Each test result is compared against Flight Test Data described in §60.13, and Paragraph 9 of this appendix. (See paragraph 1.b of this attachment for additional information.) Although use of a driver program designed to automatically accomplish the tests is authorized, each test must be able to be accomplished manually while recording all appropriate parameters. The results must be produced on a multi-channel recorder, line printer, or other appropriate recording device acceptable to the NSPM. Time histories are required unless otherwise indicated in the Table of Objective Tests. All results must be labeled using the tolerances and units given.

(2) The Table of Objective Tests in this attachment sets out the test results required, including the parameters, tolerances, and flight conditions for FTD validation. Tolerances are provided for the listed tests because aerodynamic modeling and acquisition/development of reference data are often inexact. All tolerances listed in the following tables are applied to FTD performance. When two tolerance values are given for a parameter, the less restrictive may be used unless otherwise indicated.

(3) Certain tests included in this attachment must be supported with a Statement of Compliance and Capability (SOC). In the following tabular listing of FTD tests, requirements for SOC's are indicated in the “Test Details” column.

(4) When operational or engineering judgment is used in making assessments for flight test data applications for FTD validity, such judgment must not be limited to a single parameter. For example, data that exhibit rapid variations of the measured parameters may require interpolations or a “best fit” data section. All relevant parameters related to a given maneuver or flight condition must be provided to allow overall interpretation. When it is difficult or impossible to match FTD to helicopter data throughout a time history, differences must be justified by providing a comparison of other related variables for the condition being assessed.

(5) It is not sufficient, nor is it acceptable, to program the FTD so that the aerodynamic modeling is correct only at the validation test points. Unless noted otherwise, tests must represent helicopter performance and handling qualities at normal operating weights and centers of gravity (CG). If a test is supported by aircraft data at one extreme weight or CG, another test supported by aircraft data at mid-conditions or as close as possible to the other extreme is necessary. Certain tests that are relevant only at one extreme CG or weight condition need not be repeated at the other extreme. The results of the tests for Levels 3 and 6 are expected to be indicative of the device's performance and handling qualities throughout the following:

(a) the helicopter weight and CG envelope;

(b) the operational envelope; and

(c) varying atmospheric ambient and environmental conditions – including the extremes authorized for the respective helicopter or set of helicopters.

(6) When comparing the parameters listed to those of the helicopter, sufficient data must also be provided to verify the correct flight condition and helicopter configuration changes. For example: to show that control force is within ±0.5 pounds (0.22 daN) in a static stability test, data to show the correct airspeed, power, thrust or torque, helicopter configuration, altitude, and other appropriate datum identification parameters must also be given. If comparing short period dynamics, normal acceleration may be used to establish a match to the helicopter, but airspeed, altitude, control input, helicopter configuration, and other appropriate data must also be given. If comparing landing gear change dynamics, pitch, airspeed, and altitude may be used to establish a match to the helicopter, but landing gear position must also be provided. All airspeed values must be clearly annotated as to indicated, calibrated, etc., and like values used for comparison.

(7) The QTG provided by the sponsor must describe clearly and distinctly how the FTD will be set up and operated for each test. Overall integrated testing of the FTD must be accomplished to assure that the total FTD system meets the prescribed standards; i.e., it is not acceptable to test only each FTD subsystem independently. A manual test procedure with explicit and detailed steps for completion of each test must also be provided.

(8) In those cases where the objective test results authorize a “snapshot” result in lieu of a time-history result, the sponsor must ensure that a steady state condition exists from 5 seconds prior to, through 2 seconds after, the instant of time captured by the “snapshot.”

(9) For previously qualified FTDs, the tests and tolerances of this appendix may be used in subsequent recurrent evaluations for any given test providing the sponsor has submitted a proposed MQTG revision to the NSPM and has received NSPM approval.

(10) Tests of handling qualities must include validation of augmentation devices. FTDs for highly augmented helicopters will be validated both in the unaugmented configuration (or failure state with the maximum permitted degradation in handling qualities) and the augmented configuration. Where various levels of handling qualities result from failure states, validation of the effect of the failure is necessary. Requirements for testing will be mutually agreed to between the sponsor and the NSPM on a case-by-case basis.

End QPS Requirements

b. Discussion.

Begin Information

If relevant winds are present in the objective data, the wind vector (magnitude and direction) should be clearly noted as part of the data presentation, expressed in conventional terminology, and related to the runway being used for the test.

End Information

Table of)bjective Tests								
<<< QPS REQUIREMENT								INFORMATION
TEST	TOLERENCE	FLIGHT CONDITIONS	TEST DETAILS					NOTES
			4	5	6			
2. Performance								
a. Engine Assessment								
(1) Start Operations								
a) Engine start and acceleration (transient).	Light Off Time - ±10% or ±1 sec. Torque - ±5% Rotor Speed - ±3% Fuel Flow -±10% Gas Generator Speed - ±5% Power Turbine Speed - ±5% Gas Turbine Temp. - ±30°C	Ground with the Rotor Brake Used and Not Used			X	Record each engine start from the initiation of the start sequence to steady state idle and from steady state idle to operating RPM.		.
(b) Steady State Idle and Operating RPM conditions.	Torque - ±3% Rotor Speed - ±1.5% Fuel Flow - ±5% Gas Generator Speed - ±2% Power Turbine Speed - ±2% Turbine Gas Temp. - ±20°C	Ground		X	X	Record both steady state idle and operating RPM conditions. May be a series of snapshot tests.		
(2) Power Turbine Speed Trim	±10% of total change of power turbine speed.	Ground			X	Record engine response to trim system actuation in both		

Table of Objective Tests								
<<< QPS REQUIREMENT								INFORMATION
TEST	TOLERENCE	FLIGHT CONDITIONS	TEST DETAILS					NOTES
			4	5	6			
						directions.		
(3) Engine and Rotor Speed Governing	Torque - ±5% Rotor Speed - ±1.5%	1) Climb 2) Descent			X	Record results using a step input to the collective. May be conducted concurrently with climb and descent performance tests.		
b. In Flight								
Performance and Trimmed Flight Control Positions.	Torque - ±3% Pitch Attitude - ±1.5º Sideslip Angle - ±2º Longitudinal Control Position - ±5% Lateral Control Position - ±5% Directional Control Position - ±5% Collective Control Position - ±5%	Cruise (Augmentation On and Off)		X	X	Record results for two gross weight and CG combinations with varying trim speeds throughout the airspeed envelope. May be a series of snapshot tests.		
c. Climb								
Performance and Trimmed Flight Control Positions.	Vertical Velocity - ±100 fpm (61m/sec) or ±10% Pitch Attitude - ±1.5º Sideslip Angle - ±2º Longitudinal Control Position - ±5%	All engines operating. One engine inoperative.		X	X	Record results for two gross weight and CG combinations. The data presented must be for normal climb power conditions.		

Table of Objective Tests								
<<< QPS REQUIREMENT								INFORMATION
TEST	TOLERENCE	FLIGHT CONDITIONS	TEST DETAILS					NOTES
			4	5	6			
	Lateral Control Position - ±5% Directional Control Position - ±5% Collective Control Position - ±5%	Augmentation System(s) On and Off				May be a series of snapshot tests.		
d. Descent.								
(1) Descent Performance and Trimmed Flight Control Positions.	Torque - ±3% Pitch Attitude - ±1.5º Sideslip Angle - ±2º Longitudinal Control Position - ±5% Lateral Control Position - ±5% Directional Control Position - ±5% Collective Control Position - ±5%	At or near 1,000 fpm rate of descent (RoD) at normal approach speed. Augmentation System(s) On and Off		X	X	Record results for two gross weight and CG combinations. May be a series of snapshot tests.		
(2) Autorotation Performance and Trimmed Flight Control Positions.	Torque - ±3% Pitch Attitude - ±1.5º Sideslip Angle - ±2º Longitudinal Control Position - ±5% Lateral Control Position - ±5% Directional Control Position - ±5%	Steady descents. Augmentation System(s) On and Off		X	X	Record results for two gross weight conditions. Data must be recorded for normal operating RPM. (Rotor speed tolerance applies only if collective control position is full down.) Data must be recorded		

Table of Objective Tests								
<<< QPS REQUIREMENT								INFORMATION
TEST	TOLERENCE	FLIGHT CONDITIONS	TEST DETAILS					NOTES
			4	5	6			
	Collective Control Position - ±5%					for speeds from approximately 50 kts. through at least maximum glide distance airspeed. May be a series of snapshot tests.		
d. Autorotation.								
Entry**.**	Rotor Speed - ±3% Pitch Attitude ±2º Roll Attitude - ±3º Yaw Attitude - ±5º Airspeed - ±5 kts. Vertical Velocity - ±200 fpm (1.00 m/sec) or 10%	1) Cruise; or 2) Climb			**X**	Record results of a rapid throttle reduction to idle. If accomplished in cruise, results must be for the maximum range airspeed. If accomplished in climb, results must be for the maximum rate of climb airspeed at or near maximum continuous power.		

2. Handling Qualities.								
a. Control System Mechanical Characteristics.								

	Contact the NSPM

TEST	TOLERENCE	FLIGHT CONDITIONS	4	5	6	TEST DETAILS	INFORMATION NOTES
for clarification of any issue regarding helicopters with reversible controls.							
(1) Cyclic	Breakout - ±0.25 lbs. (0.112 daN) or 25%. Force - ±1.0 lb. (0.224 daN) or 10%.	Ground; Static conditions. Trim On and Off. Friction Off Augmentation On and .ff		X	X	Record results for an uninterrupted control sweep to the stops. [This test does not apply if aircraft hardware modular controllers are used.]	
(2) Collective and Pedals	Breakout - ±0.5 lb. (0.224 daN) or 25%. Force - ±1.0 lb. (0.224 daN) or 10%.	Ground; Static conditions. Trim On and Off. Friction Off Augmentation On and Off.		X	X	Record results for an uninterrupted control *sweep* to the stops.	
(3) Brake Pedal Force vs. Position.	±5 lbs. (2.224 daN) or 10%	Ground; Static conditions.		X	X		
(4) Trim System Rate (all applicable systems)	Rate - ±10%	Ground; Static conditions. Trim On Friction Off		X	X	The tolerance applies to the recorded value of the trim rate.	
(5) Control Dynamics (all axes)	±10% of time for first zero crossing and ±10 (N+1)% of period thereafter. ±10% of amplitude of	Hover/Cruise Trim On Friction Off			X	Results must be recorded for a normal control displacement in both directions in each axis (approximately	Control Dynamics for irreversible control systems may be evaluated in a ground/static

TEST	TOLERENCE	FLIGHT CONDITIONS	4	5	6	TEST DETAILS		NOTES
		<<< QPS REQUIREMENT						INFORMATION
	first overshoot. ±20% of amplitude of 2nd and subsequent overshoots greater than 5% of initial displacement. ±1 overshoot.					25% to 50% of full throw).		condition. Refer to paragraph 3 of this attachment for additional information. "N" is the sequential period of a full cycle of oscillation.
(6) Freeplay	±0.10 in.	Ground; Static conditions.		X	X	Record and compare results for all controls..		
b. Longitudinal Handling Qualities.								
(1) Control Response	Pitch Rate - ±10% or ±2º/sec. Pitch Attitude Change - ±10% or ±1.5º.	Cruise Augmentation On and Off.		X	X	Results must be recorded for two cruise airspeeds to include minimum power required speed. Record data for a step control input. The Off-axis response must show correct trend for unaugmented cases.		
(2) Static Stability	Longitudinal Control Position: ±10% of change from trim or ±0.25 in. (6.3 mm) or Longitudinal Control	Cruise or Climb. Autorotation. Augmentation On and Off.		X	X	Record results for a minimum of two speeds on each side of the trim speed. May be a series of		

Table of Objective Tests								
<<< QPS REQUIREMENT								INFORMATION
TEST	TOLERENCE	FLIGHT CONDITIONS	TEST DETAILS					NOTES
			4	5	6			
	Force : ±0.5 lb. (0.223 daN) or ±10%.					snapshot tests.		
(3) Dynamic Stability								
(a) Long Term Response.	±10% of calculated period. ±10% of time to ½ or double amplitude, or ±0.02 of damping ratio.	Cruise Augmentation On and Off.		X	X	Record results for three full cycles (6 overshoots after input completed) or that sufficient to determine time to ½ or double amplitude, whichever is less. For non-periodic responses, the time history must be matched.		
(b) Short Term Response.	±1.5º Pitch or ±2º/sec. Pitch Rate. ±0.1 g Normal Acceleration.	Cruise or Climb. Augmentation On and Off.			X	Record results for at least two airspeeds.		
(4) Maneuvering Stability.	Longitudinal Control Position - ±10% of change from trim or ±0.25 in. (6.3mm) or Longitudinal Control Forces - ±0.5 lb. (0.223 daN) or ±10%.	Cruise or Climb. Augmentation On and Off.			X	Record results for at least two airspeeds. Record results for Approximately 30º-45º bank angle. The force may be shown as a cross plot		

<<< QPS REQUIREMENT								INFORMATION
TEST	TOLERENCE	FLIGHT CONDITIONS	TEST DETAILS					NOTES
			4	5	6			
						for irreversible systems. May be a series of snapshot tests.		
(5) Landing Gear Operating Times	±1 sec.	Takeoff (Retraction) Approach (Extension)		X	X			
d. Lateral and Directional Handling Qualities.								
(1)Control Response. (a) Lateral	Roll Rate - ±10% or ±3º/sec. Roll Attitude Change - ±10% or ±3º.	Cruise Augmentation On and Off.		X	X	Record results for at least two airspeeds, including the speed at or near the minimum power required airspeed. Record results for a step control input. The Off-axis response must show correct trend for unaugmented cases.		

Table of Objective Tests

<<< QPS REQUIREMENT								INFORMATION
TEST	**TOLERENCE**	**FLIGHT CONDITIONS**	**4**	**5**	**6**	**TEST DETAILS**		**NOTES**
(b) Directional	Yaw Rate - ±10% or ±2º/sec. Yaw Attitude Change - ±10% or ±2º.	Cruise Augmentation On and Off.		**X**	**X**	Record data for at least two Airspeeds, including the speed at or near the minimum power required airspeed. Record results for a step control input. The Off-axis response must show correct trend for unaugmented cases.		
(2) Directional Static Stability.	Lateral Control Position - ±10% of change from trim or ±0.25 in. (6.3mm) or Lateral Control Force - ±0.5 lb. (0.223 daN) or 10%. Roll Attitude - ±1.5 Directional Control Position - ±10% of change from trim or ±0.25 in. (6.3mm) or Directional Control Force - ±1 lb. (0.448 daN) or 10%. Longitudinal Control Position - ±10% of	1) Cruise; or 2) Climb (may use Descent instead of Climb if desired) Augmentation On and Off.		**X**	**X**	Record results for at least two sideslip angles on either side of the trim point. The force may be shown as a cross plot for irreversible systems. May be a series of snapshot tests.		This is a steady heading sideslip test.

Table of Objective Tests								
<<< QPS REQUIREMENT								INFORMATION
TEST	TOLERENCE	FLIGHT CONDITIONS	TEST DETAILS					NOTES
			4	5	6			
	change from trim or ±0.25 in. (6.3mm). Vertical Velocity - ±100 fpm (0.50m/sec) or 10%.							
(3) Dynamic Lateral and Directional Stability								
(a) Lateral-Directional Oscillations.	±0.5 sec. or ±10% of period. ±10% of time to ½ or double amplitude or ±0.02 of damping ratio. ±20% or ±1 sec of time difference between peaks of bank and sideslip.	Cruise or Climb Augmentation On/Off		X	X	Record results for at least two airspeeds. The test must be initiated with a cyclic or a pedal doublet input. Record results for six full cycles (12 overshoots after input completed) or that sufficient to determine time to ½ or double amplitude, whichever is less. For non-periodic response, the time history must be matched.		
(b) Spiral Stability	Correct Trend, ±2º bank	Cruise or Climb.		X	X	Record the results of a		

Table of)bjective Tests

<<< QPS REQUIREMENT								INFORMATION
TEST	TOLERENCE	FLIGHT CONDITIONS				TEST DETAILS		NOTES
			4	5	6			
	or ±10% in 20 sec.	Augmentation On and Off.				release from pedal only or cyclic only turns. Results must be recorded from turns in both directions.		
(c) Adverse / Proverse Yaw	Correct Trend, ±2º transient sideslip angle.	Cruise or Climb. Augmentation On and Off.		X	X	Record the time history of initial entry into cyclic only turns, using only a moderate rate for cyclic input. Results must be recorded for turns in both directions.		

3. Control Dynamics.

Begin Information

a. The characteristics of a helicopter flight control system have a major effect on the handling qualities. A significant consideration in pilot acceptability of a helicopter is the “feel” provided through the cockpit controls. Considerable effort is expended on helicopter feel system design in order to deliver a system with which pilots will be comfortable and consider the helicopter desirable to fly. In order for an FTD to be representative, it too must present the pilot with the proper feel; that of the respective helicopter.

b. Recordings such as free response to an impulse or step function are classically used to estimate the dynamic properties of electromechanical systems. In any case, it is only possible to estimate the dynamic properties as a result of only being able to estimate true inputs and responses. Therefore, it is imperative that the best possible data be collected since close matching of the FTD control loading system to the helicopter systems is essential. Control feel dynamic tests are described in the Table of Objective Tests in this appendix. Where accomplished, the free response is measured after a step or pulse input is used to excite the system.

c. For initial and upgrade evaluations, it is required that control dynamic characteristics be measured at and recorded directly from the cockpit controls. This procedure is usually accomplished by measuring the free response of the controls using a step or pulse input to excite the system. The procedure must be accomplished in hover, climb, cruise, and autorotation. For helicopters with irreversible control systems, measurements may be obtained on the ground. Proper pitot-static inputs (if appropriate) must be provided to represent airspeeds typical of those encountered in flight.

d. It may be shown that for some helicopters, climb, cruise, and autorotation have like effects. Thus, some tests for one may suffice for some tests for another. If either or both considerations apply, engineering validation or helicopter manufacturer rationale must be submitted as justification for ground tests or for eliminating a configuration. For FTDs requiring static and dynamic tests at the controls, special test fixtures will not be required during initial and upgrade evaluations if the sponsor's QTG shows both test fixture results and the results of an alternative approach, such as computer plots which were produced concurrently and show satisfactory agreement. Repeat of the alternative method during the initial evaluation would then satisfy this test requirement.

e. Control Dynamics Evaluations. The dynamic properties of control systems are often stated in terms of frequency, damping, and a number of other classical measurements which can be found in texts on control systems. In order to establish a consistent means of validating test results for FTD control loading, criteria are needed that will clearly define the interpretation of the measurements and the tolerances to be applied. Criteria are needed for both the underdamped system and the overdamped system, including the critically damped case. In the case of an underdamped system with very light damping, the system may be quantified in terms of frequency and damping. In critically damped or overdamped systems, the frequency and damping is not readily measured from a response time history. Therefore, some other measurement must be used.

f. Tests to verify that control feel dynamics represent the helicopter must show that the dynamic damping cycles (free response of the control) match that of the helicopter within specified tolerances. The method of evaluating the response and the tolerance to be applied are described below for the underdamped and critically damped cases.

g. Tolerances.

(1) Underdamped Response.

(a) Two measurements are required for the period, the time to first zero crossing (in case a rate limit is present) and the subsequent frequency of oscillation. It is necessary to measure cycles on an individual basis in case there are nonuniform periods in the response. Each period will be independently compared to the respective period of the helicopter control system and, consequently, will enjoy the full tolerance specified for that period.

(b) The damping tolerance will be applied to overshoots on an individual basis. Care must be taken when applying the tolerance to small overshoots since the significance of such overshoots becomes questionable. Only those overshoots larger than 5 percent of the total initial displacement will be considered significant. The residual band, labeled $T(A_d)$ on Figure 1 of this attachment is ±5 percent of the initial displacement amplitude, A_d, from the steady state value of the oscillation. Oscillations within the residual band are considered insignificant. When comparing simulator data to helicopter data, the process would begin by overlaying or aligning the simulator and helicopter steady state values and then comparing amplitudes of oscillation peaks, the time of the first zero crossing, and individual periods of oscillation. To be satisfactory, the simulator must show the same number of significant overshoots to within one when compared against the helicopter data. The procedure for evaluating the response is illustrated in Figure 1 of this attachment.

(2) Critically Damped and Overdamped Response. Due to the nature of critically damped responses (no overshoots), the time to reach 90 percent of the steady state (neutral point) value must be the same as the helicopter within ±10 percent. The simulator response must be critically damped also. Figure 2 of this attachment illustrates the procedure.

(3) (a) The following summarizes the tolerances, T, for an illustration of the referenced measurements. (See Figures 1 and 2, above)

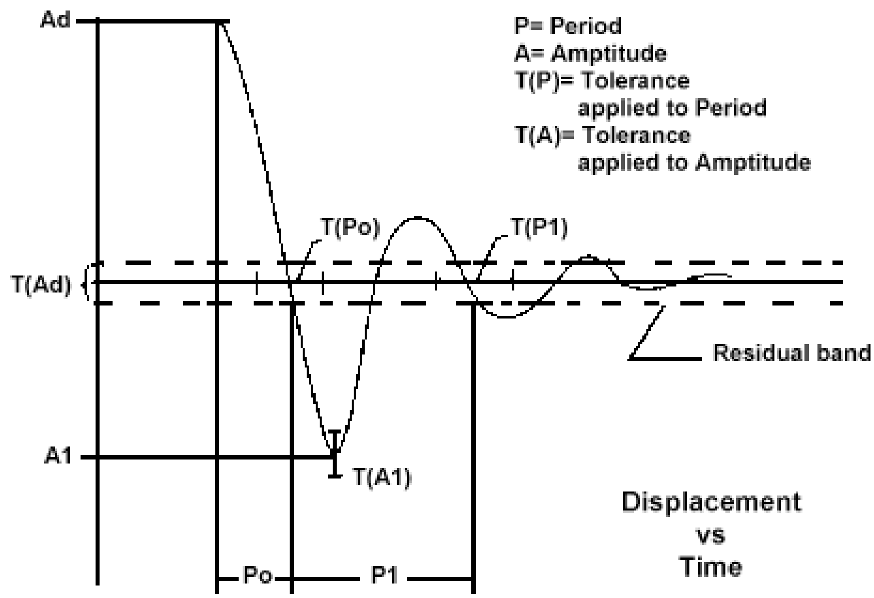
$T(P_0)$ ±10% of P_0
$T(P_1)$ ±20% of P_1
$T(A)$ ±10% of A_1, ±20% of Subsequent Peaks
$T(A_d)$ ±10% of A_d = Residual Band
Overshoots ±1

(b) In the event the number of cycles completed outside of the residual band, and thereby significant, exceeds the number depicted in figure 1, the following tolerances (T) will apply:

$T(P_n)$ ±10%(n+1)% of P_n, where “n” is the next in sequence.

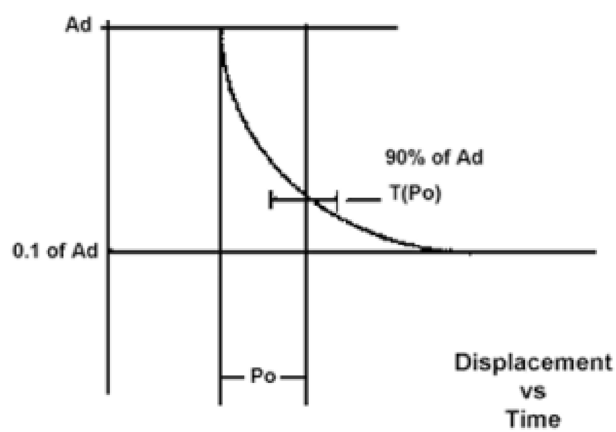
End Information

Attachment 2 to Appendix D to Part 60—
FIGURE 1. UNDER-DAMPED STEP RESPONSE



Attachment 2 to Appendix D to Part 60—

FIGURE 2. CRITICALLY-DAMPED STEP RESPONSE



Attachment 3 to Appendix D to Part 60--

FTD SUBJECTIVE TESTS

1. DISCUSSION.

Begin Information

a. The subjective tests and the examination of functions provide a basis for evaluating the capability of the FTD to perform over a typical utilization period; determining that the FTD satisfactorily meets the appropriate training/testing/checking objectives and competently simulates each required maneuver, procedure, or task; and verifying correct operation of the FTD controls, instruments, and systems. The items in the list of operations tasks are for FTD evaluation purposes only. They must not be used to limit or exceed the authorizations for use of a given level of FTD as found in the Practical Test Standards or as may be approved by the TPAA. All items in the following paragraphs are subject to an examination of function.

b. The List of Operations Tasks addressing pilot functions and maneuvers is divided by flight phases. All simulated helicopter systems functions will be assessed for normal and, where appropriate, alternate operations. Normal, abnormal, and emergency operations associated with a flight phase will be assessed during the evaluation of maneuvers or events within that flight phase.

c. Systems to be evaluated are listed separately under "Any Flight Phase" to ensure appropriate attention to systems checks. Operational navigation systems (including inertial navigation systems, global positioning systems, or other long-range systems) and the associated electronic display systems will be evaluated if installed. The NSP pilot will include in his report to the TPAA, the effect of the system operation and any system limitation.

d. At the request of the TPAA, the NSP Pilot may assess the FTD for a special aspect of a sponsor's training program during the functions and subjective portion of an evaluation. Such an assessment may include a portion of a Line Oriented Flight Training (LOFT) scenario or special emphasis items in the sponsor's training program. Unless directly related to a requirement for the qualification level, the results of such an evaluation would not necessarily affect the qualification of the FTD.

End Information

2. LIST OF OPERATIONS TASKS
Begin QPS Requirements

The NSP pilot, or the pilot designated by the NSPM, will evaluate the FTD in the following Operations Tasks, as applicable to the helicopter and FTD level, using the sponsor's approved manuals and checklists.

a. Preparation for Flight.

(1) Preflight. Accomplish a functions check of all switches, indicators, systems, and equipment at all cockpit crewmembers' and instructors' stations, and determine that the cockpit design and functions are identical to that of the helicopter simulated.

(2) APU/Engine start and run-up.

- (a) Normal start procedures.
- (b) Alternate start procedures.
- (c) Abnormal starts and shutdowns (hot start, hung start, etc.)
- (d) Rotor engagement.
- (e) System checks.
- (f) Other.

b. Takeoff.

(1) Normal.

- (a) From ground.
- (b) From hover.
  - (i) Cat A.
  - (ii) Cat B.
- (c) Running.
- (d) Crosswind/tailwind.
- (e) Maximum performance.
- (f) Instrument.

(2) Abnormal/emergency procedures:

- (a) Takeoff with engine failure after critical decision point (CDP).
  - (i) Cat A.
  - (ii) Cat B.
- (b) Other

c. Climb.

(1) Normal.

(2) One engine inoperative.

(3) Other.

d. Cruise.

(1) Performance.

(2) Flying qualities.

(3) Turns.

- (a) Timed.
- (b) Normal.
- (c) Steep.

(4) Accelerations and decelerations.

(5) High speed vibrations.

(6) Abnormal/emergency procedures, for example:

- (a) Engine fire.
- (b) Engine failure.
- (c) Inflight engine shutdown and restart.
- (d) Fuel governing system failures.
- (e) Directional control malfunction.
- (f) Hydraulic failure.
- (g) Stability system failure.
- (h) Rotor vibrations.
- (i) Other.

e. Descent.

(1) Normal.

(2) Maximum rate.

(3) Other.

f. Approach.

(1) Non-precision.

- (a) All engines operating.
- (b) One or more engines inoperative.
- (c) Approach procedures:
  - (i) NDB
  - (ii) VOR, RNAV, TACAN
  - (iii) ASR
  - (iv) Helicopter only.
  - (v) Other.

(d) Missed approach.

(i) All engines operating.

(ii) One or more engines inoperative.

(2) Precision.

(a) All engines operating.

(b) One or more engines inoperative.

(c) Approach procedures:

(i) PAR

(ii) MLS

(iii) ILS

(iv) Manual (raw data).

(v) Flight director only.

(vi) Autopilot coupled.

A Cat I

B Cat II

(vii) Other.

(d) Missed approach.

(i) All engines operating.

(ii) One or more engines inoperative.

(iii) Stability system failure.

(e) Other

g Any Flight Phase.

(1) Helicopter and powerplant systems operation.

(a) Air conditioning.

(b) Anti-icing/deicing.

(c) Auxiliary power plant.

(d) Communications.

(e) Electrical.

(f) Fire detection and suppression.

(g) Stabilizer.

(h) Flight controls.

(i) Fuel and oil.

(j) Hydraulic.

(k) Landing gear.

(l) Oxygen.

(m) Pneumatic.

(n) Powerplant.

(o) Flight control computers.

(p) Stability and control augmentation.

(q) Other.

(2) Flight management and guidance system.

(a) Airborne radar.

(b) Automatic landing aids.

(c) Autopilot.

(d) Collision avoidance system.

(e) Flight data displays.

(f) Flight management computers.

(g) Head-up displays.

(h) Navigation systems.

(i) Other.

(3) Airborne procedures.

(a) Holding.

(b) Air hazard avoidance.

(c) Retreating blade stall recovery.

(d) Mast bumping.

(e) Other.

h. Engine Shutdown and Parking.

(1) Engine and systems operation.

(2) Parking brake operation.

(3) Rotor brake operation.

(4) Abnormal/emergency procedures.

End QPS Requirements

3. FTD SYSTEMS.

Begin QPS Requirements

a Operating Station (IOS).

(1) Power switch(es).

(2) Helicopter conditions.

  (a) Gross weight, center of gravity, fuel loading and allocation, etc.

  (b) Helicopter systems status.

  (c) Ground crew functions (e.g., external power connections, push back, etc.)

  (d) Other.

(3) Airports or Landing Areas.

  (a) Number and selection.

  (b) Runway or landing area selection.

  (c) Landing surface condition (e.g., rough, smooth, icy, wet, dry, etc.)

  (d) Preset positions (e.g. ramp, gate, #1 for takeoff, takeoff position, over FAF, etc.)

  (e) Lighting controls.

  (f) Other.

(4) Environmental controls.

  (a) Temperature.

  (b) Climate conditions (e.g., ice, snow, rain, etc.).

  (c) Wind speed and direction.

  (d) Other.

(5) Helicopter system malfunctions.

  (a) Insertion / deletion.

  (b) Problem clear.

  (c) Other

(6) Locks, freezes, and repositioning.

  (a) Problem (all) freeze / release.

  (b) Position (geographic) freeze / release.

  (c) Repositioning (locations, freezes, and releases).

  (d) Two times or one-half ground speed control.

  (e) Other

(7) Remote IOS.

(8) Other.

b. Sound Controls. On / off / rheostat

c. Control Loading System. On / off / emergency stop.

d. Observer Stations.

(1) Position.

(2) Adjustments.

End QPS Requirements

Attachment 4 to Appendix D to Part 60—
SAMPLE DOCUMENTS

Attachment 4 to Appendix D to Part 60—

Figure 1 – Sample Letter, Request for Initial, Upgrade, or Reinstatement Evaluation

INFORMATION

Date

Name, POI, ______________________________(Certificate Holder)
FAA FSDO __________________________________
Address
City, State, Zip

Dear Mr./Ms. ________________________________:

(Sponsor's name) ___________________ requests evaluation of our (type) _________________ helicopter FTD for Level ______ qualification. The (name) _______________ FTD with (name) __________________visual system is fully defined on page ________ of the accompanying qualification test guide (QTG). We have completed tests of the FTD and confirm that it meets all applicable requirements of Title 14 of the Code of Federal Regulation (14 CFR) part 60 and the requirements of the Helicopter Flight FTD Qualification Performance Standards (QPS). Appropriate hardware and software configuration control procedures have been established.

Our pilot(s) (name) __________________ [and (name)__________________], who is(are) qualified on (type) __________ helicopter, has(have) assessed the FTD and found that it conforms to the (sponsor name) ___________________ (type) __________ helicopter cockpit configuration and that the simulated systems and subsystems have been evaluated and found to function equivalently to those in the helicopter. The above named pilot(s) has(have) found that the FTD represents the respective helicopter in accordance with the attached Configuration List. He/She(They) has(have) also subjectively assessed the performance and flying qualities of the FTD and state that it represents the helicopter. He/She(They) has(have) not subjectively tested the FTD for those tasks on the attached Restrictions-to-Qualification list and we do not seek qualification in these areas.

(Added comments as desired.)

Sincerely,

(Signature of Appropriate Person)

Attachment 4 to Appendix D to Part 60—
Figure 2 – Sample Qualification Test Guide Cover Page

INFORMATION

SPONSOR NAME

SPONSOR ADDRESS

FAA QUALIFICATION TEST GUIDE

(SPECIFIC HELICOPTER MODEL)

(*for example*)

(Vertiflite AB-320)

(FTD Identification Including Manufacturer, Serial Number, Visual System Used)

(FTD Level)

(Qualification Performance Standard Used)

(FTD Location)

FAA Initial Evaluation

Date: ______________

____ Date: ___________
(Sponsor)

____ Date: ___________
Manager, National Simulator Program, FAA

Attachment 4 to Appendix D to Part 60—
Figure 3 – Sample FTD Information Page

INFORMATION

SPONSOR NAME SPONSOR FTD CODE:	AB-320 #1
HELICOPTER MODEL:	Vertiflite AB-320
AERODYNAMIC DATA REVISION:	AB-320, CPX-8D, January 1988
ENGINE MODEL(S) AND REVISION:	CPX-8D; RPT-6, January 1988 DRQ-4002, RPT-3, April 1991
FLIGHT CONTROLS DATA REVISION:	AB-320MMM; May 1988
FLIGHT MANAGEMENT SYSTEM:	Berry XP
FTD MODEL AND MANUFACTURER:	VTF-320, Tinker Simulators, Inc.
DATE OF FTD MANUFACTURE:	1988
FTD COMPUTER:	CIA
VISUAL SYSTEM MODEL, MANUFACTURER, and DISPLAY TYPE:	ClearView, Inc. “Real World H1;” CRT Visual System
VISUAL SYSTEM COMPUTER:	LMB-H1
MOTION SYSTEM:	N/A

Note for Figure 3: Information on this page must be updated and kept current with any modifications or changes made to the FTD and reflected on the log of revisions and the list of effective pages.

Federal Aviation Administration
National Simulator Program

Statement of Qualification

This is to certify that representatives of the
National Simulator Program
Completed an evaluation of the

Go-Fast Training Center
Vertiflite AB-320 Flight Training Device
FAA Identification Number 889

And found it to meet the standards set forth
In the Qualification Performance Standards
For a flight training device at

Level 6

____________________ ____________________
(date) for the NSPM

Subject to the attached
Configuration List and Restrictions

Attachment 4 to Appendix D to Part 60—
Figure 4A – Sample Statement of Qualification; Configuration List
INFORMATION

STATEMENT of QUALIFICATION
CONFIGURATION LIST
Go-Fast Training Center Vertiflite AB-320 -- Level 6 -- FAA ID# 889

Configuration		**Date Qualified**
Helicopter Model:.......................	AB-320..	July 12, 1988
Engine Model(s) and Revision:...	☐ CPX-8D, RPT-6.........................	July 12, 1988
	☐ DRQ-4002, RPT-3....................	April 1, 1991
Flight Management System:.......	Berry XP..	July 12, 1988
Visual System / Manufacturer:	Real World H1, Clear View, Inc.	
CRT Installation:....................	1 Channel, 2 Window CRT............	July 12, 1988
Flight Instruments:		
Display (CRT, LCD, etc.).......	....	July 12, 1988
Flight Director:		
Single Cue..............................	Sperry...	July 12, 1988
Engine Instruments:		
☐ Display (CRT, LCD, etc.).......	....	July 12, 1988
Navigation Type(s):		
ADF.......................................	....	July 12, 1988
VOR/ILS...............................	....	July 12, 1988
GPS......................................	....	July 12, 1988
ACARS…………………………	……………………………………	April 1, 1991

Attachment 4 to Appendix D to Part 60—
Figure 4B – Sample Statement of Qualification
Non-Qualified Maneuvers, Procedures, and Tasks
INFORMATION

STATEMENT of QUALIFICATION
Non-Qualified Maneuvers, Procedures, and Tasks

Go-Fast Training Center Vertiflite AB-320 -- Level C -- FAA ID# 888

The FTD is qualified to perform all of the Maneuvers, Procedures, Tasks, and Functions listed in the Table of Functions and Subjective Tests, Part 60, Appendix D, Attachment 3, In Effect on [mm/dd/yyyy] except for the following listed Tasks or Functions.

(*Example*) **Non-Qualified Operations Tasks and Functions** Normal Takeoff, Daylight Conditions. Precision Approaches, Precision Approach Radar (PAR) Communications (ACARS)
Non-Qualified Simulator Systems: Remote IOS
Additional Qualified Tasks or Functions in addition to those listed in the Table of Functions and Subjective Tests, Part 60, Appendix D, Attachment 3. (None)

Attachment 4 to Appendix D to Part 60—

Figure 5 – Sample Continuing Qualification Evaluation Requirements Page

INFORMATION

Recurrent Evaluation Requirements ***Completed at conclusion of Initial Evaluation***	
Recurrent Evaluations to be conducted each _(fill in)__ months Allotting ______ hours of FTD time. Signed: ________________________________ NSPM / Evaluation Team Leader	Recurrent evaluations are due as follows: _(month)__ and __(month)_ and __(month)_ (enter or strike out, as appropriate) ______________________ Date

Revision: Based on (enter reasoning):	
Recurrent Evaluations are to be conducted each _(fill in)__ months. Allotting ______ hours. Signed: ________________________________ NSPM Evaluation Team Leader	Recurrent evaluations are due as follows: _(month)__ and __(month)_ and __(month)_ (enter or strike out, as appropriate) ______________________ Date

Revision: Based on (enter reasoning):	
Recurrent Evaluations are to be conducted each _(fill in)__ months. Allotting ______ hours. Signed: ________________________________ NSPM Evaluation Team Leader	Recurrent evaluations are due as follows: _(month)__ and __(month)_ and __(month)_ (enter or strike out, as appropriate) ______________________ Date

(Repeat as Necessary)

Attachment 4 to Appendix D to Part 60—
Figure 6 – Sample MQTG Index of Effective FSD Directives

INFORMATION

Index of Effective FSD Directives
Filed in this Section

Notification Number	**Received From: (TPAA/NSPM)**	**Date of Notification**	**Date of Modification Completion**

Continue as Necessary....

Appendix E to Part 60—Qualification Performance Standards for Quality Management Systems for Flight Simulation Training Devices

---

Begin QPS Requirements

a. Not later than [insert date 12 months after the effective date of the final rule] all current sponsors of FSTD's must submit to the NSPM a proposed Quality Management System (QMS) program as described in this QPS appendix. The NSPM will review the program in order of receipt and notify the sponsor within 90 days of beginning the review regarding the acceptability of the program including any required adjustments. Within 6 months of the notification of acceptability, the sponsor must implement the program, conduct internal audit(s), make any required program adjustments as a result of any internal audit, and have the NSPM initial audit scheduled.

b. For first-time FSTD sponsors, not later than 120 days prior to the date scheduled for the initial FSTD evaluation, the sponsor must submit to the NSPM the proposed QMS program as described in this QPS appendix. The NSPM will review the program and notify the sponsor within 90 days of beginning the review regarding the acceptability of the program including any required adjustments. Within 6 months of the notification of acceptability, the sponsor must implement the program, conduct internal audit(s), make any required program adjustments as a result of any internal audit, and have the NSPM initial audit scheduled.

c. When a sponsor includes a "foreign FSTD" (i.e., one maintained by a person other than a US certificate holder) under their sponsorship, the sponsor remains responsible for the QMS program for that FSTD; however –

(1) If that foreign FSTD is maintained under a QMS program accepted by that foreign regulatory authority and that authority and the NSPM have agreed to accept each other's QMS programs (e.g., the Joint Aviation Authorities, JAA, of Europe), no additional requirements must be met; or

(2) If that foreign FSTD is not maintained under a QMS program accepted by that foreign regulatory authority or that authority and the NSPM have not agreed to accept each other's QMS programs, the sponsor will be required to reach an agreement with the NSPM regarding those aspects of the sponsor's QMS program that may be met by the sponsor in regard to this specific FSTD without having any other authority regarding the specific FSTD in question.

d. The Director of Operations for a Part 119 certificate holder, the Chief Instructor for a Part 141 certificate holder, or the equivalent for a Part 142 or Flight Engineer School sponsor, must designate a management representative who has the responsibility and authority to establish and modify the sponsor's policies, practices, and procedures regarding the QMS program for the recurring qualification of, and the day-to-day use of, each FSTD.

e. An acceptable Quality Management System (QMS) Program must contain an accurate written description of and/or procedures for –

(1) The method used by management to communicate the importance of meeting the regulatory standards contained in Part 60 and this QPS appendix and the importance of establishing and meeting the requirements of a QMS Program as defined in this paragraph f.

(2) The method(s) used by management to determine that the regulatory standards and the QMS program requirements are being met, and if or when not met, what actions are taken to correct the deficiency and prevent its recurrence.

(3) The method used by management to determine that the sponsor is, on a timely and regular basis, presenting a qualified FSTD.

(4) The method used to maintain and control appropriate technical and reference documents, appropriate training records, and other documents for –

(a) continuing FSTD qualification; and

(b) the QMS program.

(5) The criteria the sponsor uses (e.g., training, experience, etc.) to determine who may be assigned to duties of § 60.19 inspection, testing, and maintenance (preventive and corrective) on FSTD's.

(6) The method used to track § 60.19 inspection, testing, and maintenance (preventive and corrective) on each FSTD.

(7) The method used to inform instructors, check airmen, and those who conduct the daily preflight, of what circumstance(s) constitute(s) a discrepancy regarding the FSTD and its operation.

(8) The method used to ensure that instructors, check airmen, and those who conduct the daily preflight know they are to record in the FSTD discrepancy log each newly discovered FSTD discrepancy and each newly discovered missing, malfunctioning, or inoperative FSTD component.

(9) The method used to verify that instructors, check airmen, or other appropriate personnel, know that they are to completely and accurately log the number of disruptions and time not available for training, testing, checking, or obtaining flight experience during a scheduled FSTD use-period, including the cause(s) of the disruption, if known.

(10) The method used by the sponsor to notify users of the FSTD of missing, malfunctioning, or inoperative components that restrict the use of the FSTD.

(11) The method of recording NSPM-conducted evaluations and other inspections (e.g., daily preflight inspections, sponsor conducted quarterly inspections, etc.), including the evaluation or inspection date, test results, discrepancies and recommendations, and all corrective actions taken.

(12) The method for ensuring that the FSTD is configured appropriately for the relevant training, evaluation, and/or experience requirements authorized and that the system(s) function(s) correctly.

(13) The method(s) for:

(a) determining whether or not modifications of the aircraft or aircraft data package are necessary to be incorporated into the FSTD;

(b) determining whether or not proposed changes to the FSTD are considered modifications in accordance with § 60.23;

(c) coordinating and communicating these items, as appropriate, with the sponsor's training organization, other users (e.g., lease or service contract users), the TPAA, and the NSPM.

(14) How information found in the discrepancy log is used to correct discrepancies and whether or not this information is used to review and, if necessary, modify existing procedures for FSTD maintenance.

(15) The method for how and when software or hardware modifications (made in accordance with § 60.23) are accomplished and tracked.

(16) The method for acquiring independent feedback regarding FSTD operation (from persons recently completing training, evaluation, or obtaining flight experience; instructors and check airmen using the FSTD for training, evaluation or flight experience sessions; and FSTD technicians and maintenance personnel) including a description of the process for addressing these comments.

(17) How devices used to test, measure, and monitor correct FSTD operation are calibrated and adjusted for accuracy, including traceability of that accuracy to a recognized standard, and how these devices are maintained in good operating condition.

(18) How, by whom, and how frequently internal audits of the QMS program are conducted and where and how the results of such audits are maintained and reported to responsible management, the NSPM, and the TPAA.

End QPS Requirements

Begin Information

f. Additional Information.

(1) In addition to specifically designated QMS evaluations, the NSPM will evaluate the sponsor's QMS program as part of regularly scheduled FSTD continuing qualification evaluations and no-notice FSTD evaluations, focusing in part on the effectiveness and viability of the QMS program and its contribution to the overall capability of the FSTD to meet the requirements of 14CFR part 60.

(2) The sponsor, through the MR, may delegate duties associated with maintaining the qualification of the FSTD (e.g., corrective and preventive maintenance, scheduling for and the conducting of tests and/or inspections, functional preflight checks, etc.) but retains the responsibility and authority for the day-to-day qualification and quality of the FSTD. One person may serve in this capacity for more than one FSTD, but one FSTD would not have more than one person serving in this capacity.

(3) The QMS requirements should not be read to preclude a given QMS program from being applicable to more than one certificate holder (e.g., part 119 and part 142 or two part 119 certificate holders) and should not be read to preclude an individual from being a Management Representative (MR) for more than one certificate holder (e.g., part 119 and part 142 or two part 119 certificate holders) as long as the other QMS program requirements and/or the other MR requirements are respectively met for each such certificate holder.

(4) The NSPM may conditionally approve a QMS program, on a temporary basis, under appropriate circumstances (e.g., meaningful progress being made, management completely committed, adequate funding appropriated, etc.) even though additional work might be necessary to develop the QMS program to the point that it would meet the requirements of part 60.

End Information

Appendix F to Part 60--

DEFINITIONS AND ABBREVIATIONS FOR FLIGHT SIMULATION TRAINING DEVICES

1. Definitions.

Note: The definitions presented below in *Italic type face* are repeated from the regulatory definitions found in part 1 or part 60, as indicated. In the event that a discrepancy exists between a definition found here, and one found in part 1 or part 60, the part 1 or part 60 definition prevails. They are provided here in addition to other definitions, presented in regular type, mixed together, in alphabetical order,

1st Segment - is that portion of the takeoff profile from liftoff to gear retraction.

2nd Segment - is that portion of the takeoff profile from after gear retraction to initial flap/slat retraction.

3rd Segment - is that portion of the takeoff profile after flap/slat retraction is complete.

Aircraft data package - is a combination of the various types of data used to design, program, manufacture, modify, and test the FSTD.

Airspeed - is calibrated airspeed unless otherwise specified and is expressed in terms of nautical miles per hour (knots).

Altitude - is pressure altitude (meters or feet) unless specified otherwise.

Angle of attack - is the angle between the airplane longitudinal axis and the relative wind vector projected onto the airplane plane of symmetry.

Automatic Testing - is FSTD testing wherein all stimuli are under computer control.

Bank - is the airplane attitude with respect to or around the longitudinal axis, or roll angle (degrees).

Breakout - is the force required at the pilot's primary controls to achieve initial movement of the control position.

Certificate holder *- A person issued a certificate under parts 119, 141, or 142 of this chapter or a person holding an approved course of training for flight engineers in accordance with part 63 of this chapter. (Part 60)*

Closed Loop Testing - is a test method for which the input stimuli are generated by controllers, which drive the FSTD to follow a pre-defined target response.

Computer Controlled Airplane - is an airplane where all pilot inputs to the control surfaces are transferred and augmented by computers.

Control Sweep - is movement of the appropriate pilot controller from neutral to an extreme limit in one direction (Forward, Aft, Right, or Left), a continuous movement back through neutral to the opposite extreme position, and then a return to the neutral position.

Convertible FSTD - is an FSTD in which hardware and software can be changed so that the FSTD becomes a replica of a different model, usually of the same type aircraft. The same FSTD platform, cockpit shell, motion system, visual system, computers, and necessary peripheral equipment can thus be used in more than one simulation.

Critical Engine Parameter - is the parameter, which is the most accurate measure of propulsive force.

Deadband - is the amount of movement of the input for a system for which there is no reaction in the output or state of the system observed.

Distance - is the length of space between two points and is expressed in terms of nautical miles unless specified otherwise.

Downgrade – is a permanent change in the qualification level of an FSTD to a lower level.

Driven - is a test method where the input stimulus or variable is positioned by automatic means, generally a computer input.

Electronic Copy of the MQTG – an electronic copy of the MQTG provided by an electronic scan presented in a Portable Document File (PDF), or similar format, acceptable to the NSPM

Electronic Master Qualification Test Guide – is an electronic version of the MQTG (eMQTG), where all objective data obtained from airplane testing, or another approved source, together with correlating objective test results obtained from the performance of the FSTD and a description of the equipment necessary to perform the evaluation for the initial and the continuing qualification evaluations is stored, archived, or presented in either reformatted or digitized electronic format.

Evaluation *- With respect to an individual, the checking, testing, or review associated with flightcrew member qualification, training, and certification under parts 61, 63, 121, or 135 of this chapter. With respect to an FSTD, the qualification activities (e.g., the objective and subjective tests, the inspections, the continuing qualification evaluations.) associated with the requirements of this part. (Part 60)*

Flight experience *- Flight experience means recency of flight experience for landing credit purposes. (Part 60)*

Flight simulation training device (FSTD) *means a full flight simulator (FFS) or a flight training device (FTD). (Part 1)*

Flight test data *- (a subset of Objective data) Aircraft data collected by the aircraft manufacturer (or other supplier of data that are acceptable to the NSPM) during an aircraft flight test program. (Part 60)*

Flight training device (FTD) *means a replica of aircraft instruments, equipment, panels, and controls in an open flight deck area or an enclosed aircraft cockpit replica. It includes the equipment and computer programs necessary to represent aircraft (or set of aircraft) operations in ground and flight conditions having the full range of capabilities of the systems installed in the device as described in part 60 of this chapter and the qualification performance standard (QPS) for a specific FTD qualification level. (Part 1)*

Free Response - is the response of the FSTD after completion of a control input or disturbance.

Frozen - is a test condition where one or more variables are held constant with time.

FSTD Approval - is the extent to which an FSTD may be used by a certificate holder as authorized by the FAA. It takes into account aircraft to FSTD differences and the training ability of the organization.

FSTD Directive *- A document issued by the FAA to an FSTD sponsor, requiring a modification to the FSTD due to a recognized safety-of-flight issue and amending the qualification basis for the FSTD. (Part 60)*

FSTD Latency - is the additional time beyond that of the response time of the aircraft due to the response of the FSTD.

FSTD Performance *- The overall performance of the FSTD includes aircraft performance (e.g., thrust/drag relationships, climb, range) as well as flight and ground handling. (Part 60)*

Full flight simulator (FFS) *means a replica of a specific type; or make, model, and series aircraft cockpit. It includes the assemblage of equipment and computer programs necessary to represent aircraft operations in ground and flight conditions, a visual system providing an out-of-the-cockpit view, a system that provides cues at least equivalent to those of a three-degree-of-freedom motion system, and has the full range of capabilities of the systems installed in the device as described in part 60 of this chapter and the qualification performance standards (QPS) for a specific FFS qualification level. (Part 1)*

Gross Weight - For objective test purposes:

Basic Operating Weight – (BOW) is the empty weight of the aircraft plus the weight of the following: normal oil quantity; lavatory servicing fluid; potable water; required crewmembers and their baggage; and emergency equipment.

Near Maximum Gross Weight – is a weight chosen by the sponsor or data provider that is not less than the basic operating weight (BOW) of the airplane being simulated plus 80% of the difference between the maximum certificated gross weight (either takeoff weight or landing weight, as appropriate for the test) and the BOW.

Light Gross Weight – is a weight chosen by the sponsor or data provider that is not more than 120% of the BOW of the airplane being simulated or as limited by the minimum practical operating weight of the test airplane.

Medium Gross Weight – is a weight chosen by the sponsor or data provider that is approximately ±10% of the average of the numerical values of the BOW and the maximum certificated gross weight.

Ground Effect - is the change in aerodynamic characteristics due to modification of the airflow past the aircraft caused by the proximity of the earth’s surface to the airplane.

Hands Off - is a test maneuver conducted or completed without pilot control inputs.

Hands On - is a test maneuver conducted or completed with pilot control inputs as required.

Heave - is FSTD movement with respect to or along the vertical axis.

Height - is the height above ground level (or AGL) expressed in meters or feet.

Integrated Testing - is testing of the FSTD such that all aircraft system models are active and contribute appropriately to the results where none of the models used are substituted with models or other algorithms intended for testing only.

Irreversible Control System - is a control system in which movement of the control surface will not backdrive the pilot's control in the cockpit.

Locked - is a test condition where one or more variables are held constant with time.

Manual Testing - is FSTD testing wherein the pilot conducts the test without computer inputs except for initial setup and all modules of the simulation are active.

Master Qualification Test Guide (MQTG) *- The FAA-approved Qualification Test Guide with the addition of the FAA-witnessed test results, applicable to each individual FSTD. (Part 60)*

Medium - is the normal operational weight for a given flight segment.

National Simulator Program Manager (NSPM) *- The FAA manager responsible for the overall administration and direction of the National Simulator Program (NSP), or a person approved by that FAA manager. (Part 60)*

Nominal - is the normal operational weight, configuration, speed, etc., for the flight segment specified.

Non-Normal Control - is a term used in reference to Computer Controlled Airplanes and is the state where one or more of the intended control, augmentation, or protection functions are not fully working. NOTE: Specific terms such as ALTERNATE, DIRECT, SECONDARY, BACKUP, etc., may be used to define an actual level of degradation.

Normal Control - is a term used in reference to Computer Controlled Airplanes and is the state where the intended control, augmentation, and protection functions are fully working.

Objective data - Quantitative data, acceptable to the NSPM, used to evaluate the FSTD.

Objective test *- A quantitative measurement and evaluation of FSTD performance. (Part 60)*

Pitch - is the airplane attitude with respect to, or around, the lateral axis expressed in degrees.

Power Lever Angle - is the angle of the pilot's primary engine control lever(s) in the cockpit. This may also be referred to as PLA, THROTTLE, or POWER LEVER.

Predicted data *- Estimations or extrapolations of either existing flight test data or data from other simulation models using engineering analyses, engineering simulations, design data, and/or wind tunnel data. (Part 60)*

Protection Functions - are systems functions designed to protect an airplane from exceeding its flight maneuver limitations.

Pulse Input - is a step input to a control followed by an immediate return to the initial position.

<u>Qualification level.</u> *– The categorization of an FSTD established by the NSPM, based on the FSTD's demonstrated technical and operational capabilities as set out in this part. (Part 60)*

Qualification Performance Standard (QPS) *- The collection of procedures and criteria published by the FAA to be used when conducting objective tests and subjective tests, including general FSTD requirements, for establishing FSTD qualification levels. The QPS are set forth in the following FAA appendices: Appendix A, for Airplane Simulators; Appendix B, for Airplane Flight Training Devices; Appendix C, for Helicopter Simulators; Appendix D, for Helicopter Flight Training Devices; and Appendix E for Quality Management Systems for Flight Simulation Training Devices. (Part 60)*

Qualification Test Guide (QTG) *- The primary reference document used for evaluating an aircraft FSTD. It contains test results, statements of compliance and capability, the configuration of the aircraft simulated, and other information for the evaluator to assess the FSTD against the applicable regulatory criteria. (Part 60)*

Quality Management System (QMS) – the initial aviation standard dealing with quality-system requirements addressing flight simulation that can be used for external quality-assurance purposes. It is a collection of requirements, generic and independent of any specific industry or economic sector, not to enforce uniformity of quality systems, but to identify the processes needed; determine the sequence and interaction of these processes; determine criteria and methods required to ensure the effective operation and control of these processes; ensure the availability of information necessary to support the operation and monitoring of these processes; measure, monitor and analyze these processes; and implement the actions necessary to achieve planned results. The design and implementation of a specific quality management system will be influenced by the varying needs of the individual sponsor, their particular objectives, the flight simulation products and services supplied, and the processes and specific practices employed.

Reversible Control System - is a control system in which movement of the control surface will backdrive the pilot's control in the cockpit.

Roll - is the airplane attitude with respect to, or around, the longitudinal axis expressed in degrees.

Set of aircraft *- Aircraft that share similar handling and operating characteristics and similar operating envelopes and have the same number and type of engines or power plants. (Part 60)*

Sideslip Angle - is the angle between the relative wind vector and the airplane plane of symmetry. (note: this definition replaces the current definition of "sideslip.")

Snapshot - is a presentation of one or more variables at a given instant of time.

Special Evaluation – is an evaluation of the FSTD for purposes other than initial, upgrade, or continuing qualification. Circumstances that might indicate the need for a special evaluation would include, but not necessarily be limited to, the following: after the FSTD is moved and reinstalled at another location; after an update to FSTD software or hardware that might affect performance or flying qualities; after a substantial update to FSTD avionics packages (autopilot, flight management systems, etc.); after substantial modifications to FSTD configuration; after a complaint is received from a credible source indicating that the FSTD does not perform or handle like the aircraft it simulates; etc.

Sponsor *- A certificate holder who seeks or maintains FSTD qualification and is responsible for the prescribed actions as set out in this part and the QPS for the appropriate FSTD and qualification level. (Part 60)*

Statement of Compliance and Capability (SOC) - is a declaration that specific requirements have been met. It must declare that compliance with the requirement is achieved and explain how the requirement is met (e.g., gear modeling approach, coefficient of friction sources, etc.). It must also describe the capability of the FSTD to meet the requirement (e.g., computer speed, visual system refresh rate, etc.). In doing this, the statement must provide references to needed sources of information for showing compliance, rationale to explain how the referenced material is used, mathematical equations and parameter values used, and conclusions reached.

Step Input - is an abrupt control input held at a constant value.

Subjective test *- A qualitative assessment of the performance and operation of the FSTD. (Part 60)*

Surge - is FSTD movement with respect to or along the longitudinal axis.

Sway - is FSTD movement with respect to or along the lateral axis.

Time History - is a presentation of the change of a variable with respect to time.

Training Program Approval Authority (TPAA) *- A person authorized by the Administrator to approve the aircraft flight training program in which the FSTD will be used. (Part 60)*

Training Restriction – is a temporary condition where, due to a Missing, Malfunctioning, or Inoperative (MMI) Component condition, the FSTD may continue to be used at the qualification level indicated on its SOQ but restricted from accomplishing the task for which the correct function of the MMI component is required..

Transport Delay or "Throughput" - is the total FSTD system processing time required for an input signal from a pilot primary flight control until motion system, visual system, or instrument response. It is the overall time delay incurred from signal input until output response. It does not include the characteristic delay of the airplane simulated.

Upgrade *- The improvement or enhancement of an FSTD for the purpose of achieving a higher qualification level. (Part 60)*

Validation Data - Objective data used to determine if the FSTD performance is within the tolerances prescribed in the QPS.

Validation Test – An objective test whereby FSTD parameters are compared to the relevant validation data to ensure that the FSTD performance is within the tolerances prescribed in the QPS.

Visual System Response Time - is the interval from a control input to the completion of the visual display scan of the first video field containing the resulting different information.

Yaw - is airplane attitude with respect to, or around, the vertical axis expressed in degrees.

2. Abbreviations.

AFM	Approved Flight Manual.
AGL	Above Ground Level (meters or feet).
AOA	Angle of Attack (degrees).
APD	Aircrew Program Designee.
CCA	Computer Controlled Airplane.
cd/m2	candela/meter^2, 3.4263 candela/m^2 = 1 ft-Lambert.
CFR	Code of Federal Regulations.
cm(s)	centimeter, centimeters.
daN	decaNewtons, one (1) decaNewton = 2.27 pounds.
deg(s)	degree, degrees.
DOF	Degrees-of-freedom
eMQTG	Electronic Master Qualification Test Guide
EPR	Engine Pressure Ratio.
FAA	Federal Aviation Administration (U.S.).
fpm	feet per minute.

ft	foot/feet, 1 foot = 0.304801 meters.\
ft-Lambert	foot-Lambert, 1 ft-Lambert = 3.4263 candela/m^2.
g	Acceleration due to Gravity (meters or feet/sec^2); 1g = 9.81 m/sec^2 or 32.2 feet/sec^2.
G/S	Glideslope.
IATA	International Airline Transport Association.
ICAO	International Civil Aviation Organization.
IGE	In ground effect.
ILS	Instrument Landing System.
IQTG	International Qualification Test Guide.
km	Kilometers 1 km = 0.62137 Statute Miles.
kPa	KiloPascal (Kilo Newton/Meters2). 1 psi = 6.89476 kPa.
Kts	Knots calibrated airspeed unless otherwise specified, 1 knot = 0.5148 m/sec or 1.689 ft/sec.
lb(s)	pound(s), one (1) pound = 0.44 decaNewton.
LDP	Landing decision point.
M,m	Meters, 1 Meter = 3.28083 feet.
Min(s)	Minute, minutes.
MLG	Main Landing Gear.
Mpa	MegaPascals (1 psi = 6894.76 pascals).
ms	millisecond(s).
N	NORMAL CONTROL Used in reference to Computer Controlled Airplanes.
nm	Nautical Mile(s) 1 Nautical Mile = 6,080 feet.
NN	NON-NORMAL CONTROL Used in reference to Computer Controlled Airplanes.
N1	Low Pressure Rotor revolutions per minute, expressed in percent of maximum.
N2	High Pressure Rotor revolutions per minute, expressed in percent of maximum.
N3	High Pressure Rotor revolutions per minute, expressed in percent of maximum.
NWA	Nosewheel Angle (degrees).
OGE	Out of ground effect.

PAPI	Precision Approach Path Indicator System.
Pf	Impact or Feel Pressure, often expressed as “q.”
PLA	Power Lever Angle.
PLF	Power for Level Flight.
psi	pounds per square inch.
QPS	Qualification Performance Standard.
RAE	Royal Aerospace Establishment.
R/C	Rate of Climb (meters/sec or feet/min).
R/D	Rate of Descent (meters/sec or feet/min).
REIL	Runway End Identifier Lights.
RVR	Runway Visual Range (meters or feet).
s	second(s).
sec(s)	second, seconds.
sm	Statute Mile(s) 1 Statute Mile = 5,280 feet.
SOC	Statement of Compliance and Capability.
Tf	Total time of the flare maneuver duration.
Ti	Total time from initial throttle movement until a 10% response of a critical engine parameter.
TIR	Type Inspection Report.
T/O	Takeoff.
Tt	Total time from Ti to a 90% increase or decrease in the power level specified.
VASI	Visual Approach Slope Indicator System.
VGS	Visual Ground Segment.
V_1	Decision speed.
V_2	Takeoff safety speed.
Vmc	Minimum Control Speed.
Vmca	Minimum Control Speed in the air.

Vmcg	Minimum Control Speed on the ground.
Vmcl	Minimum Control Speed - Landing.
Vmu	The speed at which the last main landing gear leaves the ground.
V_R	Rotate Speed.
Vs	Stall Speed or minimum speed in the stall.
WAT	Weight, Altitude, Temperature.

Part 121, Appendix H--Advanced Simulation.

This appendix provides guidelines and a means for achieving flightcrew training in advanced airplane simulators. The requirements in this appendix are in addition to the simulator approval requirements in Sec. 121.407. Each simulator which is used under this appendix must be approved as a Level B, C, or D simulator, as appropriate.

ADVANCED SIMULATION TRAINING PROGRAM

For an operator to conduct Level C or D training under this appendix all required simulator instruction and checks must be conducted under an advanced simulation training program which is approved by the Administrator for the operator. This program must also ensure that all instructors and check airmen used in Appendix H training and checking are highly qualified to provide the training required in the training program. The advanced simulation training program shall include the following:

1. The operator's initial, transition, upgrade, and recurrent simulator training programs and its procedures for re-establishing recency of experience in the simulator.

2. How the training program will integrate Level B, C, and D simulators with other simulators and training devices to maximize the total training, checking, and certification functions.

3. Documentation that each instructor and check airman has served for at least 1 year in that capacity in a certificate holder's approved program or has served for at least 1 year as a pilot in command or second in command in an airplane of the group in which that pilot is instructing or checking.

4. A procedure to ensure that each instructor and check airman actively participates in either an approved regularly scheduled line flying program as a flight crewmember or an approved line observation program in the same airplane type for which that person is instructing or checking.

5. A procedure to ensure that each instructor and check airman is given a minimum of 4 hours of training each year to become familiar with the operator's advanced simulation training program, or changes to it, and to emphasize their respective roles in the program. Training for simulator instructors and check airmen shall include training policies and procedures, instruction methods and techniques, operation of simulator controls (including environmental and trouble panels), limitations of the simulator, and minimum equipment required for each course of training.

6. A special Line Oriented Flight Training (LOFT) program to facilitate the transition from the simulator to line flying. This LOFT program consists of at least a 4-hour course of training for each flightcrew. It also contains at least two representative flight segments of the operator's route. One of the flight segments contains strictly normal operating procedures from push back at one airport to arrival at another. Another flight segment contains training in appropriate abnormal and emergency flight operations.

LEVEL B

Training and Checking Permitted

1. Recency of experience (Sec. 121.439).

2. Night takeoffs and landings (Part 121, Appendix E).

3. Landings in a proficiency check without the landing on the line requirements (Sec. 121.441).

LEVEL C

Training and Checking Permitted

1. For all pilots, transition training between airplanes in the same group, and for a pilot in command the certification check required by Sec. 61.153 of this chapter.

2. Upgrade to pilot-in-command training and the certification check when the pilot—

a. Has previously qualified as second in command in the equipment to which the pilot is upgrading;

b. Has at least 500 hours of actual flight time while serving as second in command in an airplane of the same group; and

c. Is currently serving as second in command in an airplane in this same group.

3. Initial pilot-in-command training and the certification check when the pilot—

a. Is currently serving as second in command in an airplane of the same group;

b. Has a minimum of 2,500 flight hours as second in command in an airplane of the same group; and

c. Has served as second in command on at least two airplanes of the same group.

4. For all second-in command pilot applicants who meet the aeronautical experience requirements of Sec. 61.159 of this chapter in the airplane, the initial and upgrade training and checking required by this part, and the certification check requirements of Sec. 61.153 of this chapter.

LEVEL D

Training and Checking Permitted

Except for the requirements listed in the next sentence, all pilot flight training and checking required by this part and the certification check requirements of Sec. 61.153(G) of this chapter. The line check required by Sec. 121.440 of this part, the static airplane requirements of appendix E of this part, and the operating experience requirements of Sec. 121.434 must still be performed in the airplane.

Mr. Nicholas A. Sabatini
Associate Administrator for Regulation and Certification
Federal Aviation Administration
800 Independence Ave., SW
Washington, DC 20591

FEB 22 2005

Dear Mr. Sabatini:

Attached is the recommendation from the Flight Simulation Device Aviation Rulemaking Committee (FSD ARC) in response to your request to work on the first revision of the Qualification Performance Standards (QPS) appendices of part 60. We reviewed and recommended changes to QPS appendix A (Qualification Performance Standards for Airplane Flight Simulators); QPS appendix B (Qualification Performance Standards for Airplane Flight Training Devices); QPS appendix E (Quality Management Systems for Flight Simulation Training Devices); and QPS appendix F (Definitions and Abbreviations for Flight Simulation Training Devices). We achieved consensus on all the language in those appendices. We began our work on these first revisions to the QPS appendices so that greater harmonization may be realized in the shortest time possible after publication of the final rule, and, as we have performed this work, we have solidified our belief that the FSD ARC is an excellent process to achieve the results so necessary to the aviation/simulation industry.

During our review we recognized that some of our change recommendations are within, and others are outside of, the scope of the original NPRM. We understand that the FAA is incorporating our recommendations that are within the scope of the NPRM into the final rule and those that are beyond the scope will be incorporated prior to the rule becoming effective. We also understand the FAA will make conforming changes to QPS appendix C (Qualification Performance Standards for Helicopter Flight Simulators) and QPS appendix D (Qualification Performance Standards for Helicopter Flight Training Devices). Once the FAA has made these conforming changes, the FSD ARC would like to be tasked to continue its work on part 60, specifically QPS appendix C and QPS appendix D. Therefore, we request that you extend the FSD ARC's tasking to enable our scheduling the necessary meetings within the next 120 days to review and make recommendations for change to QPS appendices C and D.

Because we continue to believe it is both useful and important that the aviation industry is afforded an opportunity to contribute advice and recommendations regarding regulations that affect our industry, the FSD ARC members and participants extend our sincere appreciation to you for the opportunity to participate in this innovative approach to rulemaking. This process will help ensure that our regulatory process and standards continue to occupy a pre-eminent position in world aviation matters.

We look forward to the opportunity to continue to provide our assistance through your additional tasking.

Sincerely,

Ron Shoulars
Industry Co-Chair

Ed Cook
FAA Co-Chair

Attachments
(1) Recommendation for changes to QPS appendix A
(2) Recommendation for changes to QPS appendix B
(3) Recommendation for changes to QPS appendix E
(4) Recommendation for changes to QPS appendix F

The Amendment

The Federal Aviation Administration amends Title 14, Chapter I of the Code of Federal Regulations as follows:

[NOTE: We have made a commitment to add language into the rule that will allow a delayed "compliance" requirement for 12 months after the effective date of the final rule.]

PART 1 – DEFINITIONS AND ABBREVIATIONS

1. The authority citation for part 1 continues to read as follows:

Authority: 49 U.S.C. 106(g), 40113, 44701.

2. Section 1.1 is amended by adding new definitions in alphabetical order to read as follows:

§ 1.1 General definitions.

* * * * *

Flight simulation training device (FSTD) means a flight simulator or a flight training device.

Full flight simulator (FFS) means a replica of a specific type; or make, model, and series aircraft cockpit. It includes the assemblage of equipment and computer programs necessary to represent aircraft operations in ground and flight conditions, a visual system providing an out-of-the-cockpit view, a system that provides cues at least equivalent to those of a three-degree-of-freedom motion system, and has the full range of capabilities of the systems installed in the device as described in part 60 of this chapter and the qualification performance standards (QPS) for a specific FFS qualification level.

* * * * *

60.3 Definitions.

60.4 Qualification Performance Standards

60.5 Quality assurance program.

60.7 Sponsor qualification requirements.

60.9 Additional responsibilities of the sponsor.

60.11 FSTD use.

60.13 FSTD objective data requirements.

60.14 Special equipment and personnel requirements for qualification of the FSTD.

60.15 Initial qualification requirements.

60.16 Additional qualifications for a currently qualified FSTD.

60.17 Previously qualified FSTD's.

60.19 Inspection, continuing qualification evaluation, and maintenance requirements.

60.20 Logging FSTD discrepancies.

60.21 Interim qualification of FSTD's for new aircraft types or models.

60.23 Modifications to FSTD's.

60.25 Operation with missing, malfunctioning, or inoperative components.

60.27 Automatic loss of qualification and procedures for restoration of qualification.

60.29 Other losses of qualification and procedures for restoration of qualification.

60.31 Recordkeeping and reporting.

60.33 Applications, logbooks, reports, and records: Fraud, falsification, or incorrect statements.

60.35 Specific simulator compliance requirements.

60.37 Simulator qualification on the basis of a Bilateral Aviation Safety Agreement (BASA).

Appendix A to Part 60--Qualification Performance Standards for Airplane Full Flight Simulators person who uses or causes the use of an FSTD when –

(1) That person knows that the FSTD does not have an FAA-approved sponsor; and

(2) The use of the FSTD by that person is nonetheless claimed for purposes of meeting any requirement of this chapter or that person knows or should have known that the person's acts or omissions would cause another person to mistakenly credit use of the FSTD for purposes of meeting any requirement of this chapter.

(b) A situation in which paragraph (a) of this section would not apply to a person would be when each of the following conditions are met:

(1) The person sold or leased the FSTD and merely represented to the purchaser or lessee that the FSTD is in a condition in which it should be able to obtain FAA approval and qualification under this part;

(2) The person does not falsely claim to be the FAA-approved sponsor for the FSTD;

(3) The person does not falsely make representations that someone else is the FAA-approved sponsor of the FSTD at a time when that other person is not the FAA-approved sponsor of the FSTD; and

(4) The person's acts or omissions do not cause another person to detrimentally rely on such acts or omissions for the mistaken conclusion that the FSTD is FAA-approved and qualified under this part at the time the FSTD is sold or leased.

§ 60.3 Definitions.

In addition to the definitions in part 1 of this chapter, for the purpose of this part, the following terms and definitions apply:

Certificate holder. A person issued a certificate under parts 119, 141, or 142 of this other aircraft data accepted by the NSPM to ensure that FSTD performance is within the tolerances prescribed in the QPS.

Predicted data. Estimations or extrapolations of either existing flight test data or data from other simulation models using engineering analyses, engineering simulations, design data, and/or wind tunnel data.

Qualification level. The categorization of the FSTD, based on its demonstrated technical and operational capability as set out in the QPS.

Qualification Performance Standard (QPS). The collection of procedures and criteria published by the FAA to be used when conducting objective tests and subjective tests, including general FSTD requirements, for establishing FSTD qualification levels. . The QPS are set forth in the following FAA appendices: Appendix A, for Airplane Simulators; Appendix B, for Airplane Flight Training Devices; Appendix C, for Helicopter Simulators; Appendix D, for Helicopter Flight Training Devices; and Appendix E for Quality Assurance Programs for Flight Simulation Devices.

Qualification Test Guide (QTG). The primary reference document used for initially evaluating an aircraft FSTD. It contains test results, performance or demonstration results, statements of compliance and capability, the configuration of the aircraft simulated, and other information for the evaluator to assess the FSTD against the applicable regulatory criteria. The addition of the FAA-witnessed tests, conducted during the successful initial evaluation, into the QTG converts this document into the Master Qualification Test Guide (MQTG).

Set of aircraft. Aircraft that share similar handling, performance, and operating characteristics; similar operating envelopes; and have the same number and type of propulsion systems (i.e., engines, or engine and propeller/rotor combinations).

the continuing surveillance and analysis of the sponsor's performance and effectiveness in providing a satisfactory FSTD for use on a regular basis as described in QPS Appendix E.

(b) The QA program must provide a process for identifying deficiencies in the program and for documenting how the program will be changed to address these deficiencies.

(c) Whenever the NSPM finds that the QA program does not adequately address the procedures necessary to meet the requirements of this part, the sponsor must, after notification by the NSPM, change the program so the procedures meet the requirements of this part. Each such change must be approved by the NSPM prior to implementation.

(d) Within 30 days after the sponsor receives a notice described in § 60.5(c), the sponsor may file a petition with the Director of Flight Standards Service (the Director) for reconsideration of the NSPM finding. The sponsor must address its petition to the Director, Flight Standards Service, AFS-1, Federal Aviation Administration, 800 Independence Ave., SW., Washington, DC 20591. The filing of such a petition to reconsider stays the notice pending a decision by the Director. However, if the Director finds that there is a situationthat requires immediate action in the interest of safety in air commerce, he may, upon a statement of the reasons, require a change effective without stay.

§ 60.7 Sponsor qualification requirements.

(a) A person is eligible to apply to be a sponsor of an FSTD if the following conditions are met:

(1) The person holds, or is an applicant for, a certificate under part 119, 141, or 142 of this chapter; or holds, or is an applicant for, an approved flight engineer course in accordance with part 63 of this chapter.

(6) For FSTD's qualified prior to [insert effective date], for the 12 month period following the first continuing qualification evaluation conducted by the NSP after [insert effective date] and for each 12 month period thereafter, that FSTD must be used within the sponsor's FAA-approved flight training program for the aircraft, aircraft type, or set of aircraft.

(c) If the use requirements of paragraphs (b)(2) and (5) of this section are not met, the person will forfeit the right to sponsor that FSTD and that person will not be eligible to apply to sponsor that FSTD for at least 12 calendar months.

(d) In addition to the FSTD described in paragraph (b) of this section, an FSTD sponsor may sponsor any other FSTD provided –

(1) That other FSTD is used within the sponsor's or another certificate holder's FAA-approved flight training program for the aircraft or set of aircraft simulated; or

(2) The sponsor obtains a written statement at least annually from a qualified pilot who has flown the aircraft or set of aircraft (as appropriate) during the preceding 12-month period stating that the subject FSTD's performance and handling qualities represent the aircraft described in the FAA Type Certificate and the type data sheet, if appropriate. The sponsor must retain the two most current written statements for review by the NSPM.

§ 60.9 Additional responsibilities of the sponsor.

(a) The sponsor must allow the NSPM upon request to inspect the FSTD as soon as practicable, i.e., without unnecessarily disrupting or delaying beyond a reasonable time the training, evaluation, or experience being conducted in the FSTD. This inspection may include all records and documents relating to the FSTD, to determine its compliance with this part. If the sponsor fails to allow the NSPM to inspect the FSTD, and all records and documents relating to the NSPM regarding the qualification of that FSTD as provided for in this part.

(4) The MR may delegate the duties described in § 60.9(c)(2) and (3) to an individual at each of the sponsor's locations.

§ 60.11 FSTD use.

No person may use or allow the use of or offer the use of an FSTD for flightcrew member training or evaluation or for obtaining flight experience to meet any of the requirements under this chapter unless, in accordance with the QPS for the specific device, the FSTD --

(a) Has a single sponsor who is qualified under § 60.7. The sponsor may arrange with another person for services of document preparation and presentation, as well as FSTD inspection, maintenance, repair, and servicing; however, the sponsor remains responsible for ensuring that these functions are conducted in a manner and with a result of continually meeting the requirements of this part.

(b) Is qualified as described in the Statement of Qualification.

(c) Remains qualified, through satisfactory inspection, continuing qualification evaluations, appropriate maintenance, and use requirements in accordance with this part and the appropriate QPS.

(d) Functions during day-to-day training, evaluation, or flight experience activities with the software and hardware that was evaluated as satisfactory by the NSPM and, if modified, modified only in accordance with the provisions of this part. This section does not apply to routine software or hardware changes that do not fall under the requirements of §60.23.

(e) Is operated in accordance with the provisions and limitations of §60.25.

§ 60.13 FSTD objective data requirements.

When notified by the NSPM, the sponsor must make available all special equipment and qualified personnel needed to accomplish or assist in the accomplishment of tests during initial, continuing qualification, or special evaluations.

§ 60.15 Initial qualification requirements.

(a) For each FSTD, the sponsor must submit a request to the NSPM to evaluate the FSTD for initial qualification at a specific level and simultaneously request the TPAA forward a concurring letter to the NSPM. The request must be submitted in the form and manner described in the appropriate QPS.

(b) The request must include all of the following:

(1) A statement that the FSTD meets all of the applicable provisions of this part and all applicable provisions of the QPS.

(2) A statement that the sponsor will forward a confirmation statement to the NSPM in such time as to be received no later than close of business on Friday of the week prior to the week in which the initial evaluation is scheduled. The statement must confirm the information described in paragraph (c) of this section and may be forwarded to the NSPM via traditional or electronic means.

(3) A qualification test guide (QTG), acceptable to the NSPM, that includes all of the following:

(i) Objective data obtained from aircraft testing or another approved source.

(ii) Correlating objective test results obtained from the performance of the FSTD as prescribed in the appropriate QPS.

(iii) The result of FSTD performance demonstrations prescribed in the appropriate QPS.

determination must be available to the NSPM upon request.

(d) Except for those FSTD's previously qualified and described in § 60.17, each FSTD evaluated for initial qualification must meet the standard that is in effect at the time of the evaluation. However –

(1) If the FAA publishes a change to the existing standard or publishes a new standard for the evaluation for initial qualification, a sponsor may request that the NSPM apply the standard that was in effect when an FSTD was ordered for delivery if the sponsor–

(i) Within 30 days of the publication of the change to the existing standard or publication of the new standard, notifies the NSPM that an FSTD has been ordered;

(ii) Within 90 days of the NSPM notification described in paragraph (d)(1)(i) of this section, requests that the standard in effect at the time the order was placed be used for the evaluation for initial qualification; and

(iii) The evaluation is conducted within 24 months following the publication of the change to the existing standard or publication of the new standard, unless circumstances beyond the control of the sponsor prevent the evaluation from occurring within that time.

(2) This notification must include a description of the FSTD; the anticipated qualification level of the FSTD; the make, model, and series of aircraft simulated; and any other pertinent information.

(3) Any tests, tolerances, or other requirements that that are current at the time of the evaluation may be used during the initial evaluation, at the request of the sponsor, if the sponsor provides acceptable updates to the required qualification test guide.

(4) The standards used for the evaluation for initial qualification will be used for all subsequent evaluations of the FSTD.

(4) A statement that the FSTD is qualified as either a flight simulator or a flight training device.

(5) Identification of the qualification level of the FSTD.

(6) A statement that, with the exception of the noted exclusions [for which the FSTD has not been subjectively tested by the sponsor or the NSPM and for which qualification is not sought the qualification of the FSTD includes –

(i) All of the operations tasks listed in the Table of Functions and Subjective Tests set out in the FSTD subjective tests attachment to the appropriate QPS appendix relevant to the qualification level of the FSTD, and

(ii) All of the simulator systems and sub-systems listed in the table of Functions and Subjective Tests set out in the FSTD subjective tests attachment to the appropriate QPS appendix relevant to the qualification level of the FSTD.

(i) After the NSPM completes the evaluation for initial qualification, the sponsor must update the QTG, with the results of the FAA-witnessed tests and demonstrations together with the results of all the objective tests and demonstrations described in the appropriate QPS.

(j) Upon issuance of the Statement of Qualification the updated QTG becomes the MQTG and must be made available to the NSPM upon request.

§ 60.16 Additional qualifications for a currently qualified FSTD.

(a) A currently qualified FSTD is required to undergo an additional qualification process if a user intends to use the FSTD for meeting training, evaluation, or flight experience requirements of this chapter beyond the qualification issued for that FSTD. This process consists of the following:

appropriate QPS, or as specified in paragraph (e) of this section, an FSTD qualified before [Insert effective date of final rule] will retain its qualification basis as long as it continues to meet the standards, including the performance demonstrations and the objective test results recorded in the MQTG,under which it was originally evaluated, regardless of sponsor. The sponsor of such an FSTD must comply with the other applicable provisions of this part.

(b) For each FSTD qualified before [Insert effective date of the final rule], no sponsor may use or allow the use of or offer the use of such an FSTD after [Insert date 6 years after the effective date of the final rule] for flightcrew member training, evaluation or flight experience to meet any of the requirements of this chapter, unless that FSTD has been issued a Statement of Qualification, including the Configuration List and Restrictions to the Qualification List in accordance with the procedures set out in the appropriate QPS.

(c) If the FSTD qualification is lost under § 60.27 and –

(i) Restored under § 60.27 in less than (2) years, the qualification basis (in terms of objective tests and performance demonstrations) for the re-qualification will be those against which the FSTD was originally evaluated and qualified.

(ii) Not restored under § 60.27 for two (2) years or more, the qualification basis (in terms of objective tests and performance demonstrations) for the re-qualification will be those standards in effect and current at the time of re-qualification application.

(d) Except as provided in paragraph (e) of this section, any change in FSTD qualification level initiated on or after [Insert the effective date of this rule] requires an evaluation for initial qualification in accordance with this part.

(e) A sponsor may request that an FSTD be permanently downgraded. In such a case, the NSPM may downgrade a qualified FSTD without requiring and without conducting an initial may be amended by an FSTD Directive.

(2) The sponsor must contact the NSPM to schedule the FSTD for continuing qualification evaluations not later than 60 days before the evaluation is due.

(3) The sponsor must provide the NSPM access to the objective test results and FSTD performance demonstration results in the MQTG, and access to the FSTD for the length of time necessary for the NSPM to complete the required continuing qualification evaluations, weekdays between 6 o'clock AM (local time) and 6 o'clock PM (local time).

(4) The frequency of NSPM-conducted continuing qualification evaluations for each FSTD will be established by the NSPM and specified in the MQTG.

(5) Continuing qualification evaluations conducted in the calendar month before or after the calendar month in which these continuing qualification evaluations are required will be considered to have been conducted in the calendar month in which they were required.

(6) No sponsor may use or allow the use of or offer the use of an FSTD for flightcrew member training or evaluation or for obtaining flight experience for the flightcrew member to meet any requirement of this chapter unless the FSTD has passed an NSPM-conducted continuing qualification evaluation within the timeframe specified in the MQTG or within the grace period as described in paragraph (b)(5) of this section.

(c) Maintenance. The sponsor is responsible for continuing corrective and preventive maintenance on the FSTD to ensure that it continues to meet the requirements of this part and the appropriate QPS appendix. No sponsor may use or allow the use of or offer the use of an FSTD for flightcrew member training, evaluation, or flight experience to meet any of the requirements of this chapter unless the sponsor does the following:

(1) Maintains a discrepancy log.

(3) The QTG test results.

(b) An FSTD that has been issued interim qualification is deemed to have been issued initial qualification unless the NSPM rescinds the qualification. Interim qualification terminates two years after its issuance, unless the NSPM determines that specific conditions warrant otherwise.

(c) Within twelve months of the release of the final aircraft data package by the aircraft manufacturer but no later than two years after the issuance of the interim qualification status the sponsor must apply for initial qualification in accordance with § 60.15 based on the final aircraft data package approved by the aircraft manufacturer, unless the NSPM determines that specific conditions warrant otherwise.

(d) An FSTD with interim qualification may be modified only in accordance with § 60.23.

§ 60.23 Modifications to FSTD's.

(a) Description of a modification. For the purposes of this part, an FSTD is said to have been modified when:

(1) Additional equipment or devices intended to simulate aircraft appliances are added;

(2) Changes are made to either software or hardware that are intended to impact flight or ground dynamics; changes that impact performance or handling characteristics of the FSTD (including motion, visual, control loading, or sound systems for those FSTD levels requiring sound tests and measurements); or changes that affect the MQTG.

(b) FSTD Directive. When the FAA determines that FSTD modification is necessary for safety of flight reasons, the sponsor of each affected FSTD must ensure that the FSTD is

(d) User notification. When a modification is made to an FSTD that affects the Statement of Qualification, the sponsor must notify each certificate holder scheduled to use that FSTD of that modification prior to that certificate holder using that FSTD the first time after the modification is complete.

(e) MQTG update. The MQTG must be updated with current objective test results in accordance with §60.15(b)(4) and appropriate aircraft data in accordance with §60.13, each time an FSTD is modified and an objective test is affected by the modification. If an FSTD Directive is the cause of this update, the direction to make the modification and the record of the modification completion must be filed in the MQTG.

§ 60.25 Operation with missing, malfunctioning, or inoperative components.

(a) No person may knowingly use or allow the use of or misrepresent the capability of an FSTD for any maneuver, procedure, or task that is to be accomplished to meet training, evaluation, or flight experience requirements of this chapter for flightcrew member certification or qualification when there is a missing, malfunctioning, or inoperative (MMI) component that is required to be present and correctly operate for the satisfactory completion of that maneuver, procedure, or task.

(b) Each MMI component as described in paragraph (a) of this section, or any MMI component installed and operating correctly to meet the current Statement of Qualification, must be repaired or replaced

within 30 calendar days, unless otherwise required or authorized by the NSPM; or

(c) A list of the current MMI components must be readily available in or adjacent to the FSTD for review by users of the device. Electronic access to this list via an appropriate terminal considers factors including the number of continuing qualification evaluations missed, the number of sponsor-conducted quarterly inspections missed, and the care that had been taken of the device since the last evaluation.

§ 60.29 Other losses of qualification and procedures for restoration of qualification.

(a) Except as provided in paragraph (c) of this section, when the NSPM determines that the FSTD no longer meets qualification standards, the following procedure applies:

(1) The NSPM notifies the sponsor in writing that the FSTD no longer meets some or all of its qualification standards.

(2) The NSPM sets a reasonable period (but not less than 7 days) within which the sponsor may submit written information, views, and arguments on the FSTD qualification.

(3) After considering all material presented, the NSPM notifies the sponsor about the determination with regard to the qualification of the FSTD.

(4) When the NSPM notifies the sponsor that some or all of the FSTD is no longer qualified, it becomes effective not less than 30 days after the sponsor receives notice of it unless-

(i) The NSPM finds under paragraph (c) of this section that there is an emergency requiring immediate action with respect to safety in air commerce; or

(ii) The sponsor petitions the Director of Flight Standards Service for reconsideration of the NSPM finding under paragraph (b) of this section.

(b) When a sponsor seeks reconsideration of a decision from the NSPM concerning the FSTD qualification, the following procedure applies:

(1) The sponsor must petition for reconsideration of that decision within 30 days of the date that the sponsor receives a notice that some or all of the FSTD is no longer qualified.

(e) In making the determinations described in paragraph (d) of this section, the NSPM considers factors including the reason for the loss of qualification, any repairs or replacements that may have to have been completed, the number of continuing qualification evaluations missed, the number of sponsor-conducted quarterly inspections missed, and the care that had been taken of the device since the loss of qualification.

§ 60.31 Recordkeeping and reporting.

(a) The FSTD sponsor must maintain the following records for each FSTD it sponsors:

(1) The MQTG and each amendment thereto.

(2) A record of all FSTD changes affected under § 60.23(a)since the issuance of the original Statement of Qualification .

(3) A copy of all of the following:

(i) Results of the qualification evaluations (initial and each upgrade) since the issuance of the original Statement of Qualification.

(ii) Results of the quarterly objective tests and the approved performance demonstrations conducted in accordance with § 60.19(a) for a period of 2 years.

(iii) Results of the previous three continuing qualification evaluations, or the continuing qualification evaluations from the previous 2 years, whichever covers a longer period.

(iv) Comments obtained in accordance with § 60.9(b) for a period of at least 90 days.

(4) A record of all discrepancies entered in the discrepancy log over the previous 2 years, including the following:

(i) A list of the components or equipment that were or are missing, malfunctioning, or inoperative.

(c) The following may serve as a basis for removal of qualification of an FSTD including the withdrawal of approval for use of an FSTD; or denying an application for a qualification:

(1) An incorrect statement, upon which the FAA relied or could have relied, made in support of an application for a qualification or a request for approval for use.

(2) An incorrect entry, upon which the FAA relied or could have relied, made in any logbook, record, or report that is kept, made, or used to show compliance with any requirement for an FSTD qualification or an approval for use.

§ 60.35 Specific FFS compliance requirements.

(a) No device will be eligible for initial or upgrade qualification to a FFS at Level C or Level D under this part unless it includes the equipment and appliances installed and operating to the extent necessary for the issuance of an airman certificate or rating.

(b) No device will be eligible for initial or upgrade qualification to a FFS at Level A or Level B under this part unless it includes the equipment and appliances installed and operating to the extent necessary for the training, testing, and/or checking that comprise a portion of the requirements for issuance of an airman certificate or rating.

§ 60.37 FSTD qualification on the basis of a Bilateral Aviation Safety Agreement (BASA).

(a) The evaluation and qualification of an FSTD by a contracting State to the Convention on International Civil Aviation for the sponsor of an FSTD located in that contracting State may be used as the basis for issuing a U.S. statement of qualification (see appropriate QPS, attachment 5, figure 4) by the NSPM to the sponsor of that FSTD in accordance with —

(1) A BASA between the United States and the Contracting State that issued the original qualification; and

Appendix A to Part 60—Qualification Performance Standards for Airplane Full Flight Simulators

---

Begin Information

This appendix establishes the standards for Airplane Full Flight Simulator (FFS) evaluation and qualification. The Flight Standards Service, National Simulator Program (NSP) staff, under the direction of the NSP Manager (NSPM), is responsible for the development, application, and interpretation of the standards contained within this appendix. The procedures and criteria specified in this appendix will be used by the NSPM, or a person or persons assigned by the NSPM (e.g., FAA pilots and/or FAA aeronautical engineers, assigned to and trained under the direction of the NSP – referred to as NSP pilots or NSP engineers, other FAA personnel, etc.) when conducting airplane FFS evaluations.

End Information

Table of Contents

1. Introduction.

Begin Information

a. This appendix contains background information as well as material that is either directive or informative in nature as described later in this section. Except for this Introduction section, the directive or the informative material is presented in sections that correspond with sections of part 60. This material provides additional requirements and/or provides information regarding that subject. Some sections will have neither additional regulatory or informational material. In these instances the corresponding section in the Table of Contents will show "(No Info)."

b. To assist the reader in determining what areas are directive or required and what areas are guiding or permissive –
(1) The text in this appendix is contained within one of two sections: regulatory requirements that are in addition to the requirements in part 60 but are found only in this appendix, referred to as "QPS Requirements;" and advisory or informative material, referred to as "Information."

(a) The FAA has chosen to place into special QPS Requirements sections those requirements that are more likely to change on a more regular basis for a variety of reasons, e.g., increased knowledge about human factors, analysis of incident/accident data, and/or changes in aircraft or simulation technology. Using this capability, the FAA will be able to use information resulting from these factors to expeditiously modify the regulatory requirements without compromising the timeliness of those changes and without violating the Administrative Procedure Act (APA). In accordance with the APA, the FAA intends to treat all such QPS Requirements changes as Notices of Proposed Rule Making (NPRM), will seek input and suggestions from a representative cross-section of the affected industry through an Aviation Rulemaking Committee, will seek public comment through announcement of any proposed change in the Federal Register, and will review changes before final action on them is complete. The FAA does not expect that many changes to these QPS Requirements will justify the expenditure of time and resources at the highest levels of the agency and will therefore streamline the process for making technical changes to these QPS Requirements by delegating authority for final review and issuance from the Administrator to the Director, Flight Standards Service.

(b) Similarly, the FAA has chosen to place into special Information sections additional material regarding the adjacent regulatory requirements such as acceptable examples of practices and either additional or clarifying information that may be useful to the public in identifying the intent of the FAA.

(2) The text presented between horizontal lines beginning with the heading "Begin QPS Requirements" and ending with the heading "End QPS Requirements," provides clarification for, or contains additional details regarding, the regulatory requirements found in the part 60 rule language.

(3) The text presented between horizontal lines beginning with the heading "Begin Information" and ending with the heading "End Information," is advisory or informative

and is presented to provide additional information and/or clarification regarding the relevant subject.

(4) The tables in this appendix have rows across the top of each table –

(a) The data presented in columns under the heading "QPS REQUIREMENTS" is regulatory but is found only in this appendix.

(b) The data presented in columns under the heading "INFORMATION" is advisory or informative.

c. Questions regarding the contents of this publication should be sent to the U.S. Department of Transportation, Federal Aviation Administration, Flight Standards Service, National Simulator Program Staff, AFS-205, 100 Hartsfield Centre Parkway, Suite 400, Atlanta, Georgia, 30354. Telephone contact numbers for the NSP are: phone, 404-832-4700; fax, 404-761-8906.
The general email address for the NSP office is: 9-aso-avr-sim-team@faa.gov.
The NSP Internet Web Site address is: http://www.faa.gov/nsp. On this Web Site you will find an NSP personnel list with telephone and email contact information for each NSP staff member, a list of qualified flight simulation devices, advisory circulars, a description of the qualification process, NSP policy, and an NSP "In-Works" section. Also linked from this site are additional information sources, handbook bulletins, frequently asked questions, a listing and text of the Federal Aviation Regulations, Flight Standards Inspector's handbooks, and other FAA links.

d. The NSPM encourages the use of electronic media for communication and the gathering, storage, presentation, or transmission of any record, report, request, test, or statement required by this appendix provided the media used has adequate provision for security and is acceptable to the NSPM. The NSPM recommends inquiries on system compatibility prior to any such activity. Minimum System requirements may be found on the NSP Website.

e. Related Reading References.
(1) 14CFR part 60
(2) 14CFR part 61.
(3) 14CFR part 63.
(4) 14CFR part 119
(5) 14CFR part 121.
(6) 14CFR part 125
(7) 14CFR part 135.
(8) 14CFR part 141
(9) 14CFR part 142
(10) Advisory Circular (AC) 120-28C, Criteria for Approval of Category III Landing Weather Minima.
(11) AC 120-29, Criteria for Approving Category I and Category II Landing Minima for part 121 operators.
(12) AC 120-35B, Line Operational Simulations: Line-Oriented Flight Training, Special Purpose Operational Training, Line Operational Evaluation.

(13) AC 120-41, Criteria for Operational Approval of Airborne Wind Shear Alerting and Flight Guidance Systems.
(14) AC 120-57A, Surface Movement Guidance and Control System (SMGS).
(15) AC 150/5300-13, Airport Design.
(16) AC 150/5340-1G, Standards for Airport Markings.
(17) AC 150/5340-4C, Installation Details for Runway Centerline Touchdown Zone Lighting Systems.
(18) AC 150/5340-19, Taxiway Centerline Lighting System.
(19) AC 150/5340-24, Runway and Taxiway Edge Lighting System.
(20) AC 150/5345-28D, Precision Approach Path Indicator (PAPI) Systems
(21) International Air Transport Association document, "Flight Simulator Design and Performance Data Requirements," as amended.
(22) AC 25-7, as amended, Flight Test Guide for Certification of Transport Category Airplanes.
(23) AC 23-8A, as amended, Flight Test Guide for Certification of Part 23 Airplanes.
(24) International Civil Aviation Organization (ICAO) Manual of Criteria for the Qualification of Flight Simulators, as amended.
(25) Airplane Flight Simulator Evaluation Handbook, Volume I, as amended and Volume II, as amended, The Royal Aeronautical Society, London, UK.
(26) FAA Publication FAA-S-8081 series (Practical Test Standards for Airline Transport Pilot Certificate, Type Ratings, Commercial Pilot, and Instrument Ratings).
(27) The FAA Aeronautical Information Manual (AIM), FAA Handbook XXXXX

f. Background.
(1) In the late 1980's several regulatory authorities around the world, including the FAA, published new or revised documents stating the requirements for the qualification of FFS's as applicable under their respective country's rules, regulations, and/or policies. As a result, those who used airplane FFS's to train and/or check flightcrew members flying under more than one country's regulatory authority found themselves having to provide unique documentation for each authority. With the encouragement of persons from several wide-ranging governmental and non-governmental interests, the Flight Simulation Group of the United Kingdom's Royal Aeronautical Society (RAeS) agreed to organize and conduct two international seminars to focus attention on this situation. The result was the formulation of an RAeS working group consisting of recognized simulation experts and regulatory authorities representatives from around the world. Utilizing the FAA's Advisory Circular (AC) 120-40B document as its practical foundation, this working group devoted over 10,000 man-hours toward the development of a set of FFS evaluation criteria that was acceptable to all parties involved.
(2) This set of evaluation criteria was presented for review and comment in an international conference hosted by RAeS in London on January 16 and 17, 1992. Following detailed explanation and considerable discussion, the conference delegates unanimously agreed to forward these criteria to the International Civil Aviation Organization (ICAO), recommending that ICAO adopt these criteria as appropriate for international FFS evaluation criteria. After reviewing this material, ICAO agreed to translate the information into the appropriate language necessary for ICAO purposes; and

the resulting ICAO document, "Manual of Criteria for the Qualification of Flight Simulators," 1st Ed., 1994, is available through the Office of the Secretary General.

(3) In 2001 an international industry working group convened under the joint auspices of the FAA and JAA to develop the second edition of the ICAO Manual 9625. Two meetings were held; one in Hoofddorp, the Netherlands, at Central JAA in March 2001, and one in Atlanta, Georgia, USA, at NSP headquarters in June 2001. During both meetings there were representatives from the FAA, JAA, Transport Canada, CASA Australia (Atlanta only), airplane manufacturers, flight simulator manufacturers and flight simulator operators from the US, the JAA coverage area, and Canada. More than 500 man-days were invested during these two meetings and many more outside the meetings. The work was shared by four subgroups (Data, Visual, Sound and Motion) and was thoroughly reviewed by the larger working group in frequent plenary sessions. An editing team, consisting of representatives of each of the four subgroups, the FAA, and Central JAA met in August 2001 to consolidate the proposals of the subgroups and ensure consistency throughout the document. A final manuscript was submitted to ICAO in January 2002. The second edition of ICAO Manual 9625 provides standards only for the highest level of flight simulator qualification equivalent to FAA Level D. The FAA, together with the other participating regulatory authorities (Australia, Canada, Finland, France, Germany, Scandinavia, Switzerland, The Netherlands, and the United Kingdom), provided letters of support to the ICAO regarding this second edition and have committed to integrating the resulting changes into their own regulation/documentation for flight simulator standards. The goal of the requirements in this appendix is to match the ICAO requirements for the evaluation and qualification of the highest level of airplane FFS addressed herein: i.e., the requirements for Level D FFS's set out in this appendix match the requirements for the ICAO simulator.

(4) For information purposes, the following is a chronological listing of the documents preceding part 60 that have addressed the qualification criteria for airplane FFS evaluation and qualification by the FAA, including the effective dates of those documents:

14 CFR part 121, appendix B	01/09/65 to 02/02/70
AC 121-14	12/19/69 to 02/09/76
AC 121-14A	02/09/76 to 10/16/78
AC 121-14B	10/16/78 to 08/29/80
14 CFR part 121, appendix H	06/30/80 to (date TBD)
AC 121-14C	08/29/80 to 01/31/83
AC 120-40	01/31/83 to 07/31/86
AC 120-40A	07/31/86 to 07/29/91
AC 120-40B	07/29/91 to (date TBD)
AC 120-40C (draft)	07/01/95 to (date TBD)

End Information

2. Applicability (§§ 60.1 & 60.2)

Begin Information

There is no additional regulatory or informational material that applies to § 60.1, Applicability, or to § 60.2, Applicability of sponsor rules to person who are not sponsors and who are engaged in certain unauthorized activities.

End Information

---

3. Definitions (§ 60.3)

Begin Information

See Appendix F for a list of definitions and abbreviations from part 1 and part 60, including the appropriate appendices of part 60.

End Information

---

4. Qualification Performance Standards (§ 60.4)

Begin Information

There is no additional regulatory or informational material that applies to § 60.4, Qualification Performance Standards.

End Information

---

5. Quality Management System (§ 60.5).

Begin Information

Additional regulatory material and informational material regarding Quality Management Systems for Flight Simulation Training Devices may be found in appendix E of this part.

End Information

---

6. Sponsor Qualification Requirements (§ 60.7).

Begin Information

a. The intent of the language used in § 60.7(b) is to have a specific FFS, identified by the sponsor, used by the sponsor at least once in the sponsor's FAA-approved flight training program for the airplane simulated during the 12-month period described. The identification of the specific FFS may change from one 12-month period to the next 12-month period as long as that sponsor sponsors and uses at least one FFS at least once during the prescribed period. There is no minimum number of hours or minimum FFS periods required.

b. To assist in avoiding confusion regarding the requirements for use of a qualified FFS the following examples/descriptions are provided to describe acceptable operational practices:

(1) Example One.

(a) A sponsor is sponsoring a single, specific FFS for their own use, in their own facility or elsewhere – this single FFS forms the basis for the sponsorship. The sponsor uses that FFS at least once in each 12-month period in that sponsor's FAA-approved flight training program for the airplane simulated. This 12-month period is established according to the following:

(i) If the FFS was qualified prior to [insert the effective date of this rule] the 12-month period begins on the date of the first NSPM-conducted continuing qualification after [insert the effective date of this rule] and continues for each subsequent 12-month period;

(ii) If the FFS satisfactorily completes an initial or upgrade evaluation on or after [insert the effective date of this rule] the 12-month period begins on the date of that completed initial or upgrade evaluation and continues for each subsequent 12-month period.

(b) There is no minimum number of hours or minimum FFS periods required.

(c) The identification of the specific FFS may change from one 12-month period to the next 12-month period as long as that sponsor sponsors and uses at least one FFS at least once during the prescribed period.

(2) Example Two.

(a) A sponsor sponsors an additional number of FFS's, in their facility or elsewhere. Each such additionally sponsored FFS must be –

(i) Used by the sponsor in the sponsor's FAA-approved flight training program for the airplane simulated [as described in § 60.7(d)(1)] at least once in each 12-month period in that sponsor's FAA-approved flight training program for the airplane simulated (this 12-month period is established in the same manner as in example one);

OR

(ii) Used by another FAA certificate holder in that other certificate holder's FAA-approved flight training program for the airplane simulated [as described in § 60.7(d)(1)] at least once in each 12-month period in that certificate holder's FAA-approved flight training program for the airplane simulated (this 12-month period is established in the same manner as in example one);

OR

(iii) Provided a statement each year from a qualified pilot, (after having flown the airplane, not the subject FFS or another FFS, during the preceding 12-month period) stating that the subject FFS's performance and handling qualities represent the airplane [as described in § 60.7(d)(2)]. This statement is provided at least once in each 12-month period established in the same manner as in example one.

(b) There is no minimum number of hours or minimum FFS periods required.

(3) Example Three.

(a) A sponsor (in this example, a Part 142 certificate holder) in "New York" (having at least one FFS used at least once per year in the sponsor's FAA-approved flight training program) establishes a "satellite" training center in "Chicago" and/or a satellite center in "Moscow."

(b) The satellite function means that the "Chicago" and/or "Moscow" center(s) must operate under the "New York" center's certificate (in accordance with all of the "New York" center's practices, procedures, and policies; e.g., instructor and/or technician training/checking requirements, record keeping, QMS program, etc.).

(c) All of the FFS's in the "Chicago" center and/or the "Moscow" center could be dry-leased (i.e., the certificate holder does not have and utilize FAA-approved flight training programs for the FFS's in the "Chicago" and/or the "Moscow" center) because –

(i) Each FFS in the "Chicago" center and/or each FFS in the "Moscow" center is used at least once each 12-month period by another FAA certificate holder in that other certificate holder's FAA-approved flight training program for the airplane [as described in § 60.7(d)(1)];or

(ii) A statement is obtained from a qualified pilot (having flown the airplane, not the subject FFS or another FFS during the preceding 12-month period) stating that the performance and handling qualities of each FFS in the "Chicago" center and/or each FFS in the "Moscow" center represent the airplane [as described in § 60.7(d)(2)].

End Information

---

7. Additional Responsibilities of the Sponsor (§ 60.9).

Begin Information

The phrase "…as soon as practicable…" as found in § 60.9(a), means without unnecessarily disrupting or delaying beyond a reasonable time the training, evaluation, or experience being conducted in the FSTD.

End Information

---

8. Simulator Use (§ 60.11).

Begin Information

There is no additional regulatory or informational material that applies to § 60.11, Simulator Use.

End Information

---

9. Simulator Objective Data Requirements (§ 60.13).

Begin QPS Requirements

a. Flight test data used to validate FFS performance and handling qualities must have been gathered in accordance with a flight test program containing the following:

(1) A flight test plan, that contains:

(a) The required maneuvers and procedures.

(b) For each maneuver or procedure --

(i) The procedures and control input the flight test pilot and/or engineer are to use.

(ii) The atmospheric and environmental conditions.

(iii) The initial flight conditions.

(iv) The airplane configuration, including weight and center of gravity.

(v) The data that is to be gathered.

(vi) Any other appropriate factors.
(2) Appropriately qualified flight test personnel.
(3) An understanding of the accuracy of the data to be gathered using appropriatealternative data sources, procedures, and instrumentation such as those found in Attachment 2, Table A2D, which may require traceability to a recognized standard,.
(4) Appropriate and sufficient data acquisition equipment or system(s), including appropriate data reduction and analysis methods and techniques, as would be acceptable to the FAA's Aircraft Certification Service.

b. The data, regardless of source, must be presented:
(1) in a format that supports the flight FFS validation process;
(2) in a manner that is clearly readable and annotated correctly and completely;
(3) with resolution sufficient to determine compliance with the tolerances set forth in attachment 2 of this appendix.
(4) with any necessary guidance information provided; and
(5) without alteration, adjustments, or bias; however the data may be re-scaled, digitized, or otherwise manipulated to fit the desired presentation.

c. After completion of any additional flight test, a flight test report must be submitted in support of the validation data. The report must contain sufficient data and rationale to support qualification of the FFS at the level requested.

End QPS Requirements

Begin Information

d. The FFS sponsor is encouraged to maintain a liaison with the manufacturer of the aircraft being simulated (or with the holder of the aircraft type certificate for the aircraft being simulated if the manufacturer is no longer in business), and/or, if appropriate, with the person having supplied the aircraft data package for the FFS in order to facilitate the notification described in this paragraph. The NSPM requests that the sponsor notify the NSPM when an addition to or a revision of the flight related data or airplane systems related data is available if this data is used to program and/or operate a qualified FFS. The data referred to in this sub-section are those data that are used to validate the performance, handling qualities, or other characteristics of the aircraft, including data related to any relevant changes occurring after the type certification is issued. Such notification should also provide technical information about this data to the NSPM relative to the data's significance for training, evaluation, or flight experience activities in the FFS.

e. It is tbe intent of the NSPM that for new aircraft entering service, at a point well in advance of preparation of the Qualification Test Guide (QTG), the sponsor should submit to the NSPM for approval, a descriptive document (a validation data roadmap) containing the plan for acquiring the validation data, including data sources. This document should clearly identify sources of data for all required tests, a description of the validity of these data for a specific engine type and thrust rating configuration, and the revision levels of all avionics affecting the performance or flying qualities of the aircraft. Additionally, this document should provide rationale or explanations for cases where data or data parameters are missing, where engineering simulation data are used, where flight test methods require further explanations, etc. and provide a brief narrative describing the cause and effect of any deviation from data requirements. This document may be provided by the aircraft manufacturer.

f. There is no requirement for any flight test data supplier to submit a flight test plan/program prior to gathering flight test data. However, the NSP staff has experience that indicates at least some data gatherers, primarily those that do not have a satisfactory "history" of supplying such data, often provide data that is irrelevant, not properly marked, without adequate justification for selection, without adequate information regarding initial conditions, without adequate information regarding the test maneuver, etc. The NSP staff has been forced to not accept such data submissions as validation data for FFS evaluation. It is for this reason that the NSP staff recommends that any data supplier not previously experienced in this area review the data necessary for programming and for validating the performance of the FFS and discuss the flight test plan anticipated for acquiring such data with the NSP staff well in advance of commencing the flight tests.

g. In those cases where the objective test results authorize a "snapshot test" or a "series of snapshot tests" results in lieu of a time-history result, the sponsor or other data provider must ensure that a steady state condition exists at the instant of time captured by the "snapshot." This is often verified by showing that a steady state condition existed from some period prior to, through some period following, the snap shot. The time period most frequently used is from 5 seconds prior to, through 2 seconds following, the instant of time captured by the snap shot. This paragraph is primarily addressing the source data and the method by which the data provider ensures that the steady state condition for the snap shot is representative.

h. The NSPM will consider, on a case-by-case basis, whether or not to approve supplemental validation data derived from flight data recording systems such as a Quick Access Recorder or Flight Data Recorder.

End Information

---

10. Special Equipment and Personnel Requirements for Qualification of the Simulator (§ 60.14).

Begin Information

a. In the event that the NSPM determines that special equipment or (a) specifically qualified person(s) will be required for the conduct of any evaluation, the NSPM will make every attempt to notify the sponsor at least one (1) week, but in no case less than 72 hours, in advance of the evaluation. Examples of special equipment include spot photometers, flight control measurement devices, sound analyzer, etc. Examples of specially qualified personnel would be those specifically qualified to install or use any special equipment when its use is required.

b. Examples of a special evaluation would be an evaluation conducted after the move of a FFS; at the request of the TPAA; as a result of comments received from users of the FFS that, upon analysis and confirmation, might cause a question as to the continued qualification or use of the FFS; etc.

End Information

---

11. Initial (and Upgrade) Qualification Requirements (§ 60.15).

Begin QPS Requirements

a. In order to be qualified at the appropriate qualification level, the simulator must:
(1) Meet the general requirements listed in Attachment1 found in –
(a) The Table of Minimum Simulator Requirements;
(b) The Table of Tasks vs. Simulator Level, Subjective Requirements; and
(c) The Table of Simulator Systems, Subjective Requirements.
(2) Meet the objective testing requirements in Attachment 2; and
(3) Satisfactorily perform the subjective tests listed in Attachment 3.

b. The request described in § 60.15(a) must include all of the following:
(1) A statement that the FSTD meets all of the applicable provisions of this part and all applicable provisions of the QPS.
(2) A confirmation that the sponsor will forward to the NSPM the statement described in § 60.15(b) in such time as to be received no later than 5 business days prior to the scheduled evaluation and may be forwarded to the NSPM via traditional or electronic means.
(3) A qualification test guide (QTG), acceptable to the NSPM, that includes all of the following:
(a) Objective data obtained from aircraft testing or another approved source.
(b) Correlating objective test results obtained from the performance of the FSTD as prescribed in the appropriate QPS.
(c) The result of FSTD subjective tests prescribed in the appropriate QPS.
(d) A description of the equipment necessary to perform the evaluation for initial qualification and the continuing qualification evaluations.

c. The QTG described in paragraph a(3) of this section, must provide the documented proof of compliance with the simulator objective tests in attachment 2 of this appendix.

d. The QTG is prepared and submitted by the sponsor, or the sponsor's agent on behalf of the sponsor, to the NSPM for review and approval, and must include, for each objective test:
(1) Parameters, tolerances, and flight conditions;

(2) Pertinent and complete instructions for the conduct of automatically and manually conducted tests;
(3) A means of comparing the FFS's test results to the objective data;
(4) Any other information as necessary, to assist in the evaluation of the test results;
(5) Other information appropriate to the qualification level of the FFS.

e. The QTG described in paragraphs a(3) and b of this section, must include the following:
(1) A QTG cover page with sponsor and FAA approval signature blocks (see Attachment 4, Figure 2, for a sample QTG cover page).
(2) A continuing qualification evaluation schedule requirements page – to be used by the NSPM to establish and record the frequency with which continuing qualification evaluations must be conducted and any subsequent changes that may be determined by the NSPM. See Attachment 4, Figure 4, for a sample Continuing Qualification Evaluation Schedule Requirements page.
(3) A FFS information page that provides the information listed in this paragraph (see Attachment 4, Figure 3, for a sample FFS information page). For convertible FFS's, the sponsor must submit at least a separate page for each configuration of the FFS.
(a) The sponsor's FFS identification number or code.
(b) The airplane model and series being simulated.
(c) The aerodynamic data revision number or reference.
(d) The engine model(s) and its data revision number or reference.
(e) The flight control data revision number or reference.
(f) The flight management system identification and revision level.
(g) The FFS model and manufacturer.
(h) The date of FFS manufacture.
(i) The FFS computer identification.
(j) The visual system model and manufacturer, including display type.
(k) The motion system type and manufacturer, including degrees of freedom.
(4) A Table of Contents.
(5) A log of revisions and a list of effective pages.
(6) List of all relevant data references.
(7) A glossary of terms and symbols used (including sign conventions and units).
(8) Statements of compliance and capability (SOC's) with certain requirements. SOC's must provide references to the sources of information for showing the capability of the FFS to comply with the requirement, a rationale explaining how the referenced material is used, mathematical equations and parameter values used, and the conclusions reached; i.e. that the FFS complies with the requirement. Refer to the "Additional Details" column in attachment 1, "Simulator Standards," or in the "Test Details" column in attachment 2, "Simulator Objective Tests," to see when SOC's are required.
(9) Recording procedures or equipment required to accomplish the objective tests.
(10) The following information for each objective test designated in attachment 2, as applicable to the qualification level sought:
(a) Name of the test.
(b) Objective of the test.

(c) Initial conditions.
(d) Manual test procedures.
(e) Automatic test procedures (if applicable).
(f) Method for evaluating FFS objective test results.
(g) List of all relevant parameters driven or constrained during the automatically conducted test(s).
(h) List of all relevant parameters driven or constrained during the manually conducted test(s).
(i) Tolerances for relevant parameters.
(j) Source of Validation Data (document and page number).
(k) Copy of the Validation Data (if located in a separate binder, a cross reference for the identification and page number for pertinent data location must be provided).
(l) Simulator Objective Test Results as obtained by the sponsor. Each test result must reflect the date completed and must be clearly labeled as a product of the device being tested.

f. A convertible FFS is addressed as a separate FFS for each model and series airplane to which it will be converted and for the FAA qualification level sought. The NSP will conduct an evaluation for each configuration. For example, if a sponsor seeks qualification for two models of an airplane type using a convertible FFS, the sponsor must submit two QTG's, or a supplemented QTG, and the NSP will conduct two evaluations.

g. Form and manner of presentation of objective test results in the QTG:
(1) The sponsor's FFS test results must be recorded in a manner, acceptable to the NSPM, that will allow easy comparison of the FFS test results to the validation data (e.g., use of a multi-channel recorder, line printer, cross plotting, overlays, transparencies, etc.).
(2) FFS results must be labeled using terminology common to airplane parameters as opposed to computer software identifications.
(3) Validation data documents included in a QTG may be photographically reduced only if such reduction will not alter the graphic scaling or cause difficulties in scale interpretation or resolution.
(4) Scaling on graphical presentations must provide the resolution necessary to evaluate the parameters shown in attachment 2 of this appendix.
(5) For tests involving time histories, data sheets (or transparencies thereof) and FFS test results must be clearly marked with appropriate reference points to ensure an accurate comparison between FFS and airplane with respect to time. Time histories recorded via a line printer are to be clearly identified for cross-plotting on the airplane data. Over-plots must not obscure the reference data.

h. The sponsor may elect to complete the QTG objective tests at the manufacturer's facility. Tests performed at this location must be conducted after assembly of the FFS has been essentially completed, the systems and sub-systems are functional and operate in an interactive manner, and prior to the initiation of disassembly for shipment. The sponsor must substantiate FFS performance at the sponsor's training facility by repeating a representative sampling of all the objective tests in the QTG and submitting these repeated test results to the NSPM. This sample must consist of at least one-third of the QTG objective tests. The QTG must be clearly annotated to indicate when and where each test was accomplished.

i. While the subjective tests are normally accomplished at the sponsor's training facility, the sponsor may elect to complete the subjective tests at the manufacturer's facility. Tests performed at this location will be conducted after assembly of the FFS has been essentially completed, the systems and sub-systems are functional and operate in an interactive manner, and prior to the initiation of disassembly for shipment. The sponsor must substantiate FFS performance at the sponsor's training facility by having the pilot(s) who performed these tests originally (or similarly qualified pilot(s)), repeat a representative sampling of these subjective tests (need not take more than one normal FFS period – e.g., 4 hours) and submit a statement to the NSPM that the FFS has not changed from the original determination. This statement must clearly indicate when and where these repeated tests were completed.

j. The sponsor must maintain a copy of the MQTG at the FFS location.

k. All FFS's for which the initial qualification is conducted after [insert 6 years after effective date of this rule] must have an electronic MQTG (eMQTG) including all objective data obtained from airplane testing, or another approved source (reformatted or digitized), together with correlating objective test results obtained from the performance of the FFS (reformatted or digitized) as prescribed in this appendix, the general FFS performance or demonstration results (reformatted or digitized) prescribed in this appendix, and a description of the equipment necessary to perform the evaluation for initial qualification and the continuing qualification evaluations for continuing qualification. This eMQTG must include the original validation data used to validate FFS performance and handling qualities in either the original digitized format from the data supplier or an electronic scan of the original time-history plots that were provided by the data supplier. An eMQTG must be provided to the NSPM.

l. All other FFS's (not covered in subparagraph "j") must have an electronic copy of the MQTG by and after [insert 6 years after effective date of this rule], a copy of which must be provided to the NSPM. This may be provided by an electronic scan presented in a Portable Document File (PDF), or similar format, acceptable to the NSPM.

End QPS Requirements

Begin Information

m. Only those FFS's that are sponsored by a certificate holder (as defined for use in part 60 and this QPS appendix) will be evaluated by the NSPM. However, other FFS evaluations may be conducted on a case-by-case basis as the Administrator deems appropriate, but only in accordance with applicable agreements.

n. Each FFS must be evaluated as completely as possible. To ensure a thorough and uniform evaluation, each FFS is subjected to the general simulator requirements and

performance demonstrations in attachment 1, the objective tests listed in attachment 2, and the subjective tests listed in attachment 3 of this appendix. The evaluation(s) described herein will include, but not necessarily be limited to the following, as appropriate, for the qualification level of the FFS:
(1) Airplane responses, including longitudinal and lateral-directional control responses (see attachment 2 of this appendix);
(2) Performance in authorized portions of the simulated airplane's operating envelope, to include tasks evaluated by the NSPM in the areas of ground operations, takeoff, climb, cruise, descent, approach, and landing as well as abnormal and emergency operations (see paragraph [check reference] and attachment 2 of this appendix);
(3) Control checks (see attachment 1 and attachment 2 of this appendix);
(4) Cockpit configuration (see attachment 1 of this appendix);
(5) Pilot, flight engineer, and instructor station functions checks (see attachment 1 and attachment 3 of this appendix);
(6) Airplane systems and sub-systems (as appropriate) as compared to the airplane simulated (see attachment 1 and attachment 3 of this appendix);
(7) FFS systems and sub-systems, including force cueing (motion), visual, and aural (sound) systems, as appropriate (see attachment 1 and attachment 2 of this appendix); and
(8) Certain additional requirements, depending upon the complexity of the FFS qualification level sought, including equipment or circumstances that may become hazardous to the occupants. The sponsor may be subject to Occupational Safety and Health Administration requirements.

o. The NSPM administers the objective and subjective tests, which includes an examination of functions. The tests include a qualitative assessment of the FFS by an NSP pilot. The NSP evaluation team leader may assign other qualified personnel to assist in accomplishing the functions examination and/or the objective and subjective tests performed during an evaluation when required.
(1) Objective tests provide a basis for measuring and evaluating FFS performance and determining compliance with the requirements of this part.
(2) Subjective tests provide a basis for:
  (a) Evaluating the capability of the FFS to perform over a typical utilization period;
  (b) Determining that the FFS satisfactorily simulates each required task;
  (c) Verifying correct operation of the FFS controls, instruments, and systems; and
  (d) Demonstrating compliance with the requirements of this part.

p. The tolerances for the test parameters listed in attachment 2 of this appendix are the maximum acceptable to the NSPM for FFS validation and are not to be confused with design tolerances specified for FFS manufacture. In making decisions regarding tests and test results, the NSPM relies on the use of operational and engineering judgment in the application of data (including consideration of the way in which the flight test was flown and way the data was gathered and applied) data presentations, and the applicable tolerances for each test.

q. In addition to the scheduled continuing qualification evaluation (see paragraph [check reference]), each FFS is subject to evaluations conducted by the NSPM at any time with no prior notification to the sponsor. Such evaluations would be accomplished in a normal manner (i.e., requiring exclusive use of the FFS for the conduct of objective and subjective tests and an examination of functions) if the FFS is not being used for flightcrew member training, testing, or checking. However, if the FFS were being used, the evaluation would be conducted in a non-exclusive manner. This non-exclusive evaluation will be conducted by the FFS evaluator accompanying the check airman, instructor, Aircrew Program Designee (APD), or FAA inspector aboard the FFS along with the student(s) and observing the operation of the FFS during the training, testing, or checking activities.

r. Problems with objective test results are handled according to the following:
(1) If a problem with an objective test result is detected by the NSP evaluation team during an evaluation, the test may be repeated and/or the QTG may be amended.
(2) If it is determined that the results of an objective test do not support the level requested but do support a lower level, the NSPM may qualify the FFS at that lower level. For example, if a Level D evaluation is requested and the FFS fails to meet sound test tolerances, it could be qualified at Level C.

s. After the NSPM issues a statement of qualification to the sponsor when a FFS is successfully evaluated, the FFS is recommended to the TPAA, who will exercise authority on behalf of the Administrator in approving the FFS in the appropriate airplane flight training program. It is the intent that the SOQ be issued at the satisfactory conclusion of the initial/continuing qualification; however, it is the responsibility of the sponsor to obtain TPAA approval prior to using the FSTD in any FAA-approved flight training program.

t. Under normal circumstances, the NSPM establishes a date for the initial or upgrade evaluation within ten (10) working days after determining that a complete QTG is acceptable. Unusual circumstances may warrant establishing an evaluation date before this determination is made; however, once a schedule is agreed to, any slippage of the evaluation date at the sponsor's request may result in a significant delay, perhaps 45 days or more, in rescheduling and completing the evaluation. A sponsor may commit to an initial evaluation date under this early process, in coordination with and the agreement of the NSPM, but the request must be in writing and must include an acknowledgment of the potential schedule impact if the sponsor slips the evaluation from this early-committed date. See Attachment 4, figure 5, Sample Request for Initial Evaluation Date.

u. The numbering system used for objective test results in the QTG should closely follow the numbering system set out in attachment 2, Simulator Objective Tests.

v. If additional information is needed regarding the preferred qualifications of pilots used to meet the requirements of §60.15(e), the reader should contact the NSPM or visit the NSPM website.

w. Examples of the exclusions for which the FFS might not have been subjectively tested by the sponsor or the NSPM and for which qualification might not be sought or granted, as described in §60.15(h)(6), include windshear training, circling approaches, etc.

End Information

12. Additional Qualifications for a Currently Qualified Simulator (§ 60.16).

Begin Information

There is no additional regulatory or informational material that applies to § 60.16, Additional Qualifications for a Currently Qualified FFS.

End Information

13. Previously Qualified Simulators (§ 60.17).

Begin QPS Requirements

a. In instances where a sponsor plans to remove a FFS from active status for prolonged periods, the following procedures will apply:

(1) The NSPM must be advised in writing and the advisement must include an estimate of the period that the FFS will be inactive;

(2) Continuing Qualification evaluations would not be scheduled during the inactive period;

(3) The NSPM will remove the FFS from the list of qualified FSTD's on a mutually established date not later than the date on which the first missed continuing qualification evaluation would have been scheduled;

(4) Before the FFS may be restored to qualified status, it will require an evaluation by the NSPM. The evaluation content and time required for accomplishment will be based on the number of continuing qualification evaluations and sponsor-conducted quarterly inspections missed during the period of inactivity. For example, if the FFS were out of service for a 1 year period, it would be necessary to complete the entire QTG, since all of the quarterly evaluations would have been missed;

(5) The sponsor must notify the NSPM of any changes to the original scheduled time out of service;

(6) The FFS will normally be re-qualified using the FAA-approved MQTG and the criteria that was in effect prior to its removal from qualification; however, inactive periods of 2 years or more will require a review of the qualification basis and will likely result in the re-qualification to be against the standards in effect and current at the time of re-qualification.

b. Simulators qualified prior to [insert the effective date], are not required to meet the general simulation requirements, the objective test requirements, and the subjective test requirements of attachments 1, 2, and 3, respectively, of this appendix.

c. Each visual scene/model added to a previously qualified simulator after [insert effective date of the rule] must meet the requirements of Table A3C of attachment 3 to this QPS appendix.

End QPS Requirements

Begin Information

d. Other certificate holders or persons desiring to use a FFS may contract with FFS sponsors to use those FFS's already qualified at a particular level for an airplane type and approved for use within an FAA-approved flight training program. Such FFS's are not required to undergo an additional qualification process, except as described in § 60.16.

e. Each FFS user must obtain approval from the appropriate TPAA to use any FFS in an FAA-approved flight training program.

f. The intent of the requirement listed in § 60.17(b), for each FFS to have a Statement of Qualification within 6 years, is to have the availability of that statement (including the configuration list and the limitations to authorizations) to provide a complete picture of the FFS inventory regulated by the FAA. The issuance of the statement will not require any additional evaluation or require any adjustment to the evaluation basis for the FFS.

g. Downgrading of a FFS is a permanent change in qualification level and will necessitate the issuance of a revised Statement of Qualification to reflect the revised qualification level, as appropriate. If a temporary restriction is placed on a FFS because of a missing, malfunctioning, or inoperative component or some repair is in progress, the restriction is not a permanent change in qualification level and such a temporary restriction can, and is, removed when the reason for the restriction has been resolved. It would be inappropriate to permanently downgrade a FFS and, at some undetermined time in the future, allow that FFS to be returned to its original status (i.e., accomplish an "upgrade") using the original qualification standards.

h. It is not the intent of the NSPM to discourage the improvement of existing simulation (e.g., the "updating" of a visual system to a newer model, or the replacement of the IOS with a more capable unit) by requiring the "updated" device to meet the qualification standards current at the time of the update. While the NSPM may require that the updated device be evaluated and may require that evaluation to include all or just some of the elements of an initial evaluation, depending on the extent of the update, the standards against which the device would be evaluated would be those that are found in the MQTG for that device.

End Information

---

14. Inspection, Continuing Qualification Evaluation, and Maintenance Requirements (§ 60.19).

Begin QPS Requirements

a. The sponsor must conduct a minimum of four evenly spaced inspections throughout the year. The objective test sequence and content of each inspection in this sequence will be developed by the sponsor and will be acceptable to the NSPM.

b. The description of what constitutes the functional preflight inspection will be contained in the sponsor's QMS.

(c) Record "functional preflight" in the FFS discrepancy log book or other acceptable location, including any item found to be missing, malfunctioning, or inoperative.

End QPS Requirements

Begin Information

d. In determining the acceptability of the sponsor's test sequence and the content of each quarterly inspection required in § 60.19(a)(1), the NSPM looks for a balance and a mix from the performance demonstrations and objective test requirement areas listed as follows:
(1) Performance.
(2) Handling qualities.
(3) Motion system (where appropriate).
(4) Visual system (where appropriate).
(5) Sound system (where appropriate).
(6) Other FFS systems.

e. If the NSP evaluator plans to accomplish specific tests during a normal continuing qualification evaluation that requires the use of special equipment or technicians, the sponsor will be notified as far in advance of the evaluation as practical; but not less than 72 hours. These tests, for example, include latencies, control dynamics, sounds and vibrations, motion, and/or some visual system tests.

f. The continuing qualification evaluations, described in § 60.19(b), normally will require 4 hours of FFS time. Flexibility is necessary to address those situations that are not normal or those that involve aircraft with additional levels of complexity (e.g. computer controlled aircraft) and may require additional time. The continuing qualification evaluations will consist of the following:
(1) Review of the results of the objective tests and all the designated FFS performance demonstrations (quarterly inspections) conducted by the sponsor since the last scheduled continuing qualification evaluation.
(2) At the discretion of the evaluator, a selection of approximately 8 to 15 objective tests from the MQTG, that will, in the opinion of the evaluator, provide an adequate opportunity to evaluate, first hand, the performance of the FFS. The tests chosen will be performed either automatically or manually, at the discretion of the evaluator and should be able to be conducted within approximately one-third (1/3) of the allotted FFS time.
(3) A subjective evaluation of the FFS to perform a representative sampling of the tasks set out in attachment 3 of this appendix, selected at the discretion of the evaluator. This portion of the evaluation should take approximately two-thirds (2/3) of the allotted FFS time.
(4) An examination of the functions of the FFS, to include, but not necessarily limited to, the motion system, visual system, sound system, instructor operating station, and the

normal functions and simulated malfunctions of the simulated airplane systems. This examination is normally accomplished simultaneously with the subjective evaluation requirements noted in subparagraph d(3).

g. The requirement established in § 60.19(b)(4) regarding the frequency of NSPM-conducted continuing qualification evaluations for each FFS is typically 12 months. However, the establishment and satisfactory operation of an approved quality management system for a sponsor will provide a basis for adjusting the interval between evaluations on some FFS's at a given sponsor's location to exceed this 12-month interval.

End Information

---

15. Logging Simulator Discrepancies (§ 60.20).

Begin Information

There is no additional regulatory or informational material that applies to § 60.20. Logging FFS Discrepancies.

End Information

---

16. Interim Qualification of Simulators for New Airplane Types or Models (§ 60.21).

Begin Information

There is no additional regulatory or informational material that applies to § 60.21, Interim Qualification of FFSs for New Airplane Types or Models.

End Information

---

17. Modifications to Simulators (§ 60.23).

Begin QPS Requirements

a. The notification described in § 60.23(c)(2) must include a complete description of the planned modification, with a description of the operational and engineering effect the proposed modification will have on the operation of the FFS and the results that are expected with the modification incorporated.

b. Prior to using the modified FFS:

(1) All the applicable objective tests that have been run with the modification incorporated, including any necessary updates to the MQTG must be acceptable to the NSPM; and

(2) The sponsor must provide the NSPM with a statement signed by the MR that the factors cited in § 60.15(b) are addressed by the appropriate personnel as described in that section.

End QPS Requirements

Begin Information

c. See Attachment 4 for a sample Index of Effective FSTD Directives.

End Information

18. Operation with Missing, Malfunctioning, or Inoperative Components (§ 60.25).

Begin Information

a. Once the sponsor fairly and accurately advises the user of a FFS's current status, including any missing, malfunctioning, or inoperative (MMI) component(s), the sponsor's responsibility with respect to § 60.25(a) will have been satisfied.

b. If the 29^{th} or 30^{th} day of the 30-day period described in § 60.25(b) is on a Saturday, a Sunday, or a holiday, the intent of the FAA is to automatically extend the deadline until the next business day.

c. In accordance with the authorization described in § 60.25(b), the NSPM may find as acceptable a discrepancy prioritizing system wherein the length of time authorized to repair or replace any given MMI component is based on the level of impact on the capability of the FFS to provide the required training, evaluation, or flight experience, with the larger impact on this capability associated with a higher priority for repair or replacement.

End Information

19. Automatic Loss of Qualification and Procedures for Restoration of Qualification (§ 60.27).

Begin Information

If the sponsor provides a plan for how the FFS is to be maintained during its out-of-service period (e.g., periodic exercise of mechanical, hydraulic, and electrical systems; routine replacement of hydraulic fluid; control of the environmental factors in which the FFS is to be maintained, etc.) there is a greater likelihood of being able to more fairly determine the amount of testing that would be required for re-qualification.

End Information

20. Other Losses of Qualification and Procedures for Restoration of Qualification (§ 60.29).

Begin Information

If the sponsor provides a plan for how the FFS is to be maintained during its out-of-service period (e.g., periodic exercise of mechanical, hydraulic, and electrical systems; routine replacement of hydraulic fluid; control of the environmental factors in which the

FFS is to be maintained, etc.) there is a greater likelihood of being able to more fairly determine the amount of testing that would be required for re-qualification.

End Information

---

21. Recordkeeping and Reporting (§ 60.31).

Begin QPS Requirements

a. The minimally acceptable record of programming changes, as described in § 60.31(a)(2), must consist of the name of the aircraft system software, aerodynamic model, or engine model change, the date of the change, a summary of the change, and the reason for the change.

b. If a coded form for record keeping is used, it must provide for the preservation and retrieval of information with appropriate security or controls to prevent the illegal or inappropriate alteration of such records after the fact.

End QPS Requirements

---

22. Applications, Logbooks, Reports, and Records: Fraud, Falsification, or Incorrect Statements (§ 60.33).

Begin Information

There are no additional QPS requirements or informational material that apply to § 60.33, Applications, Logbooks, Reports, and Records: Fraud, Falsification, or Incorrect Statements.

End Information

---

23. Specific Simulator Compliance Requirements (§ 60.35).

Begin Information

There are no additional QPS requirements or informational material that apply to § 60.35, Specific FFS Compliance Requirements.

End Information

---

24. [Reserved].

---

25. Simulator Qualification on the Basis of a Bilateral Aviation Safety Agreement (BASA) (§ 60.37).

Begin Information

There are no additional QPS requirements or informational material that apply to § 60.37, FFS Qualification on the Basis of a Bilateral Aviation Safety Agreement (BASA).

End Information

Attachment 1 to Appendix A to Part 60--
GENERAL SIMULATOR REQUIREMENTS

Begin QPS Requirements

1. Requirements.

a. Certain requirements included in this appendix must be supported with a Statement of Compliance and Capability (SOC) and/or, in some designated cases, an Objective Test. The SOC will describe how the requirement was met, such as gear modeling approach, coefficient of friction sources, etc. The test results must show that the requirement has been attained. Other requirements are satisfied by Subjective Tests. In the following tabular listing, requirements for SOCs and tests are indicated in the "General Simulator Requirements" column.

b. The requirements described in Table A1A are the minimum required for the indicated level of FFS. However, devices may include operational systems or functions in excess of the minimum required, but the NSPM will test those systems or functions in accordance with this appendix to ensure proper operation.

End QPS Requirements

Begin Information

2. Discussion.

a. This attachment describes the minimum general simulator requirements for qualifying airplane full flight simulators (FFS). To determine the complete requirements for a specific level simulator the objective tests in attachment 2 and the examination of functions and subjective tests listed in attachment 3 must also be consulted.

b. The material contained in this attachment is divided into the following categories:

(1) General cockpit configuration.

(2) Simulator programming.

(3) Equipment operation.

(4) Equipment and facilities for instructor/evaluator functions.

(5) Motion system.

(6) Visual system.

(7) Sound system.

c. Table A1A sets out, and provides an overview of, the General Simulator Requirements.

d. Table A1B sets out, and provides a reference for, the tasks for which the simulated airplane may be qualified, and provides a reference for the tasks that the sponsor-designated pilot will examine as part of his/her determination that the performance and handling qualities of the FSTD represents those of the airplane within the airplane's normal operating envelope.

e. Table A1C sets out, and provides a reference for, the tasks for which the simulator may be qualified, and provides a reference for the tasks that the sponsor will examine as part of the determination that control of the FSTD satisfactorily meets the demands made by flight crew training, testing, and experience requirements.

End Information

Table A1A

Minimum Simulator Requirements						
	<<< QPS Requirements >>>	Simulator Levels				< Information >
Number	General Simulator Requirements	A	B	C	D	Notes
1. General Cockpit Configuration.						
1.a.	The simulator must have a cockpit that is a full-scale replica of the airplane simulated with controls, equipment, observable cockpit indicators, circuit breakers, and bulkheads properly located, functionally accurate and replicating the airplane. The direction of movement of controls and switches must be identical to that in the airplane. Pilot seats must afford the capability for the occupant to be able to achieve the design "eye position" established for the airplane being simulated. Equipment for the operation of the cockpit windows must be included, but the actual windows need not be operable. Fire axes, extinguishers, spare light bulbs, etc., must be available in the flight simulator but may be relocated to a suitable location as near as practical to the original position. Fire axes, landing gear pins, and any similar purpose instruments need only be represented in silhouette. **An SOC is required.**	X	X	X	X	For simulator purposes, the cockpit consists of all that space forward of a cross section of the fuselage at the most extreme aft setting of the pilots' seats including additional, required flight crewmember duty stations and those required bulkheads aft of the pilot seats. For clarification, bulkheads containing only items such as landing gear pin storage compartments, fire axes or extinguishers, spare light bulbs, aircraft documents pouches etc., are not considered essential and may be omitted.
1.b.	Those circuit breakers that affect procedures and/or result in observable cockpit indications must be properly located and functionally accurate. **An SOC is required.**	X	X	X	X	
2. Programming.						
2.a.	A flight dynamics model that accounts for various combinations of drag and thrust normally encountered in flight must correspond to actual flight conditions, including the effect of change in airplane attitude, thrust, drag, altitude, temperature, gross weight, moments of inertia, center of gravity location, and configuration. **An SOC is required.**	X	X	X	X	

Table A1A

Minimum Simulator Requirements						
	<<< QPS Requirements >>>	Simulator Levels				< Information >
Number	General Simulator Requirements	A	B	C	D	Notes
2.b.	The simulator must have the computer capacity, accuracy, resolution, and dynamic response needed to meet the qualification level sought. **An SOC is required.**	X	X	X	X	
2.c.	Ground operations must be represented to the extent that allows turns within the confines of the runway and adequate controls on the landing and roll-out from a crosswind approach to a landing. **A subjective test is required.**	X				
2.d.	Ground handling and aerodynamic programming must include the following:					
2.d.1.	Ground effect.		X	X	X	Applicable areas include: roundout, flare, and touchdown and necessarily requires modeling of lift, drag, pitching moment, trim, and power while in ground effect.
2.d.2.	Ground reaction.		X	X	X	This necessarily requires modeling that accounts for strut deflections, tire friction, side forces, etc. and is the reaction of the airplane upon contact with the runway during landing, and may differ with changes in gross weight, airspeed, rate of descent on touchdown, etc.
2.d.3.	Ground handling characteristics, including aerodynamic and ground reaction modeling including steering inputs, operations with crosswind, braking, thrust reversing, deceleration, and turning radius.		X	X	X	

Table A1A

Minimum Simulator Requirements						
	<<< QPS Requirements >>>	Simulator Levels				< Information >
Number	General Simulator Requirements	A	B	C	D	Notes
2.e.	The simulator must employ windshear models that provide training for recognition of windshear phenomena and the execution of recovery procedures. Models must be available to the instructor/evaluator for the following critical phases of flight: 1. Prior to takeoff rotation. 2. At liftoff. 3. During initial climb. 4. On final approach, below 500 ft AGL. Objective tests are required for qualification; see Attachment 2 and Attachment 5 of this appendix. The QTG must reference the FAA Windshear Training Aid or present alternate airplane related data, including the implementation method(s) used. If the alternate method is selected, wind models from the Royal Aerospace Establishment (RAE), the Joint Airport Weather Studies (JAWS) Project and other recognized sources may be implemented, but must be supported and properly referenced in the QTG. Only those simulators meeting these requirements may be used to satisfy the training requirements of part 121 pertaining to a certificate holder's approved low-altitude windshear flight training program as described in §121.409.			X	X	If desired, Level A and B simulators may qualify for windshear training by meeting these standards; see Attachment 5 of this appendix. Windshear models may consist of independent variable winds in multiple simultaneous components. The FAA Windshear Training Aid presents one acceptable means of compliance with simulator wind model requirements.
2.f.	The simulator must provide for manual and automatic testing of simulator hardware and software programming to determine compliance with simulator objective tests as prescribed in Attachment 2. **An SOC is required.**			X	X	Automatic "flagging" of out-of-tolerance situations is encouraged.
2.g.	Relative responses of the motion system, visual system, and cockpit instruments, measured by latency tests or transport delay tests. Motion onset should occur before the start of the visual scene change (the start of the scan of the first video field containing different information) but must occur before the end of the scan of that video field. Instrument response may not occur prior to motion onset. Test results must be within the following limits:					The intent is to verify that the simulator provides instrument, motion, and visual cues that are, within the stated time delays, like the airplane responses. For airplane response, acceleration in the appropriate, corresponding rotational axis is preferred. .
2.g.1.	300 milliseconds of the airplane response. **Objective Tests are required.**	X	X			

Table A1A

Minimum Simulator Requirements						
	<<< QPS Requirements >>>	Simulator Levels				< Information >
Number	General Simulator Requirements	A	B	C	D	Notes
2.g.2.	150 milliseconds of the airplane response. **Objective Tests are required.**			X	X	
2.h.	The simulator must accurately reproduce the following runway conditions: (1) Dry; (2) Wet; (3) Icy; (4) Patchy Wet. (5) Patchy Icy. (6) Wet on Rubber Residue in Touchdown Zone. **An SOC is required.** **Objective tests are required** for dry, wet, and icy runway conditions; see Attachment 2. **Subjective tests are required** for patchy wet, patchy icy, and wet on rubber residue in touchdown zone conditions; see Attachment 3.			X	X	
2.i.	The simulator must simulate: (1) brake and tire failure dynamics (including antiskid failure); and (2) decreased brake efficiency due to high brake temperatures, if applicable. **An SOC is required.**			X	X	Simulator pitch, side loading, and directional control characteristics should be representative of the airplane.
2.j.	The simulator must replicate the effects of airframe and engine icing. **A subjective test is required.**			X	X	

Table A1A

Minimum Simulator Requirements						
	<<< QPS Requirements >>>	Simulator Levels				< Information >
Number	General Simulator Requirements	A	B	C	D	Notes
2.k.	The aerodynamic modeling in the simulator must include: (1) Low-altitude level-flight ground effect; (2) Mach effect at high altitude; (3) Normal and reverse dynamic thrust effect on control surfaces; (4) Aeroelastic representations; and (5) Nonlinearities due to sideslip. **An SOC is required** and must include references to computations of aeroelastic representations and of nonlinearities due to sideslip.			X	X	See Attachment 2, paragraph 4, for further information on ground effect.
2.l.	The simulator must have aerodynamic and ground reaction modeling for the effects of reverse thrust on directional control, if applicable. **An SOC is required.**		X	X	X	
2.m.	The simulator must provide for realistic mass properties, including gross weight, center of gravity, and moments of inertia as a function of payload and fuel loading **An SOC is required** and must include a range of tabulated target values to enable a subjective test of the mass properties model to be conducted from the instructor's station.	X	X	X	X	
3. Equipment Operation.						
3.a.	All relevant instrument indications involved in the simulation of the airplane must automatically respond to control movement or external disturbances to the simulated airplane; e.g., turbulence or windshear. Numerical values must be presented in the appropriate units. **A subjective test is required.**	X	X	X	X	
3.b.	Communications, navigation, caution, and warning equipment must be installed and operate within the tolerances applicable for the airplane being simulated. **A subjective test is required.**	X	X	X	X	See Attachment 3, paragraph 2d for further information regarding long-range navigation equipment.

Table A1A

Minimum Simulator Requirements						
	<<< QPS Requirements >>>	Simulator Levels				< Information >
Number	**General Simulator Requirements**	**A**	**B**	**C**	**D**	**Notes**
3.c.	Simulated airplane systems must operate as the airplane systems would operate under normal, abnormal, and emergency operating conditions on the ground and in flight. **A subjective test is required.**	X	X	X	X	
3.d.	The simulator must provide pilot controls with control forces and control travel that correspond to the simulated airplane. The simulator must also react in the same manner as in the airplane under the same flight conditions. **An objective test is required.**	X	X	X	X	
3.e.	Simulator control feel dynamics must replicate the airplane simulated. This must be determined by comparing a recording of the control feel dynamics of the simulator to airplane measurements. For initial and upgrade evaluations, the control dynamic characteristics must be measured at and recorded directly from the cockpit controls, and must be accomplished in takeoff, cruise, and landing flight conditions and configurations. **Objective tests are required.**			X	X	
4. Instructor / Evaluator Facilities.						
4.a.	In addition to the flight crew member stations, the simulator must have at least two suitable seats for the instructor/check airman and FAA inspector. These seats must provide adequate vision to the pilot's panel and forward windows. All seats other than flight crew seats need not represent those found in the airplane but must be adequately secured to the floor and equipped with similar positive restraint devices. **A subjective test is required.**	X	X	X	X	
4.b.	The simulator must have controls that enable the instructor/evaluator to control all required system variables and insert all abnormal or emergency conditions into the simulated airplane systems as described in the sponsor's FAA-approved training program; or as described in the relevant operating manual as appropriate. **A subjective test is required.**	X	X	X	X	

Table A1A

Minimum Simulator Requirements						
	<<< QPS Requirements >>>	Simulator Levels				< Information >
Number	General Simulator Requirements	A	B	C	D	Notes
4.c.	The simulator must have instructor controls for environmental conditions including wind speed and direction. **A subjective test is required.**	X	X	X	X	
4.d.	The simulator must provide the instructor or evaluator the ability to present ground and air hazards. **A subjective test is required.**			X	X	For example, another airplane crossing the active runway and converging airborne traffic; etc.
5. Motion System.						
5.a.	The simulator must have motion (force) cues perceptible to the pilot that are representative of the motion in an airplane. **A subjective test is required.**	X	X	X	X	For example, touchdown cues should be a function of the rate of descent (RoD) of the simulated airplane.
5.b.	The simulator must have a motion (force cueing) system with a minimum of three degrees of freedom (at least pitch, roll, and heave). **An SOC is required.**	X	X			
5.c.	The simulator must have a motion (force cueing) system that produces cues at least equivalent to those of a six-degrees-of-freedom, synergistic platform motion system (i.e., pitch, roll, yaw, heave, sway, and surge). **An SOC is required.**			X	X	
5.d.	The simulator must provide for the recording of the motion system response time. **An SOC is required.**	X	X	X	X	
5.e.	The simulator must provide motion effects programming to include the following:					

Table A1A

Minimum Simulator Requirements						
	<<< QPS Requirements >>>	Simulator Levels				< Information >
Number	General Simulator Requirements	A	B	C	D	Notes
	1. Thrust effect with brakes set. 2. Runway rumble, oleo deflections, effects of ground speed, uneven runway, centerline lights, and taxiway characteristics. 3. Buffets on the ground due to spoiler/speedbrake extension and thrust reversal. 4. Bumps associated with the landing gear. 5. Buffet during extension and retraction of landing gear. 6. Buffet in the air due to flap and spoiler/speedbrake extension. 7. Approach-to-Stall buffet. 8. Representative touchdown cues for main and nose gear. 9. Nosewheel scuffing, if applicable. 10. Mach and maneuver buffet. **A subjective test is required for each.**		X	X	X	
	11. Tire failure dynamics. 12. Engine malfunction and engine damage. 13. Airframe (e.g., tail, flap, engine pod) ground strike. **A subjective test is required for each.**			X	X	
5.f.	The simulator must provide characteristic motion vibrations that result from operation of the airplane, in so far as vibration marks an event or airplane state, which can be sensed in the cockpit. **A subjective test is required.**				X	The simulator should be programmed and instrumented in such a manner that the characteristic buffet modes can be measured and compared to airplane data.
6. Visual System.						
6.a.	The simulator must have a visual system providing an out-of-the-cockpit view. **A subjective test is required.**	X	X	X	X	

Table A1A

Minimum Simulator Requirements						
	<<< QPS Requirements >>>	Simulator Levels				< Information >
Number	General Simulator Requirements	A	B	C	D	Notes
6.b.	The simulator must provide a continuous minimum collimated field of view of 45° horizontally and 30° vertically per pilot seat. Both pilot seat visual systems must be operable simultaneously. **An SOC is required.**	X	X			
6.c.	The simulator must provide a continuous minimum collimated visual field of view of 75° horizontally and 30° vertically per pilot seat. Both pilot seat visual systems must be operable simultaneously. Wide-angle systems providing cross-cockpit viewing (for both pilots simultaneously) must provide a minimum field of view of 150° horizontally. **An SOC is required.**			X	X	Optimization of the vertical field of view may be considered with respect to the specific airplane cockpit cut-off angle.
6.d.	The simulator must provide a continuous minimum collimated visual field of view of 180° horizontally and 40° vertically. **An SOC is required.** **An objective test is required.**				X	Optimization of the vertical field of view may be considered with respect to the specific airplane cockpit cut-off angle.
6.e.	The visual system must be free from optical discontinuities and artifacts that create non-realistic cues. **A subjective test is required.**	X	X	X	X	Non-realistic cues might include image "swimming" and image "roll-off," that may lead a pilot to make incorrect assessments of speed, acceleration and/or situational awareness.
6.f.	The simulator must have operational landing lights for night scenes. Where used, dusk (or twilight) scenes require operational landing lights. **A subjective test is required.**	X	X	X	X	

Table A1A

Minimum Simulator Requirements						
	<<< QPS Requirements >>>	Simulator Levels				< Information >
Number	General Simulator Requirements	A	B	C	D	Notes
6.g.	The simulator must have instructor controls for the following: 1. Visibility in statute miles (km) and runway visual range (RVR) in ft. (m). 2. Airport selection. 3. Airport lighting. **A subjective test is required.**	X	X	X	X	
6.h.	Each airport scene displayed must include the following: 1. Airport runways and taxiways. 2. Runway definition: a. Runway surface and markings. b. Lighting for the runway in use, including runway threshold, edge, centerline, touchdown zone, VASI (or PAPI), and approach lighting of appropriate colors, as appropriate. c. Taxiway lights. **A subjective test is required.**	X	X	X	X	
6.i.	The distances at which runway features are visible, as measured from runway threshold to an airplane aligned with the runway on an extended 3° glide slope must not be less than listed below: 1. Runway definition, strobe lights, approach lights, runway edge white lights and Visual Approach Slope Indicator (VASI) or Precision Approach Path Indicator (PAPI) system lights from 5 statute miles (8 kilometers (km)) of the runway threshold. 2. Runway centerline lights and taxiway definition from 3 statute miles (4.8 km). 3. Threshold lights and touchdown zone lights from 2 statute miles (3.2 km). 4. Runway markings within range of landing lights for night scenes and as required by three (3) arc-minutes resolution on day scenes. **A subjective test is required.**	X	X	X	X	

Table A1A

Minimum Simulator Requirements						
	<<< QPS Requirements >>>	Simulator Levels				< Information >
Number	General Simulator Requirements	A	B	C	D	Notes
6.j.	The simulator must provide visual system compatibility with dynamic response programming. **A subjective test is required.**	X	X	X	X	
6.k.	The simulator must show that the segment of the ground visible from the simulator cockpit is the same as from the airplane cockpit (within established tolerances) when at the correct airspeed, in the landing configuration, at a main wheel height of 100 feet (30 meters) above the touchdown zone, and with visibility of 1,200 ft (350 m) RVR. **An SOC is required.** **An objective test is required.**	X	X	X	X	This will show the modeling accuracy of RVR, glideslope, and localizer for a given weight, configuration, and speed within the airplane's operational envelope for a normal approach and landing.
6.l.	The simulator must provide visual cues necessary to assess sink rates (provide depth perception) during takeoffs and landings, to include: 1. Surface on runways, taxiways, and ramps. 2. Terrain features. **A subjective test is required.**		X	X	X	
6.m.	The simulator must provide for accurate portrayal of the visual environment relating to the simulator attitude. **A subjective test is required.**	X	X	X	X	
6.n	The simulator must provide for quick confirmation of visual system color, RVR, focus, and intensity. **An SOC is required.** **A subjective test is required.**			X	X	

Table A1A

Minimum Simulator Requirements						
	<<< QPS Requirements >>>	Simulator Levels				< Information >
Number	General Simulator Requirements	A	B	C	D	Notes
6.o.	The simulator must provide a minimum of three airport scenes including the following: 1. Surfaces on runways, taxiways, and ramps. 2. Lighting of appropriate color for all runways, including runway threshold, edge, centerline, VASI (or PAPI), and approach lighting for the runway in use. 3. Airport taxiway lighting. 4. Ramps and buildings that correspond to the sponsor's Line Oriented scenarios, as appropriate. **A subjective test is required.**			X	X	
6.p.	The simulator must be capable of producing at least 10 levels of occulting. **A subjective test is required.**			X	X	
6.q.	Night Visual Scenes. When used in training, testing, or checking activities, the simulator must provide night visual scenes with sufficient scene content to recognize the airport, the terrain, and major landmarks around the airport. The scene content must allow a pilot to successfully accomplish a visual landing. Night scenes, as a minimum, must provide presentations of sufficient surfaces with appropriate textural cues that include self-illuminated objects such as road networks, ramp lighting, and airport signage, to conduct a visual approach, a landing, and airport movement (taxi). Scenes must include a definable horizon and typical terrain characteristics such as fields, roads and bodies of water and surfaces illuminated by airplane landing lights.	X	X	X	X	

Table A1A						
Minimum Simulator Requirements						
	<<< QPS Requirements >>>	Simulator Levels				< Information >
Number	**General Simulator Requirements**	**A**	**B**	**C**	**D**	**Notes**
6.r.	Night and Dusk (Twilight) Visual Scenes. When used in training, testing, or checking activities, the simulator must provide night and dusk (or twilight) visual scenes with sufficient scene content to recognize the airport, the terrain, and major landmarks around the airport. The scene content must allow a pilot to successfully accomplish a visual landing. Dusk (or twilight) scenes, as a minimum, must provide full color presentations of reduced ambient intensity, sufficient surfaces with appropriate textural cues that include self-illuminated objects such as road networks, ramp lighting and airport signage, to conduct a visual approach, landing and airport movement (taxi). Scenes must include a definable horizon and typical terrain characteristics such as fields, roads and bodies of water and surfaces illuminated by representative aircraft lighting (e.g. landing lights). If provided, directional horizon lighting must have correct orientation and be consistent with surface shading effects. Total scene content must be comparable in detail to that produced by 10,000 visible textured surfaces and 15,000 visible lights with sufficient system capacity to display 16 simultaneously moving objects. **An SOC is required.**			**X**	**X**	

Table A1A

Minimum Simulator Requirements						
	<<< QPS Requirements >>>	Simulator Levels				< Information >
Number	General Simulator Requirements	A	B	C	D	Notes
6.s.	Night, Dusk (Twilight), and Daylight Visual Scenes. The simulator must have night, dusk (twilight), and daylight visual scenes with sufficient scene content to recognize the airport, the terrain, and major landmarks around the airport. The scene content must allow a pilot to successfully accomplish a visual landing. Any ambient lighting must not "washout" the displayed visual scene. Total scene content must be comparable in detail to that produced by 10,000 visible textured surfaces and 6,000 visible lights with sufficient system capacity to display 16 simultaneously moving objects. The visual display must be free of apparent quantization and other distracting visual effects while the simulator is in motion. NOTE: These requirements are applicable to any level of simulator equipped with a daylight visual system. **An SOC is required.** **A subjective test is required.** **Objective tests are required for Daylight.**				X	
6.t.	The simulator must provide operational visual scenes that portray physical relationships known to cause landing illusions to pilots. **A subjective test is required.**				X	For example: short runways, landing approaches over water, uphill or downhill runways, rising terrain on the approach path, unique topographic features, etc.
6.u.	The simulator must provide special weather representations of light, medium, and heavy precipitation near a thunderstorm on takeoff and during approach and landing. Representations need only be presented at and below an altitude of 2,000 ft. (610 m) above the airport surface and within 10 miles (16 km) of the airport. **A subjective test is required.**				X	
6.v.	The simulator must present visual scenes of wet and snow-covered runways, including runway lighting reflections for wet conditions, partially obscured lights for snow conditions, or suitable alternative effects. **A subjective test is required.**				X	

Table A1A

Minimum Simulator Requirements						
	<<< QPS Requirements >>>	Simulator Levels				< Information >
Number	**General Simulator Requirements**	**A**	**B**	**C**	**D**	**Notes**
6.w.	The simulator must present realistic color and directionality of all airport lighting. **A subjective test is required.**				X	
7. Sound System.						
7.a.	The simulator must provide cockpit sounds that result from pilot actions that correspond to those that occur in the airplane.	X	X	X	X	
7.b.	Volume control, if installed, must have an indication of the sound level setting.	X	X	X	X	
7.c.	The simulator must accurately simulate the sound of precipitation, windshield wipers, and other significant airplane noises perceptible to the pilot during normal and abnormal operations, and include the sound of a crash (when the simulator is landed in an unusual attitude or in excess of the structural gear limitations); normal engine and thrust reversal sounds; and the sounds of flap, gear, and spoiler extension and retraction. **An SOC is required.** **A subjective test is required.**			X	X	
7.d.	The simulator must provide realistic amplitude and frequency of cockpit noises and sounds. Simulator performance must be recorded, compared to amplitude and frequency of the same sounds recorded in the airplane, and made a part of the QTG. **Objective tests are required.**				X	

Table A1B

Table of Tasks vs. Simulator Level						
<<< QPS Requirements >>>						<< Information >>
Number	**Subjective Requirements** In order to be qualified at the simulator qualification level indicated, the simulator must be able to perform at least the tasks associated with that level of qualification.	Simulator Levels				Notes
		A	B	C	D	
1. Preflight Procedures.						
1.a.	Preflight Inspection (Cockpit Only)	X	X	X	X	
1.b.	Engine Start	X	X	X	X	
1.c.	Taxiing			X	X	
1.d.	Pre-takeoff Checks	X	X	X	X	
2. Takeoff and Departure Phase.						
2.a.	Normal and Crosswind Takeoff			X	X	
2.b.	Instrument Takeoff	X	X	X	X	
2.c.	Engine Failure During Takeoff	A	X	X	X	
2.d.	Rejected Takeoff	X	X	X	X	
2.e.	Departure Procedure	X	X	X	X	
3. Inflight Maneuvers.						
3.a.	Steep Turns	X	X	X	X	
3.b.	Approaches to Stalls	X	X	X	X	
3.c.	Engine Failure—Multiengine Airplane	X	X	X	X	
3.d.	Engine Failure—Single-Engine Airplane	X	X	X	X	
3.e.	Specific Flight Characteristics	>	>	>	>	Level of device as determined by the airplane Flight Standardization Board (FSB).
3.f.	Recovery From Unusual Attitudes	X	X	X	X	Within the normal flight envelope supported by applicable data.
4. Instrument Procedures.						
4.a.	Standard Terminal Arrival / Flight Management System Arrivals Procedures	X	X	X	X	
4.b.	Holding	X	X	X	X	
4.c.	Precision Instrument					
4.c.1.	All engines operating.	X	X	X	X	e.g., Autopilot, Manual (Flt. Dir. Assisted), Manual (Raw Data)
4.c.2.	One engine inoperative.	X	X	X	X	e.g., Manual (Flt. Dir. Assisted), Manual (Raw Data)

Table A1B

Table of Tasks vs. Simulator Level						
<<< QPS Requirements >>>						<< Information >>
Number	**Subjective Requirements** In order to be qualified at the simulator qualification level indicated, the simulator must be able to perform at least the tasks associated with that level of qualification.	Simulator Levels				Notes
		A	B	C	D	
4.d.	d. Non-precision Instrument Approach	X	X	X	X	e.g., NDB, VOR, VOR/DME, VOR/TAC, RNAV, LOC, LOC/BC, ADF, SDF, etc.
4.e.	e. Circling Approach	X	X	X	X	Specific authorization required.
4.f.	Missed Approach					
4.f.1.	Normal.	X	X	X	X	
4.f.2.	One engine Inoperative.	X	X	X	X	
5. Landings and Approaches to Landings.						
5.a.	Normal and Crosswind Approaches and Landings			X	X	
5.b.	Landing From a Precision / Non-Precision Approach			X	X	
5.c.	Approach and Landing with (Simulated) Engine Failure – Multiengine Airplane			X	X	
5.d.	Landing From Circling Approach			X	X	
5.e.	Rejected Landing	X	X	X	X	
5.f.	Landing From a No Flap or a Nonstandard Flap Configuration Approach			X	X	
6. Normal and Abnormal Procedures.						
6.a.	Engine (including shutdown & restart)	X	X	X	X	
6.b.	Fuel System	X	X	X	X	
6.c.	Electrical System	X	X	X	X	
6.d.	Hydraulic System	X	X	X	X	
6.e.	Environmental and Pressurization Systems	X	X	X	X	
6.f.	Fire Detection and Extinguisher Systems	X	X	X	X	
6.g.	Navigation and Avionics Systems	X	X	X	X	
6.h.	Automatic Flight Control System, Electronic Flight Instrument System, and Related Subsystems	X	X	X	X	
6.i.	Flight Control Systems	X	X	X	X	
6.j.	Anti-ice and Deice Systems	X	X	X	X	
6.k.	Aircraft and Personal Emergency Equipment	X	X	X	X	
7. Emergency Procedures.						
7.a.	Emergency Descent (Max. Rate)	X	X	X	X	

Table A1B

Table of Tasks vs. Simulator Level						
<<< QPS Requirements >>>						<< Information >>
Number	Subjective Requirements In order to be qualified at the simulator qualification level indicated, the simulator must be able to perform at least the tasks associated with that level of qualification.	Simulator Levels				Notes
		A	B	C	D	
7.b.	Inflight Fire and Smoke Removal	X	X	X	X	
7.c.	Rapid Decompression	X	X	X	X	
7.d.	**Emergency Evacuation**	X	X	X	X	
8. Postflight Procedures.						
8.a.	After-Landing Procedures	X	X	X	X	
8.b.	Parking and Securing	X	X	X	X	

Table A.1.C.

Table of Simulator System Tasks						
<<< QPS Requirements >>>						<< Information >>
Number	**Subjective Requirements** In order to be qualified at the simulator qualification level indicated, the simulator must be able to perform at least the tasks associated with that level of qualification.	Simulator Levels				Notes
		A	B	C	D	
1. Instructor Operating Station (IOS), as appropriate.						
1.a.	Power switch(es).	X	X	X	X	
1.b.	Airplane conditions.	X	X	X	X	e.g., GW, CG, Fuel loading, Systems, Ground. Crew
1.c.	Airports / Runways.	X	X	X	X	e.g., Selection, Surface, Presets, Lighting controls.
1.d.	Environmental controls.	X	X	X	X	e.g., Clouds, Visibility, RVR, Temp, Wind, Ice, Snow, Rain, Windshear, etc.
1.e.	Airplane system malfunctions (Insertion / deletion)	X	X	X	X	
1.f.	Locks, Freezes, and Repositioning.	X	X	X	X	
2. Sound Controls.						
2.a.	On / off / adjustment	X	X	X	X	
3. Motion / Control Loading System.						
3.a.	On / off / emergency stop, Crosstalk, Smoothness	X	X	X	X	
4. Observer Seats / Stations.						
4.a.	Position / Adjustment / Positive restraint system.	X	X	X	X	

Attachment 2 to Appendix A to Part 60

FULL FLIGHT SIMULATOR (FFS) OBJECTIVE EVALUATION

Table of Contents

Begin QPS Requirements

1. Test Requirements

a. The ground and flight tests required for qualification are listed in Table A2A, FFS Objective Tests. Computer generated simulator test results must be provided for each test except where specifically authorized an alternate means by the NSPM. If a flight condition or operating condition is required for the test but which does not apply to the airplane being simulated or to the qualification level sought, it may be disregarded (for example: an engine out missed approach for a single-engine airplane; a maneuver using reverse thrust for an airplane without reverse thrust capability; a landing test for a Level A simulator; etc.). Each test result is compared against the validation data described in § 60.13, and in Appendix A, paragraph 9. Although use of a driver program designed to automatically accomplish the tests is encouraged for all simulators and required for Level C and Level D simulators, it must be possible to conduct each test manually while recording all appropriate parameters. The results must be produced on an appropriate recording device acceptable to the NSPM and must include simulator number, date, time, conditions, tolerances, and appropriate dependent variables portrayed in comparison to the validation data. Time histories are required unless otherwise indicated in Table A2A. All results must be labeled using the tolerances and units given.

b. For the purposes of this attachment, the flight conditions specified in the Flight Conditions Column of Table A2A, are defined as follows:

(1) Ground – on ground, independent of airplane configuration;
(2) Take-off – gear down with flaps/slats in any certified takeoff position;
(3) First segment climb – gear down with flaps/slats in any certified takeoff position (normally not above 50 ft AGL);
(4) Second segment climb – gear up with flaps/slats in any certified takeoff position (normally between 50 ft and 400 ft AGL);
(5) Clean – flaps/slats retracted and gear up;
(6) Cruise – clean configuration at cruise altitude and airspeed;
(7) Approach – gear up or down with flaps/slats at any normal approach position as recommended by the airplane manufacturer; and
(8) Landing – gear down with flaps/slats in any certified landing position.

c. Table A2A in this attachment sets out the test results required, including the parameters, tolerances, and flight conditions for simulator validation. Tolerances are provided for the listed tests because mathematical modeling and acquisition/development of reference data are often inexact. All tolerances listed in the following tables are applied to simulator performance. When two tolerance values are given for a parameter, the less restrictive may be used unless otherwise indicated.

d. Certain tests included in this attachment must be supported with a Statement of Compliance and Capability (SOC). In Table A2A, requirements for SOC's are indicated in the "Test Details" column.

e. When operational or engineering judgment is used in making assessments for flight test data applications for simulator validity, such judgment must not be limited to a single parameter. For example, data that exhibit rapid variations of the measured parameters may require interpolations or a "best fit" data selection. All relevant parameters related to a given maneuver or flight condition must be provided to allow overall interpretation. When it is difficult or impossible to match simulator to airplane data throughout a time history, differences must be justified by providing a comparison of other related variables for the condition being assessed.

f. Unless noted otherwise, simulator tests must represent airplane performance and handling qualities at operating weights and centers of gravity (CG) typical of normal operation. If a test is supported by airplane data at one extreme weight or CG, another test supported by airplane data at mid-conditions or as close as possible to the other extreme must be included, except as may be authorized by the NSPM. Tests of handling qualities must include validation of augmentation devices.

g. When comparing the parameters listed to those of the airplane, sufficient data must also be provided to verify the correct flight condition and airplane configuration changes. For example: to show that control force is within ±5 pounds (2.2 daN) in a static stability test, data to show the correct airspeed, power, thrust or torque, airplane configuration, altitude, and other appropriate datum identification parameters must also be given. If comparing short period dynamics, normal acceleration may be used to establish a match to the airplane, but airspeed, altitude, control input, airplane configuration, and other appropriate data must also be given. If comparing landing gear change dynamics, pitch, airspeed, and altitude may be used to establish a match to the airplane, but landing gear position must also be provided. All airspeed values must be clearly annotated as to indicated, calibrated, etc., and like values used for comparison.

h. The QTG provided by the sponsor must describe clearly and distinctly how the simulator will be set up and operated for each test. Overall integrated testing of the simulator must be accomplished to assure that the total simulator system meets the prescribed standards; i.e., it is not acceptable to test only each simulator subsystem independently. A manual test procedure with explicit and detailed steps for completion of each test must also be provided.

i. In those cases where the objective test results authorize a "snapshot test" or a "series of snapshot tests" results in lieu of a time-history result, the sponsor or other data provider must ensure that a steady state condition exists at the instant of time captured by the "snapshot."

j. For previously qualified simulators, the tests and tolerances of this attachment may be used in subsequent continuing qualification evaluations for any given test providing the sponsor has submitted a proposed MQTG revision to the NSPM and has received NSPM approval.

k. Simulators are evaluated and qualified with an engine model simulating the airplane data supplier's flight test engine. For qualification of alternative engine models (either variations of the flight test engines or other manufacturer's engines) additional tests with the alternative engine models may be required. See Paragraph 12 of this Attachment for acceptance guidelines for alternate engines.

l. For testing Computer Controlled Airplane (CCA) simulators, or other highly augmented airplane simulators, flight test data may be required for the Normal (N) and/or Non-normal (NN) control states, as indicated in this attachment. Where test results are independent of control state, Normal or Non-normal control data may be used. All tests in Table A2A require test results in the Normal control state unless specifically noted otherwise in the Test Details section following the CCA designation. Tests for other levels of control state degradation may be required as detailed by the NSPM at the time of definition of a set of specific airplane tests for simulator data. Where Non-normal control states are required, test data must be provided for one or more Non-normal control states, and must include the least augmented state. Where applicable, flight test data must record Normal and Non-normal states for:
(1) Pilot controller deflections or electronically generated inputs, including location of input; and
(2) Flight control surface positions unless test results are not affected by, or are independent of, surface positions.

m. For airplanes using airplane hardware (e.g., "side stick controller") in the simulator cockpit, some tests will not be required as noted in Section 2 "Handling Qualities" in Table A2A of this attachment. However, in these cases the sponsor must supply a statement that the airplane hardware meets and will continue to meet the appropriate manufacturer's specifications and the sponsor must have supporting information to that fact available for NSPM review.

End QPS Requirements

Begin Information

n. The format for numbering the objective tests in Appendix A, Attachment 2, Table A2A, and the objective tests in Appendix B, Attachment 2, Table B2A, is identical. However, each test required for FFS's is not necessarily required for FTD's. Also, each test required for FTD's is not necessarily required for FSS's. Therefore, when a test number (or series of numbers) is not required, the term "Reserved" is used in the table at that location. Following this numbering format provides a degree of commonality between the two tables and substantially reduces the potential for confusion when referring to objective test numbers for either FFS's or FTD's.

o. In those cases where the objective test results authorize a "snapshot test" or a "series of snapshot tests" results in lieu of a time-history result, the sponsor or other data provider must ensure that a steady state condition exists at the instant of time captured by the "snapshot." This is often verified by showing that a steady state condition existed from some period prior to, through some period following, the snap shot. The time period most frequently used is from 5 seconds prior to, through 2 seconds following, the instant of time captured by the snap shot.

p. The reader is encouraged to review the Airplane Flight Simulator Evaluation Handbook, Volumes I and II, published hy the Royal Aeronautical Society, London, UK, and FAA Advisory Circulars (AC) 25-7, as may be amended, Flight Test Guide for Certification of Transport Category Airplanes, and (AC) 23-8, as may be amended, Flight Test Guide for Certification of Part 23 Airplanes, for references and examples regarding flight testing requirements and techniques.

Table A2A

Full Flight Simulator (FFS) Objective Tests									
<<< QPS Requirements >>>									< Information >
Test		Tolerance(s)	Flight Condition	Test Details	Simulator Level				Notes
Number	Title				A	B	C	D	
1. Performance.									
1.a.	**Taxi.**								
1.a.1.	Minimum Radius Turn.	±3 ft (0.9m) or 20% of airplane turn radius.	Ground.	Record both main and nose gear turning radius. This test is to be accomplished without the use of brakes and only minimum thrust, except for airplanes requiring asymmetric thrust or braking to turn.		X	X	X	
1.a.2.	Rate of Turn vs. Nosewheel Steering Angle.	±10% or ±2°/sec turn rate.	Ground.	Record a minimum of two speeds, greater than minimum turning radius speed, with a spread of at least 5 knots.		X	X	X	
1.b.	**Takeoff.**								All commonly used takeoff flap settings should be demonstrated at least once in the tests for minimum unstick (1.b.3.), normal takeoff (1.b.4.), critical engine failure on takeoff (1.b.5.), or crosswind takeoff (1.b.6.).
1.b.1.	Ground Acceleration Time and Distance.	±5% time and distance or ±5% time and ±200 ft (61 m) of distance.	Takeoff.	Record acceleration time and distance for a minimum of 80% of the time from brake release to V_R. Preliminary aircraft certification data may be used.	X	X	X	X	May be combined with normal take-off (1.b.4.) or rejected take-off (1.b.7.). Plotted data should be shown using appropriate scales for each portion of the maneuver.
1.b.2.	Minimum Control Speed - Ground	±25% of maximum	Takeoff.	Engine failure speed must be within ±1 knot of airplane engine	X	X	X	X	If a V_{mcg} test is not available, an

Table A2A

Full Flight Simulator (FFS) Objective Tests									
<<< QPS Requirements >>>									< Information >
Test Number	Test Title	Tolerance(s)	Flight Condition	Test Details	Simulator Level A	B	C	D	Notes
	(V_{mcg}) using aerodynamic controls only (per applicable Airworthiness Standard) or Low Speed, Engine Inoperative Ground Control Characteristics.	airplane lateral deviation or ±5 ft (1.5 m). Additionally, for those simulators of airplanes with reversible flight control systems: ±10% or ± 5 lb (2.2 daN) rudder pedal force.		failure speed. Engine thrust decay must be that resulting from the mathematical model for the engine variant applicable to the simulator under test. If the modeled engine is not the same as the airplane manufacturer's flight test engine, a further test may be run with the same initial conditions using the thrust from the flight test data as the driving parameter.					acceptable alternative is a flight test snap engine deceleration to idle at a speed between V_1 and V_1 –10 knots, followed by control of heading using aerodynamic control only. Recovery should be achieved with the main gear on the ground. To ensure only aerodynamic control is used, nosewheel steering should be disabled (i.e., castered) or the nosewheel held slightly off the ground.
1.b.3.	Minimum Unstick Speed (V_{mu}) or equivalent test to demonstrate early rotation takeoff characteristics.	±3 kt airspeed. ±1.5° pitch angle.	Takeoff.	Record main landing gear strut compression or equivalent air/ground signal. Record from 10 kt before start of rotation until at least 5 seconds after the occurrence of main gear lift-off.	X	X	X	X	V_{mu} is defined as the minimum speed at which the last main landing gear leaves the ground. Main landing gear strut compression or equivalent air/ground signal should be recorded. If a V_{mu} test is not available, alternative acceptable flight tests are a constant high-attitude take-off run through

Table A2A

Full Flight Simulator (FFS) Objective Tests									
<<< QPS Requirements >>>									< Information >
Test		Tolerance(s)	Flight Condition	Test Details	Simulator Level				Notes
Number	Title				A	B	C	D	
									main gear lift-off or an early rotation take-off.
1.b.4.	Normal Takeoff.	±3 kt airspeed, ±1.5° pitch angle, ±1.5° angle of attack ±20 ft (6 m) height. Additionally, for those simulators of airplanes with reversible flight control systems: ±10% or ± 5 lb (2.2 daN).stick/column force.	Takeoff.	Data are required for near maximum certificated take-off gross weight at a mid-range center of gravity and light take-off gross weight at an aft center of gravity. If the airplane has more than one certificated takeoff configuration, a different configuration should be used for each gross weight. Record takeoff profile from brake release to at least 200 ft (61 m) above ground level (AGL).	X	X	X	X	This test may be used for ground acceleration time and distance (1.b.1.). Plotted data should be shown nsing appropriate scales for each portion of the maneuver.
1.b.5.	Critical Engine Failure on Takeoff.	±3 kt airspeed, ±1.5° pitch angle, ±1.5° angle of attack, ±20 ft (6 m) height, ±3° heading angle, ±2° bank angle ±2° sideslip angle. Additionally, for those simulators of airplanes with reversible flight control systems: ±10% or ±5 lb (2.2 daN)) stick/column force, ±10% or 3 lb (±1.3 daN) wheel force ±10% or ±5 lb (2.2 daN) rudder pedal force.	Takeoff.	Record takeoff profile at near maximum takeoff weight from prior to engine failure to at least 200 ft (61 m) AGL. Engine failure speed must be within ±3 Kt of airplane data.	X	X	X	X	
1.b.6.	Crosswind	±3 kt airspeed,	Takeoff.	Record takeoff profile from brake	X	X	X	X	

Table A2A

Full Flight Simulator (FFS) Objective Tests									
<<< QPS Requirements >>>									< Information >
Test		Tolerance(s)	Flight Condition	Test Details	Simulator Level				Notes
Number	Title				A	B	C	D	
	Takeoff.	±1.5° pitch angle, ±1.5° angle of attack, ±20 ft (6 m) height, ±2° bank angle ±2° sideslip angle, ±3° heading angle. Correct trend at groundspeeds below 40 kt for rudder/pedal and heading. Additionally, for those simulators of airplanes with reversible flight control systems: ±10% or ±5 lb (2.2 daN) stick/column force, ±10% or ±3 lb (1.3daN) wheel force, ±10% or ±5 lb (2.2 daN) rudder pedal force.		release to at least 200 ft (61 m) AGL. Requires test data, including information on wind profile, for a crosswind component of at least 60% of the maximum described in the FAA approved Airplane Flight Manual (AFM), as measured at 33 ft (10 m) above the runway.					
1.b.7.	Rejected Takeoff.	±5% time or ±1.5 sec, ±7.5% distance or ±250 ft (±76 m).	Takeoff	Record time and distance from brake application to full stop. Speed for reject must be at least 80% of V_1. The airplane must be at or near the maximum takeoff gross weight. Use maximum braking effort, auto or manual.	X	X	X	X	Autobrakes will be used where applicable.
1.b.8.	Dynamic Engine Failure After Takeoff.	±20% or ±2°/sec body angular rates.	Takeoff.	Engine failure speed must be within ±3 kt of airplane data. Record Hands Off from 5 seconds before to at least 5 seconds after engine failure or 30° Bank, whichever occurs first. Engine			X	X	For safety considerations, airplane flight test may be performed out of ground effect at a safe altitude, but with

Table A2A

Test Number	Test Title	Tolerance(s)	Flight Condition	Test Details	Simulator Level A	B	C	D	Notes
Full Flight Simulator (FFS) Objective Tests									
<<< QPS Requirements >>>									< Information >
				failure may be a snap deceleration to idle. (CCA: Test in Normal and Non-normal control state.)					correct airplane configuration and airspeed.
1.c.	**Climb.**								
1.c.1.	Normal Climb all engines operating.	±3 kt airspeed, ±5% or ±100 ft/min (0.5 m/sec) climb rate.	Clean.	Flight test data is preferred, however, airplane performance manual datais an acceptable alternative. Record at nominal climb speed and mid-initial climb altitude. Flight simulator performance must be recorded over an interval of at least 1,000 ft (300 m).	X	X	X	X	
1.c.2.	One engine Inoperative Climb.	±3 kt airspeed, ±5% or ±100 ft/min (0.5 m/sec) climb rate, but not less than the climb gradient requirements of 14CFR part 23, or part 25, as appropriate.	For part 23 airplanes, in accordance with part 23. For part 25 airplanes, Second Segment Climb.	Flight test data is preferred, however, airplane performance manual data is an acceptable alternative. Flight simulator performance must be recorded over an interval of at least 1,000 ft. (300m). Test at weight, altitude, or temperature limiting condition.	X	X	X	X	
1.c.3.	One Engine Inoperative En-Route Climb.	±10% time, ±10% distance, ±10% fuel used.	Clean.	Record results for at least a 5,000 ft (1550 m) climb segment. Flight test data or airplane performance manual data may be used.			X	X	
1.c.4.	One Engine Inoperative Approach Climb (if the approved AFM requires specific performance in icing conditions).	±3 kt airspeed, ±5% or ±100 ft/min (0.5 m/sec) climb rate, but not less than the climb gradient requirements of 14CFR part 23, or part 25, as appropriate.	Approach	Record results at near maximum landing weight. Flight test data or airplane performance manual data may be used. Flight simulator performance must be recorded over an interval of at least 1,000 ft. (300m).	X	X	X	X	The airplane should be configured with all anti-ice and de-ice systems operating normally, with the gear up and go-around flaps set. All icing accountability considerations should

Table A2A

Full Flight Simulator (FFS) Objective Tests									
<<< QPS Requirements >>>									< Information >
Test		Tolerance(s)	Flight Condition	Test Details	Simulator Level				Notes
Number	Title				A	B	C	D	
									be applied in accordance with the AFM for an approach in icing conditions.
1.d.	**Cruise / Descent.**								
1.d.1.	Level flight acceleration.	±5% time.	Cruise.	Record results for a minimum of 50 kt speed increase using maximum continuous thrust rating or equivalent.	X	X	X	X	
1.d.2.	Level flight deceleration.	±5% time.	Cruise.	Record results for a minimum of 50 kt. speed decrease using idle power.	X	X	X	X	
1.d.3.	Cruise performance.	±0.05 EPR or ±5% of N_1, or ±5% of torque, ±5% of fuel flow.	Cruise.	May be a single snapshot showing instantaneous fuel flow or a minimom of 2 consecutive snapshots with a spread of at least 3 minutes in steady flight.			X	X	
1.d.4.	Idle descent.	±3 kt airspeed, ±5% or ±200 ft/min (1.0m/sec) descent rate.	Clean.	Record a stabilized, idle power descent at normal descent speed at mid-altitude. Flight simulator performance must be recorded over an interval of at least 1,000 ft. (300m).	X	X	X	X	
1.d.5.	Emergency descent.	±5 kt airspeed, ±5% or ±300 ft/min (1.5m/s) descent rate.	As per approved AFM.	Performance must be recorded over an interval of at least 3,000 ft (900m).	X	X	X	X	The stabilized descent should be conducted with speed brakes extended, if applicable, at mid-altitude and near V_{mo} speed or in accordance with emergency descent procedures.
1.e.	**Stopping.**								
1.e.1.	Stopping time and distance, using	±5% of time. For distance up to	Landing.	Record time and distance for at least 80% of the total time from	X	X	X	X	

Table A2A

Full Flight Simulator (FFS) Objective Tests									
<<< QPS Requirements >>>									< Information >
Test		Tolerance(s)	Flight Condition	Test Details	Simulator Level				Notes
Number	Title				A	B	C	D	
	manual application of wheel brakes and no reverse thrust on a dry runway.	4000 ft (1220 m): ±200 ft (61 m) or ±10% of distance, whichever is smaller. For distance greater than 4000 ft (1220 m): ±5% of distance.		touch down to full stop. Data are required for medium and near maximum landing weights. Data for brake system pressure and position of ground spoilers (including method of deployment, if used) must be provided. Engineering data may be used for the medium gross weight condition.					
1.e.2.	Stopping time and distance, using reverse thrust and no wheel brakes on a dry runway.	±5% time and the smaller of ±10% or ±200 ft (61 m) of distance.	Landing.	Record time and distance for at least 80% of the total time from initiation of reverse thrust to the minimum operating speed with full reverse thrust. Data is required for medium, and near maximum landing gross weights. Data on the position of ground spoilers, (including method of deployment, if used) must be provided. Engineering data may be used for the medium gross weight condition.	X	X	X	X	
1.e.3.	Stopping distance, using wheel brakes (and no reverse thrust) on a wet runway.	±10% of distance or ±200 ft (61 m).	Landing.	Either flight test data or manufacturer's performance manual data must be used where available. Engineering data, based on dry runway flight test stopping distance modified by the effects of contaminated runway braking coefficients are an acceptable alternative.			X	X	
1.e.4.	Stopping distance, using wheel brakes (and no	±10% of distance or ±200 ft (61 m).	Landing.	Either flight test or manufacturer's performance manual data must be used, where available.			X	X	

Table A2A

Full Flight Simulator (FFS) Objective Tests									
<<< QPS Requirements >>>									< Information >
Test		Tolerance(s)	Flight Condition	Test Details	Simulator Level				Notes
Number	Title				A	B	C	D	
	reverse thrust) on an icy runway.			Engineering data, based on dry runway flight test stopping distance modified by the effects of contaminated runway braking coefficients, are an acceptable alternative.					
1.f.	Engines.								
1.f.1.	Acceleration.	±10% T_i or ±0.25 sec and ±10% T_t.	Approach or landing.	Record engine power (N_1, N_2, EPR, Torque, etc.) from flight idle to go-around power for a rapid (slam) throttle movement.	X	X	X	X	T_i is the total time from initial throttle movement until reaching a 10% response of engine power. T_t is the total time from initial throttle movement to reaching 90% of go around power.
1.f.2.	Deceleration.	±10% T_i or ±0.25 sec and ±10% T_t.	Ground.	Record engine power (N_1, N_2, EPR, Torque, etc.) from Max T/O power to 90% decay of Max T/O power for a rapid (slam) throttle movement.	X	X	X	X	T_i is the total time from initial throttle movement until reaching a 10% response of engine power. T_t is the total time from initial throttle movement to reaching 90% decay of maximum takeoff power.
2. Handling Qualities.									

Table A2A

Full Flight Simulator (FFS) Objective Tests									
<<< QPS Requirements >>>									< Information >
Test		Tolerance(s)	Flight Condition	Test Details	Simulator Level				Notes
Number	Title				A	B	C	D	
	For simulators requiring Static or Dynamic tests at the controls (i.e., column, wheel, rudder pedal), special test fixtures will not be required during initial or upgrade evaluations if the sponsor's QTG/MQTG shows both test fixture results **and** the results of an alternative approach, such as computer plots produced concurrently, that show satisfactory agreement. Repeat of the alternative method during the initial or upgrade evaluation would then satisfy this test requirement. For initial and upgrade evaluations, the control dynamic characteristics must be measured at and recorded directly from the cockpit controls, and must be accomplished in takeoff, cruise, and landing flight conditions and configurations. Testing of position versus force is not applicable if forces are generated solely by use of airplane hardware in the flight simulator.								
2.a.	**Static Control Tests.**								
2.a.1.a.	Pitch Controller Position vs. Force and Surface Position Calibration.	±2 lb (0.9 daN) breakout, ±10% or ±5 lb (2.2 daN) force, ±2° elevator.	Ground.	Record results for an uninterrupted control sweep to the stops.	X	X	X	X	Test results should be validated (where possible) with in-flight data from tests such as longitudinal static stability, stalls, etc. Static and dynamic flight control tests should be accomplished at the same feel or impact pressures.
2.a.1.b.	**(Reserved)**								
2.a.2.a.	Roll Controller Position vs. Force and Surface Position Calibration.	±2 lb (0.9 daN) breakout, ±10% or ±3 lb (1.3 daN) force, ±2° aileron, ±3° spoiler angle.	Ground.	Record results for an uninterrupted control sweep to the stops.	X	X	X	X	Test results should be validated with in-flight data from tests such as engine out trims, steady state sideslips, etc. Static and dynamic flight control tests should be accomplished at the same feel or impact pressures.
2.a.2.b.	**(Reserved)**								

Table A2A

Full Flight Simulator (FFS) Objective Tests									
<<< QPS Requirements >>>									< Information >
Test		Tolerance(s)	Flight Condition	Test Details	Simulator Level				Notes
Number	Title				A	B	C	D	
2.a.3.a.	Rudder Pedal Position vs. Force and Surface Position Calibration.	±5 lb (2.2 daN) breakout, ±10% or ±5 lb (2.2 daN) force, ±2° rudder angle.	Ground.	Record results for an uninterrupted control sweep to the stops.	X	X	X	X	Test results should be validated with in-flight data from tests such as engine out trims, steady state sideslips, etc. Static and dynamic flight control tests should be accomplished at the same feel or impact pressures.
2.a.3.b.	**(Reserved)**								
2.a.4.	Nosewheel Steering Controller Force & Position Calibration.	±2 lb (0.9 daN) breakout, ±10% or ±3 lb (1.3 daN) force, ±2° nosewheel angle.	Ground.	Record results of an uninterrupted control sweep to the stops.	X	X	X	X	
2.a.5.	Rudder Pedal Steering Calibration.	±2° nosewheel angle.	Ground.	Record results of an uninterrupted control sweep to the stops.	X	X	X	X	
2.a.6.	Pitch Trim Indicator vs. Surface Position Calibration.	±0.5° of computed trim surface angle.	Ground.		X	X	X	X	The purpose of the test is to compare flight simulator against design data or equivalent.
2.a.7.	Pitch Trim Rate.	±10% trim rate (°/sec).	Ground and approach.	The trim rate must be checked using the pilot primary trim (ground) and using the autopilot or pilot primary trim in flight at go-around flight conditions.	X	X	X	X	
2.a.8.	Alignment of Cockpit Throttle Lever vs. Selected Engine Parameter.	±5° of throttle lever angle, or ±3% N1, or ±.03 EPR, or ±3% maximum rated	Ground.	Requires simultaneous recording for all engines. The tolerances apply against airplane data and between engines. In the case of propeller powered airplanes, if a	X	X	X	X	

Table A2A

Full Flight Simulator (FFS) Objective Tests									
<<< QPS Requirements >>>									< Information >
Test		Tolerance(s)	Flight Condition	Test Details	Simulator Level				Notes
Number	Title				A	B	C	D	
		manifold pressure, or ±3% torque. Where control levers do not have angular travel, a tolerance of ±0.8 inch (±2 cm.) applies.		propeller lever is present, it must also be checked. For airplanes with throttle "detents," all detents must be presented. May be a series of snapshot test results.					
2.a.9.	Brake Pedal Position vs. Force and Brake System Pressure Calibration.	±5 lb (2.2 daN) or 10% force, ±150 psi (1.0 MPa) or ±10% brake system pressure.	Ground.	Hydraulic system pressure must be related to pedal position through a ground static test.	X	X	X	X	Flight simulator computer output results may be used to show compliance.
2.b.	**Dynamic Control Tests.**								
	Tests 2.b.1., 2.b.2., and 2.b.3. are not applicable if dynamic response is generated solely by use of airplane hardware in the flight simulator. Power setting is that required for level flight unless otherwise specified.								
2.b.1.	Pitch Control.	For underdamped systems: ±10% of time from 90% of initial displacement (A_d) to first zero crossing and ±10(n+1)% of period thereafter. ±10% amplitude of first overshoot applied to all overshoots greater than 5% of initial displacement (A_d). ±1 overshoot (first significant overshoot must be matched). For overdamped systems:	Takeoff, Cruise, and Landing.	Data must show normal control displacement in both directions. Tolerances apply against the absolute values of each period (considered independently). Normal control displacement for this test is 25% to 50% of full throw or approximately 25% to 50% of the maximum allowable pitch controller deflection for flight conditions limited by the maneuvering load envelope.			X	X	"n" is the sequential period of a full cycle of oscillation. Refer to paragraph 3 of this attachment for more information. Static and dynamic flight control tests should be accomplished at the same feel or impact pressures.

Table A2A

Full Flight Simulator (FFS) Objective Tests									
<<< QPS Requirements >>>									< Information >
Test		Tolerance(s)	Flight Condition	Test Details	Simulator Level				Notes
Number	Title				A	B	C	D	
		±10% of time from 90% of initial displacement (0.9 A_d) to 10% of initial displacement (0.1 A_d). For the alternate method (see paragraph 3 of this attachment): The slow sweep is the equivalent to the static test 2.a.1. For the moderate and rapid sweeps: ±0.9 daN (2 lb) or ±10% dynamic increment above the static force.							
2.b.2.	Roll Control.	For underdamped systems: ±10% of time from 90% of initial displacement (0.9 A_d) to first zero crossing, and ±10 (n+1)% of period thereafter. ±10% amplitude of first overshoot, applied to all overshoots greater than 5% of initial displacement (A_d), ±1 overshoot (first	Takeoff, Cruise, and Landing.	Data must show normal control displacement in both directions. Tolerances apply against the absolute values of each period (considered independently). Normal control displacement for this test is 25% to 50% of full throw or approximately 25% to 50% of maximum allowable roll controller deflection for flight conditions limited by the maneuvering load envelope.			X	X	"n" is the sequential period of a full cycle of oscillation. Refer to paragraph 3 of this attachment for more information. Static and dynamic flight control tests should be accomplished at the same feel or impact pressures.

Table A2A

Full Flight Simulator (FFS) Objective Tests									
<<< QPS Requirements >>>									< Information >
Test		Tolerance(s)	Flight Condition	Test Details	Simulator Level				Notes
Number	Title				A	B	C	D	
		significant overshoot must be matched). For overdamped systems: ±10% of time from 90% of initial displacement (0.9 A_d) to 10% of initial displacement (0.1A_d). For the alternate method (see Paragraph 3 of this attachment): The slow sweep is the equivalent to the static test 2.a.2. For the moderate and rapid sweeps: ±0.9 daN (2 lb) or ±10% dynamic increment above the static force.							
2.b.3.	Yaw Control.	For underdamped systems: ±10% of time from 90% of initial displacement (0.9 A_d) to first zero crossing, and ±10 (n+1)% of period thereafter. ±10% amplitude of first overshoot applied to all overshoots	Takeoff, Cruise, and Lauding.	Data must show normal control displacement in both directions. Tolerances apply against the absolute values of each period (considered independently). Normal control displacement for this test is 25% to 50% of full throw.			X	X	"n" is the sequential period of a full cycle of oscillation. Refer to paragraph 3 of this attachment for more information. Static and dynamic flight control tests should be accomplished at the same feel or impact pressures.

Table A2A

Full Flight Simulator (FFS) Objective Tests									
<<< QPS Requirements >>>									< Information >
Test		Tolerance(s)	Flight Condition	Test Details	Simulator Level				Notes
Number	Title				A	B	C	D	
		greater than 5% of initial displacement (A_d). ±1 overshoot (first significant overshoot must be matched). For overdamped systems: ±10% of time from 90% of initial displacement (0.9 A_d) to 10% of initial displacement (0.1A_d). For the alternate method (see paragraph 3 of this attachment): The slow sweep is the equivalent to the static test 2.a.3. For the moderate and rapid sweeps: ±0.9 daN (2 lb) or ±10% dynamic increment above the static force.							
2.b.4.	Small Control Inputs – Pitch.	±0.15°/sec body pitch rate or ±20% of peak body pitch rate applied throughout the time history.	Approach or Landing.	Control inputs must be typical of minor corrections made while established on an ILS approach course (approximately 0.5°/sec to 2°/sec pitch rate). The test must be in both directions, showing time history data from 5 seconds before until at least 5 seconds			X	X	

Table A2A

Full Flight Simulator (FFS) Objective Tests									
<<< QPS Requirements >>>									< Information >
Test Number	Test Title	Tolerance(s)	Flight Condition	Test Details	Simulator Level A	B	C	D	Notes
				after initiation of control input. CCA: Test in normal and non-normal control states.					
2.b.5.	Small Control Inputs – Roll.	±0.15°/sec body roll rate or ±20% of peak body roll rate applied throughout the time history	Approach or landing.	Control inputs must be typical of minor corrections made while established on an ILS approach course (approximately 0.5°/sec to 2°/sec roll rate). The test may be run in only one direction; however, for airplanes that exhibit non-symmetrical behavior, the test must include both directions. Time history data must be recorded from 5 seconds before until at least 5 seconds after initiation of control input. CCA: Test in normal and non-normal control states.			X	X	
2.b.6.	Small Control Inputs – Yaw.	±0.15°/sec body yaw rate or ±20% of peak body yaw rate applied throughout the time history	Approach or landing.	Control inputs must be typical of minor corrections made while established on an ILS approach course (approximately 0.5°/sec to 2°/sec yaw rate). The test may be run in only one direction; however, for airplanes that exhibit non-symmetrical behavior, the test must include both directions. Time history data must be recorded from 5 seconds before until at least 5 seconds after initiation of control input. CCA: Test in normal and non-normal control states.			X	X	
2.c.	**Longitudinal Control Tests.**								
	Power setting is that required for level flight unless otherwise specified.								
2.c.1.	Power Change	±3 kt airspeed,	Approach.	Power is changed from the thrust	X	X	X	X	

Table A2A

Full Flight Simulator (FFS) Objective Tests									
<<< QPS Requirements >>>									< Information >
Test		Tolerance(s)	Flight Condition	Test Details	Simulator Level				Notes
Number	Title				A	B	C	D	
	Dynamics.	±100 ft (30 m) altitude, ±20% or ±1.5° pitch angle.		setting required for approach or level flight to maximum continuous thrust or go-around power setting. Record the uncontrolled free response from at least 5 seconds before the power change is initiated to 15 seconds after the power change is completed. **(CCA:** Test in Normal and Non-normal control state.)					
2.c.2.	Flap/Slat Change Dynamics.	±3 kt airspeed, ±100 ft (30 m) altitude, ±20% or ±1.5° pitch angle.	Takeoff through initial flap retraction, and approach to landing.	Record the uncontrolled free response from at least 5 seconds before the configuration change is initiated to 15 seconds after the configuration change is completed. **(CCA:** Test in Normal and Non-normal control state.)	X	X	X	X	
2.c.3.	Spoiler/Speedbrake Change Dynamics.	±3 kt airspeed, ±100 ft (30 m) altitude, ±20% or ±1.5° pitch angle.	Cruise.	Record the uncontrolled free response from at least 5 seconds before the configuration change is initiated to 15 seconds after the configuration change is completed. Record results for both extension and retraction. **(CCA:** Test in Normal and Non-normal control state.)	X	X	X	X	
2.c.4.	Gear Change Dynamics.	±3 kt airspeed, ±100 ft (30 m) altitude, ±20% or ±1.5° pitch angle.	Takeoff (retraction), and Approach (extension).	Record the time history of uncontrolled free response for a time increment from at least 5 seconds before the configuration change is initiated to 15 seconds after the configuration change is completed. **(CCA:** Test in Normal and Non-normal control state.)	X	X	X	X	

Table A2A

Full Flight Simulator (FFS) Objective Tests									
<<< QPS Requirements >>>									< Information >
Test			Flight	Test	Simulator Level				
Number	Title	Tolerance(s)	Condition	Details	A	B	C	D	Notes
2.c.5.	Longitudinal Trim.	±0.5° trim surface angle ±1°elevator ±1° pitch angle ±5% net thrust or equivalent.	Cruise, Approach, and Landing.	Record steady-state condition with wings level and thrust set for level flight. May be a series of snapshot tests. **(CCA:** Test in Normal or Non-normal control state, as applicable.)	X	X	X	X	
2.c.6.	Longitudinal Maneuvering Stability (Stick Force/g).	±5 lb (±2.2 daN) or ±10% pitch controller force. Alternative method: ±1° or ±10% change of elevator.	Cruise, Approach, and Landing.	Continuous time history data or a series of snapshot tests may be used. Record results up to approximately 30° of bank for approach and landing configurations. Record results for up to approximately 45° of bank for the cruise configuration. The force tolerance is not applicable if forces are generated solely by the use of airplane hardware in the flight simulator. The alternative method applies to airplanes that do not exhibit "stick-force-per-g" characteristics. **(CCA:** Test in Normal and Non-normal control state as applicable.)	X	X	X	X	
2.c.7.	Longitudinal Static Stability.	±5 lb (±2.2 daN) or ±10% pitch controller force. Alternative method: ±1° or ±10% change of elevator.	Approach.	Record results for at least 2 speeds above and 2 speeds below trim speed. May be a series of snapshot test results. The force tolerance is not applicable if forces are generated solely by the use of airplane hardware in the flight simulator. The alternative method applies to airplanes that do not exhibit speed stability	X	X	X	X	

Table A2A

Full Flight Simulator (FFS) Objective Tests									
<<< QPS Requirements >>>									< Information >
Test		Tolerance(s)	Flight Condition	Test Details	Simulator Level				Notes
Number	Title				A	B	C	D	
				characteristics. (CCA: Test in Normal or Non-normal control state, as applicable.)					
2.c.8.	Stall Characteristics.	±3 kt airspeed for initial buffet, stall warning, and stall speeds. ±2° bank for speeds greater than stick shaker or initial buffet. Additionally, for those simulators with reversible flight control systems: ±10% or ±5 lb (2.2 daN)) Stick/Column force (prior to "g break" only).	Second Segment Climb, and Approach or Landing.	The stall maneuver must be entered with thrust at or near idle power and wings level (1g). Record the stall warning signal and initial buffet, if applicable. Time history data must be recorded for full stall and initiation of recovery. The stall warning signal must occur in the proper relation to buffet/stall. Flight simulators of airplanes exhibiting a sudden pitch attitude change or "g break" must demonstrate this characteristic. (CCA: Test in Normal and Non-normal control state.)	X	X	X	X	
2.c.9.	Phugoid Dynamics.	±10% period, ±10% of time to ½ or double amplitude or ±.02 of damping ratio.	Cruise.	The test must include whichever is less of the following: Three full cycles (six overshoots after the input is completed), or the number of cycles sufficient to determine time to ½ or double amplitude. (CCA: Test in Non-normal control state.)	X	X	X	X	
2.c.10	Short Period Dynamics.	±1.5° pitch angle or ±2°/sec pitch rate, ±0.10g acceleration.	Cruise.	(CCA: Test in Normal and Non-normal control state.)	X	X	X	X	
2.c.11.	**(Reserved)**								
2.d.	**Lateral Directional Tests.**								
	Power setting is that required for level flight unless otherwise specified.								

Table A2A

Full Flight Simulator (FFS) Objective Tests									
<<< QPS Requirements >>>									< Information >
Test		Tolerance(s)	Flight Condition	Test Details	Simulator Level				Notes
Number	Title				A	B	C	D	
2.d.1.	Minimum Control Speed, Air (V_{mca} or V_{mcl}), per Applicable Airworthiness Standard or Low Speed Engine Inoperative Handling Characteristics in the Air.	±3 kt airspeed.	Takeoff or Landing (whichever is most critical in the airplane).	Takeoff thrust must be used on the operating engine(s). A time history or a series of snapshot tests may be used. (CCA: Test in Normal or Non-normal control state.)	X	X	X	X	Low Speed Engine Inoperative Handling may be governed by a performance or control limit that prevents demonstration of V_{mca} in the conventional manner.
2.d.2.	Roll Response (Rate).	±10% or ±2°/sec roll rate. Additionally, for those simulators of airplanes with reversible flight control systems: ±10% or ±3lb (1.3 daN) wheel force.	Cruise, and Approach or Landing.	Record results for normal roll controller deflection (about one-third of maximum roll controller travel). May be combined with step input of flight deck roll controller test (2.d.3.).	X	X	X	X	
2.d.3.	Roll Response to Cockpit Roll Controller Step Input.	±10% or ±2° bank angle.	Approach or Landing.	Record from initiation of roll through 10 seconds after control is returned to neutral and released. May be combined with roll response (rate) test (2d2). (CCA: Test in Normal and Non-normal control state.)	X	X	X	X	With wings level, apply a step roll control input using approximately one-third of the roll controller travel. When reaching approximately 20° to 30° of bank, abruptly return the roll controller to neutral and allow approximately 10 seconds of airplane free response.
2.d.4.	Spiral Stability.	Correct trend and ±2°	Cruise and	Record results for both directions.	X	X	X	X	

Table A2A

Full Flight Simulator (FFS) Objective Tests									
<<< QPS Requirements >>>									< Information >
Test		Tolerance(s)	Flight Condition	Test Details	Simulator Level				Notes
Number	Title				A	B	C	D	
		or ±10% bank angle in 20 seconds. Alternate test requires correct trend and ±2° aileron.	Approach or Landing.	Airplane data averaged from multiple tests may be used. As an alternate test, demonstrate the lateral control required to maintain a steady turn with a bank angle of approximately 30°. (CCA: Test in Non-normal control state.)					
2.d.5.	Engine Inoperative Trim.	±1° rudder angle or ±1° tab angle or equivalent pedal, ±2° sideslip angle.	Second Segment Climb, and Approach or Landing.	May be a series of snapshot tests.	X	X	X	X	The test should be performed in a manner similar to that for which a pilot is trained to trim an engine failure condition. Second segment climb test should be at takeoff thrust. Approach or landing test should be at thrust for level flight.
2.d.6.	Rudder Response.	±2°/sec or ±10% yaw rate.	Approach or Landing.	Record results for stability augmentation system ON and OFF. A rudder step input of 20%-30% rudder pedal throw is used. (CCA: Test in Normal and Non-normal control state.)	X	X	X	X	
2.d.7.	Dutch Roll, (Yaw Damper OFF).	±0.5 sec or ±10% of period, ±10% of time to ½ or double amplitude or ±.02 of damping ratio. ±20% or ±1 sec of time difference between peaks of bank and sideslip.	Cruise, and Approach or Landing.	Record results for at least 6 complete cycles with stability augmentation OFF. (CCA: Test in Non-normal control state.)		X	X	X	

Table A2A

Full Flight Simulator (FFS) Objective Tests									
<<< QPS Requirements >>>									< Information >
Test		Tolerance(s)	Flight Condition	Test Details	Simulator Level				Notes
Number	Title				A	B	C	D	
2.d.8.	Steady State Sideslip.	For given rudder position ±2° bank angle, ±1° sideslip angle, ±10% or ±2° aileron, ±10% or ±5° spoiler or equivalent roll, controller position or force. Additionally, for those simulators of airplanes with reversible flight control systems: ±10% or ±3 lb (1.3 daN) wheel force ±10% or ±5 lb (2.2 daN) rudder pedal force.	Approach or Landing.	May be a series of snapshot test results using at least two rudder positions, one of which must be near maximum allowable rudder. Propeller driven airplanes must test in each direction.	X	X	X	X	
2.e.	**Landings.**								
2.e.1.	Normal Landing.	±3 kt airspeed, ±1.5° pitch angle, ±1.5° angle of attack, ±10% or ±10 ft (3 m) height. Additionally, for those simulators of airplanes with reversible flight control systems: ±10% or ±5 lbs (±2.2 daN) stick/column force.	Landing.	Record results from a minimum of 200 ft (61 m) AGL to nose-wheel touchdown. Tests should be conducted with two normal landing flap settings (if applicable) one of which must be at or near maximum certificated landing weight, the other at light or medium landing weight. (CCA: Test in Normal and Non-normal control state if applicable.)		X	X	X	
2.e.2.	Minimum Flap Landing.	±3 kt airspeed, ±1.5° pitch angle, ±1.5° angle of attack, ±10% or ±10 ft (3 m)	Minimum Certified Landing Flap Configuration.	Record results from a minimum of 200 ft (61 m) AGL to nosewheel touchdown with airplane at near Maximum Landing Weight.			X	X	

Table A2A

Full Flight Simulator (FFS) Objective Tests									
<<< QPS Requirements >>>									< Information >
Test		Tolerance(s)	Flight Condition	Test Details	Simulator Level				Notes
Number	Title				A	B	C	D	
		height. Additionally, for those simulators of airplanes with reversible flight control systems: ±10% or ±5 lbs (2.2 daN) stick/column force.							
2.e.3.	Crosswind Landing.	±3 kt airspeed, ±1.5° pitch angle, ±1.5° angle of attack, ±10% or ±10 ft (3 m) height ±2° bank angle, ±2° sideslip angle ±3° heading.angle Additionally, for those simulators of airplanes with reversible flight control systems: ±10% or ±3 lb (1.3 daN) wheel force ±10% or ±5 lb (2.2 daN) rudder pedal force.	Landing.	Record results from a minimum of 200 ft (61 m) AGL, through nosewheel touch down, to 50% decrease in main landing gear touchdown speed. Requires test data, including information on wind profile, for a crosswind component of at least 60% of the maximum described in the AFM as measured at 33 ft (10m) above the runway.		X	X	X	
2.e.4.	One Engine Inoperative Landing.	±3 kt airspeed, ±1.5° pitch angle, ±1.5° angle of attack, ±10% height or ±10 ft (3 m); ±2° bank angle, ±2° sideslip angle, ±3° heading.	Landing.	Record results from a minimum of 200 ft (61 m) AGL, through nosewheel touch down, to 50% decrease in main landing gear touchdown speed or less.		X	X	X	
2.e.5.	Autopilot landing (if applicable).	±5 ft (1.5 m) flare height,	Landing.	If autopilot provides rollout guidance, record lateral deviation		X	X	X	T_f = duration of flare.

Table A2A

Full Flight Simulator (FFS) Objective Tests									
<<< QPS Requirements >>>									< Information >
Test		Tolerance(s)	Flight Condition	Test Details	Simulator Level				Notes
Number	Title				A	B	C	D	
		±0.5 sec T_f, ±140 ft/min (.7 m/sec) rate of descent at touch-down. ±10 ft (3 m) lateral deviation during rollout.		from touchdown to a 50% decrease in main landing gear touchdown speed or less. Time of autopilot flare mode engage and main gear touchdown must be noted.					
2.e.6.	All engines operating, autopilot, go around.	±3 kt airspeed, ±1.5° pitch angle, ±1.5° angle of attack.	As per AFM.	Normal. all-engines-operating, Go Around with the autopilot engaged (if applicable) at medium landing weight. **(CCA:** Test in Normal and Non-normal control state.)		X	X	X	
2.e.7.	One engine inoperative go around.	±3 kt airspeed, ±1.5° pitch angle, ±1.5° angle of attack, ±2° bank angle, ±2° sideslip angle.	As per AFM.	The one engine inoperative go around is required at near maximum certificated landing weight with the critical engine inoperative using manual controls. If applicable, an additional engine inoperative go around test must be accomplished with the autopilot engaged. **(CCA:** Non-autopilot test in non-normal control state.)		X	X	X	
2.e.8.	Directional control (rudder effectiveness) with symmetric reverse thrust.	±5 kt airspeed, ±2°/sec yaw rate.	Landing.	Record results starting from a speed approximating touchdown speed to the minimum thrust reverser operation speed. With full reverse thrust, apply yaw control in both directions until reaching minimum thrust reverser operation speed.		X	X	X	
2.e.9.	Directional control (rudder effectiveness)	±5 kt airspeed, ±3° heading angle.	Landing.	Maintain heading with yaw control with full reverse thrust on the operating engine(s). Record		X	X	X	

Table A2A

Full Flight Simulator (FFS) Objective Tests									
<<< QPS Requirements >>>									< Information >
Test		Tolerance(s)	Flight Condition	Test Details	Simulator Level				Notes
Number	Title				A	B	C	D	
	with asymmetric reverse thrust.			results starting from a speed approximating touchdown speed to a speed at which control of yaw cannot be maintained or until reaching minimum thrust reverser operation speed, whichever is higher. The tolerance applies to the low speed end of the data recording.					
2.f.	**Ground Effect.**								
	Test to demonstrate Ground Effect.	±1° elevator, ±0.5° stabilizer angle, ±5% net thrust or equivalent, ±1° angle of attack, ±10% height or ±5 ft (1.5 m), ±3 kt airspeed, ±1° pitch angle.	Landing.	The Ground Effect model must be validated by the test selected and a rationale must be provided for selecting the particular test.		X	X	X	See paragraph 4, Ground Effect, in this attachment for additional information.
2.g.	**Windshear.**								
	Four tests, two takeoff and two landing, with one of each conducted in still air and the other with windshear active to demonstrate windshear models.	See Attachment 5.	Takeoff and Landing.	Requires windshear models that provide training in the specific skills needed to recognize windshear phenomena and to execute recovery procedures. See Attachment 5 for tests, tolerances, and procedures.			X	X	See Attachment 5 for information related to Level A and B simulators.
2.h.	**Flight Maneuver and Envelope Protection Functions.**								
	The requirements of tests h (1) through (6) of this attachment are applicable to computer controlled airplanes only. Time history results are required for simulator response to control inputs during entry into envelope protection limits including both normal and degraded control states if the function is different. Set thrust as required to reach the envelope protection function.								
2.h.1.	Overspeed.	±5 kt airspeed.	Cruise.			X	X	X	

Table A2A

Full Flight Simulator (FFS) Objective Tests									
<<< QPS Requirements >>>									< Information >
Test		Tolerance(s)	Flight Condition	Test Details	Simulator Level				Notes
Number	Title				A	B	C	D	
2.h.2.	Minimum Speed.	±3 kt airspeed.	Takeoff, Cruise, and Approach or Landing.			X	X	X	
2.h.3.	Load Factor.	±0.1g normal load factor.	Takeoff, Cruise.			X	X	X	
2.h.4.	Pitch Angle.	±1.5° pitch angle.	Cruise, Approach.			X	X	X	
2.h.5.	Bank Angle.	±2° or ±10% bank angle.	Approach.			X	X	X	
2.h.6.	Angle of Attack.	±1.5° angle of attack.	Second Segment Climb, and Approach or Landing.			X	X	X	
3. Motion System.									
3.a.	**Frequency response.**								
		As specified by the applicant for flight simulator qualification.	N/A	Required as part of MQTG but not required as part of continuing evaluations. The test must demonstrate frequency response of the motion system.	X	X	X	X	
3.b.	**Leg balance.**								
		As specified by the applicant for flight simulator qualification.	N/A	Required as part of MQTG but not required as part of continuing evaluations. The test must demonstrate motion system leg balance.	X	X	X	X	
3.c.	**Turn-around check.**								
		As specified by the applicant for flight simulator qualification.	N/A	Required as part of MQTG but not required as part of continuing evaluations. The test must demonstrate a smooth turn-around (shift to opposite direction of movement)	X	X	X	X	

Table A2A

Full Flight Simulator (FFS) Objective Tests									
<<< QPS Requirements >>>									< Information >
Test Number	Test Title	Tolerance(s)	Flight Condition	Test Details	Simulator Level A	B	C	D	Notes
				of the motion system.					
3.d.	**Motion system repeatability.**								
		With the same input signal, the test results must be repeatable to within ±0.05g actual platform linear acceleration in each axis.	Accomplished in both the "ground" mode and in the "flight" mode of the motion system operation.	Required as part of the MQTG and at each continuing evaluation. The test is accomplished by injecting a motion signal to generate movement of the platform. The input must be such that the rotational accelerations, rotational rates, and linear accelerations are inserted before the transfer from airplane center of gravity to the pilot reference point with a minimum amplitude of 5 deg/sec/sec, 10 deg/sec and 0.3g, respectively, to provide adequate analysis of the output.	X	X	X	X	See Paragraph 5.c. in this attachment for additional information. Note: if there is no difference in the model for "ground" and "flight" operation of the motion system, this should be described in an SOC and will not require tests in both modes.
3.e.	**Motion cueing performance signature.**								
				Required as part of MQTG but not required as part of continuing evaluations.	X	X	X	X	These tests should be run with the motion buffet mode disabled. See paragraph 5.d., of this attachment, Motion cueing performance signature.
3.e.1.	Takeoff rotation (V_R to V_2).	As specified by the sponsor for flight simulator qualification.	Ground.	Pitch attitude due to initial climb should dominate over cab tilt due to longitudinal acceleration.	X	X	X	X	Associated to test 1.b.4.
3.e.2.	Engine failure between V_1 and V_R.	As specified by the sponsor for flight simulator qualification.	Ground.		X	X	X	X	Associated to test 1.b.5.
3.e.3.	Pitch change during go-	As specified by the sponsor for flight	Flight.			X	X	X	Associated to test 2.c.6.

Table A2A

Full Flight Simulator (FFS) Objective Tests									
<<< QPS Requirements >>>									< Information >
Test		Tolerance(s)	Flight Condition	Test Details	Simulator Level				Notes
Number	Title				A	B	C	D	
	around.	simulator qualification.							
3.e.4.	Configuration changes.	As specified by the sponsor for flight simulator qualification.	Flight.		X	X	X	X	Associated to tests 2.c.2. & 2.c.4.
3.e.5.	Power change dynamics.	As specified by the sponsor for flight simulator qualification.	Flight.		X	X	X	X	Associated to test 2.c.1.
3.e.6.	Landing flare.	As specified by the sponsor for flight simulator qualification.	Flight.			X	X	X	Associated to test 2.c.1.
3.e.7.	Touchdown bump.	As specified by the sponsor for flight simulator qualification.	Ground.				X	X	Associated to test 2.e.1.
3.f.	**Characteristic motion vibrations.**								
	The recorded test results for characteristic buffets must allow the comparison of relative amplitude versus frequency.								
3.f.1.	Thrust effect with brakes set.	Simulator test results must exhibit the overall appearance and trends of the airplane data, with at least three (3) of the predominant frequency "spikes" being present within ±2 Hz.	Ground.	The test must be conducted within 5% of the maximum possible thrust with brakes set.				X	
3.f.2.	Buffet with landing gear extended.	Simulator test results must exhibit the overall appearance and trends of the airplane	Flight.	The test must be conducted at a nominal, mid-range airspeed; i.e., sufficiently below landing gear limiting airspeed so as to avoid				X	

Table A2A

Full Flight Simulator (FFS) Objective Tests									
<<< QPS Requirements >>>									< Information >
Test		Tolerance(s)	Flight Condition	Test Details	Simulator Level				Notes
Number	Title				A	B	C	D	
		data, with at least three (3) of the predominant frequency "spikes" being present within ±2 Hz.		inadvertently exceeding this limitation.					
3.f.3.	Buffet with flaps extended.	Simulator test results must exhibit the overall appearance and trends of the airplane data, with at least three (3) of the predominant frequency "spikes" being present within ±2 Hz.	Flight.	The test must be conducted at a nominal, mid-range airspeed; i.e., sufficiently below flap extension limiting airspeed so as to avoid inadvertently exceeding this limitation.				X	
3.f.4.	Buffet with speedbrakes deployed.	Simulator test results must exhibit the overall appearance and trends of the airplane data, with at least three (3) of the predominant frequency "spikes" being present within ±2 Hz.	Flight.					X	
3.f.5.	Buffet at approach-to-stall.	Simulator test results must exhibit the overall appearance and trends of the airplane data, with at least three (3) of the predominant frequency "spikes" being present within ±2 Hz.	Flight.	The test must be conducted for approach to stall. Post stall characteristics are not required.				X	
3.f.6.	Buffet at high airspeeds or high Mach.	Simulator test results must exhibit the overall appearance and trends of the airplane	Flight.					X	The test may be conducted during either a high speed maneuver (e.g.,

Table A2A

Full Flight Simulator (FFS) Objective Tests									
<<< QPS Requirements >>>									< Information >
Test Number	Test Title	Tolerance(s)	Flight Condition	Test Details	Simulator Level A	B	C	D	Notes
		data, with at least three (3) of the predominant frequency "spikes" being present within ±2 Hz.							"wind-up" turn) or at high Mach.
3.f.7.	In-flight vibrations.	Simulator test results must exhibit the overall appearance and trends of the airplane data, with at least three (3) of the predominant frequency "spikes" being present within ±2 Hz.	Flight (clean configuration).					X	This test is directed toward propeller driven airplanes.
4. Visual System.									
4.a.	**Visual System Response Time:** (Choose either test 4.a.1. or 4.a.2. to satisfy test 4.a., Visual System Response Time Test. This test also suffices for motion system response timing and cockpit instrument response timing.)								See paragraph 14 of this attachment for additional information.
4.a.1.	Latency.								
		300 ms (or less) after airplane response.	Take-off, cruise, and approach or landing.	One test is required in each axis (pitch, roll and yaw) for each of the three conditions (take-off, cruise, and approach or landing).	X	X			The visual scene or test pattern used during the response testing should be representative of the system capacities required to meet the daylight, twilight (dusk/dawn) and/or night visual capability as appropriate.
		150 ms (or less) after airplane response.	Take-off, cruise, and approach or landing.	One test is required in each axis (pitch, roll and yaw) for each of the three conditions (take-off, cruise, and approach or landing).			X	X	
4.a.2.	Transport Delay.								
	If Transport Delay is chosen to demonstrate response time rather than Latency, it is expected that, when reviewing those existing tests where latency can be identified (e.g., short period, roll response, rudder response, etc.) the sponsor and the NSPM will apply additional scrutiny to ensure proper simulator response.								

Table A2A

Full Flight Simulator (FFS) Objective Tests									
<<< QPS Requirements >>>									< Information >
Test		Tolerance(s)	Flight Condition	Test Details	Simulator Level				Notes
Number	Title				A	B	C	D	
		300 ms (or less) after controller movement.	N/A	A separate test is required in each axis (pitch, roll, and yaw).	X	X			
		150 ms (or less) after controller movement.	N/A	A separate test is required in each axis (pitch, roll, and yaw).			X	X	
4.b.	**Field of View.**								
4.b.1.	Continuous collimated visual field of view.	Minimum continuous collimated field of view providing 45° horizontal and 30° vertical field of view for each pilot simultaneously.	N/A	Required as part of MQTG but not required as part of continuing evaluations.	X	X			A vertical field of view of 30° may be insufficient to meet visual ground segment requirements.
4.b.2.	Continuous, collimated, cross-cockpit visual field of view of 180° horizontally and 40° vertically.	±4° horizontally and ±4° vertically.	N/A	An SOC is required. Horizontal field of view must be not less than 176 measured degrees (including not less than ±88 measured degrees either side of the center line of the design eye point). Vertical field of view must be not less than 36 measured degrees from each pilot's eye point. Required as part of MQTG but not required as part of continuing evaluations.			X	X	Field of view should be measured using a visual test pattern filling the entire visual scene (all channels) with a matrix of black and white 5° squares. The installed alignment should be addressed in the SOC.
4.c.	**System geometry.**								
		5° even angular spacing within ±1° as measured from either pilot eye point and within 1.5° for adjacent squares.	N/A	The angular spacing of any chosen 5° square and the relative spacing of adjacent squares must be within the stated tolerances.	X	X	X	X	The purpose of this test is to evaluate local linearity of the displayed image at either pilot eye point. System geometry should be measured using a visual test pattern filling the entire visual scene (all channels) with a

Table A2A

Full Flight Simulator (FFS) Objective Tests									
<<< QPS Requirements >>>									< Information >
Test		Tolerance(s)	Flight Condition	Test Details	Simulator Level				Notes
Number	Title				A	B	C	D	
									matrix of black and white 5° squares with light points at the intersections.
4.d.	**Surface contrast ratio.**								
		Not less than 5:1.	N/A	The ratio is calculated by dividing the brightness level of the center, bright square (providing at least 2 foot-lamberts or 7 cd/m2) by the brightness level of any adjacent dark square. This requirement is applicable to any level of simulator equipped with a daylight visual system.				X	Measurements should be made using a 1° spot photometer and a raster drawn test pattern filling the entire visual scene (all channels) with a test pattern of black and white squares, 5° per square, with a white square in the center of each channel. During contrast ratio testing, simulator aft-cab and flight deck ambient light levels should be zero.
4.e.	**Highlight brightness.**								
		Not less than six (6) foot-lamberts (20 cd/m^2).	N/A	Measure the brightness of a white square while superimposing a highlight on that white square. The use of calligraphic capabilities to enhance the raster brightness is acceptable; however, measuring lightpoints is not acceptable. This requirement is applicable to any level of simulator equipped with a daylight visual system.				X	Measurements should be made using a 1° spot photometer and a raster drawn test pattern filling the entire visual scene (all channels) with a test pattern of black and white squares, 5° per square, with a white square in the center of each channel.
4.f.	**Vernier resolution (surface resolution).**								

Table A2A

Full Flight Simulator (FFS) Objective Tests									
<<< QPS Requirements >>>									< Information >
Test		Tolerance(s)	Flight Condition	Test Details	Simulator Level				Notes
Number	Title				A	B	C	D	
		Not greater than 2 arc minutes.	N/A	An SOC is required and must include the appropriate calculations and an explanation of those calculations. This requirement is applicable to any level of simulator equipped with a daylight visual system.				X	The eye will subtend two arc minutes when positioned on a 3° glide slope, 6,876 ft slant range from the centrally located threshold of a black runway surface painted with white threshold bars that are 16 ft wide with 4-foot gaps between the bars.
4.g.	**Light point size.**								
		Not greater than five (5) arc-minutes.	N/A	An SOC is required and must include the relevant calculations and an explanation of those calculations. This requirement is applicable to any level of simulator equipped with a daylight visual system.				X	Light point size should be measured using a test pattern consisting of a centrally located single row of light points reduced in length until modulation is just discernible in each visual channel. A row of 48 lights will form a 4° angle or less.
4.h.	**Light point contrast ratio.**								
4.h.1.	For Level A and B simulators.	Not less than 10:1.	N/A	An SOC is required and must include the relevant calculations.	X	X			A 1° spot photometer is used to measure a square of at least 1° filled with light points (where light point modulation is just discernible) and compare the results to the measured adjacent

Table A2A

Full Flight Simulator (FFS) Objective Tests									
<<< QPS Requirements >>>									< Information >
Test		Tolerance(s)	Flight Condition	Test Details	Simulator Level				Notes
Number	Title				A	B	C	D	
									background. During contrast ratio testing, simulator aft-cab and flight deck ambient light levels should be zero.
4.h.2.	For Level C and D simulators.	Not less than 25:1.	N/A	An SOC is required and must include the relevant calculations.			X	X	A 1° spot photometer is used to measure a square of at least 1° filled with light points (where light point modulation is just discernible) and compare the results to the measured adjacent background. During contrast ratio testing, simulator aft-cab and flight deck ambient light levels should be zero.
4.i.	**Visual ground segment.**								
		The visible segment in the simulator must be within 20% of the segment computed to be visible from the airplane cockpit. The tolerance(s) may be applied at either or both ends of the displayed segment. However, lights and ground objects computed to be visible from the airplane	Landing configuration, trimmed for appropriate airspeed, at 100 ft (30m) above the touchdown zone, on glide slope with an RVR value set at 1,200 ft (350m).	The QTG must contain appropriate calculations and a drawing showing the pertinent data used to establish the airplane location and the segment of the ground that is visible considering design eyepoint, the airplane attitude, cockpit cut-off angle, and a visibility of 1200 ft (350 m) RVR. Simulator performance must be measured against the QTG calculations. The data submitted must include at least the following:	X	X	X	X	Pre-position for this test is encouraged but may be achieved via manual or autopilot control to the desired position.

Table A2A

Full Flight Simulator (FFS) Objective Tests									
<<< QPS Requirements >>>									< Information >
Test		Tolerance(s)	Flight Condition	Test Details	Simulator Level				Notes
Number	Title				A	B	C	D	
		cockpit at the near end of the visible segment must be visible in the simulator.		(1) Static airplane dimensions as follows: (i) Horizontal and vertical distance from main landing gear (MLG) to glideslope reception antenna. (ii) Horizontal and vertical distance from MLG to pilot's eyepoint. (iii) Static cockpit cutoff angle. (2) Approach data as follows: (i) Identification of runway. (ii) Horizontal distance from runway threshold to glideslope intercept with runway. (iii) Glideslope angle. (iv) Airplane pitch angle on approach. (3) Airplane data for manual testing: (i) Gross weight. (ii) Airplane configuration. (iii) Approach airspeed. If non-homogenous fog is used to obscure visibility, the vertical variation in horizontal visibility must be described and be inclnded in the slant range visibility calculation used in the computations.					

5. Sound System.

The sponsor will not be required to rerun the airplane tests [i.e., tests 5.a.1. through 5.a.8. (or 5.b.1. through 5.b.9.) and 5.c., as appropriate] during continuing qualification evaluations if frequency response and background noise test results are within tolerance when compared to the initial evaluation results, and the sponsor shows that no software changes have occurred that will affect the airplane test results. If the frequency response test method is chosen and fails, the sponsor may elect to fix the frequency response problem and rerun the test or the sponsor may elect to re-run the airplane tests. However, if the airplane tests are rerun during continuing qualification evaluations, the results may be compared against initial evaluation results rather than airplane master data.

Table A2A

Full Flight Simulator (FFS) Objective Tests									
<<< QPS Requirements >>>									< Information >
Test Number	Test Title	Tolerance(s)	Flight Condition	Test Details	Simulator Level A	B	C	D	Notes
5.a.	**Turbo-jet airplanes.**								
5.a.1.	Ready for engine start.	±5 dB per 1/3 octave band.	Ground.	Normal conditions prior to engine start with the Auxiliary Power Unit operating, if appropriate.				X	
5.a.2.	All engines at idle.	±5 dB per 1/3 octave band.	Ground.	Normal condition prior to takeoff.				X	
5.a.3.	All engines at maximum allowable thrust with brakes set.	±5 dB per 1/3 octave band.	Ground.	Normal condition prior to takeoff.				X	
5.a.4.	Climb.	±5 dB per 1/3 octave band.	En-route climb.	Medium altitude.				X	
5.a.5.	Cruise.	±5 dB per 1/3 octave band	Cruise.	Normal cruise configuration.				X	
5.a.6.	Speedbrake / spoilers extended (as appropriate).	±5 dB per 1/3 octave band.	Cruise.	Normal and constant speedbrake deflection for descent at a constant airspeed and power setting.				X	
5.a.7.	Initial approach.	±5 dB per 1/3 octave band.	Approach.	Constant airspeed, gear up, flaps and slats as appropriate.				X	
5.a.8.	Final approach.	±5 dB per 1/3 octave band	Landing.	Constant airspeed, gear down, full flaps.				X	
5.b.	**Propeller airplanes.**								
5.b.1.	Ready for engine start.	±5 dB per 1/3 octave band.	Ground.	Normal conditions prior to engine start with the Auxiliary Power Unit operating, if appropriate.				X	
5.b.2.	All propellers feathered.	±5 dB per 1/3 octave band.	Ground.	Normal condition prior to takeoff.				X	
5.b.3.	Ground idle or equivalent.	±5 dB per 1/3 octave band.	Ground.	Normal condition prior to takeoff.				X	
5.b.4	Flight idle or equivalent.	±5 dB per 1/3 octave band.	Ground.	Normal condition prior to takeoff.				X	
5.b.5.	All engines at maximum allowable power	±5 dB per 1/3 octave band.	Ground.	Normal condition prior to takeoff.				X	

Table A2A

Full Flight Simulator (FFS) Objective Tests									
<<< QPS Requirements >>>									< Information >
Test		Tolerance(s)	Flight Condition	Test Details	Simulator Level				Notes
Number	Title				A	B	C	D	
	with brakes set.								
5.b.6.	Climb.	±5 dB per 1/3 octave band.	En-route climb.	Medium altitude.				X	
5.b.7.	Cruise.	±5 dB per 1/3 octave band.	Cruise.	Normal cruise configuration.				X	
5.b.8.	Initial approach.	±5 dB per 1/3 octave band.	Approach.	Constant airspeed, gear up, flaps extended as appropriate, RPM as per operating manual.				X	
5.b.9.	Final Approach.	±5 dB per 1/3 octave band.	Landing.	Constant airspeed, gear down, full flaps, RPM as per operating manual.				X	
5.c.	**Special cases.**								
		±5 dB per 1/3 octave band.	As appropriate.					X	These special cases are identified as particularly significant to the pilot, important in training, or unique to a specific airplane type or model.
5.d.	**Background noise.**								
		±3 dB per 1/3 octave band.						X	Results of the background noise at initial qualification should be included in the MQTG. The simulated sound will be evaluated to ensure that the background noise does not interfere with training, testing, or checking. Measurements made with the simulation running, the sound muted and a "dead"

Table A2A

Full Flight Simulator (FFS) Objective Tests									
<<< QPS Requirements >>>									< Information >
Test		Tolerance(s)	Flight Condition	Test Details	Simulator Level				Notes
Number	Title				A	B	C	D	
									cockpit.
5.e.	Frequency response.								
		±5 dB on three (3) consecutive bands when compared to initial evaluation; and ±2 dB when comparing the average of the absolute differences between initial and continuing qualification evaluation. (where does the following material reside?) However, if frequency response plots are provided for each channel at initial evaluation, these plots may be re-run at the continuing qualification evaluation with the following tolerances applied: (a) The continuing qualification 1/3 octave band amplitudes should not exceed ± 5 dB for three consecutive bands when compared to initial results. (b) The average of the		Applicable only to Continuing Qualification Evaluations.				X	Measurements are compared to those taken during initial evaluation.

Table A2A

Full Flight Simulator (FFS) Objective Tests									
<<< QPS Requirements >>>									< Information >
Test		Tolerance(s)	Flight Condition	Test Details	Simulator Level				Notes
Number	Title				A	B	C	D	
		sum of the absolute differences between initial and continuing qualification results should not exceed 2 dB (refer to table A.2.B. in this attachment).							
6.	(Reserved)								

Begin Information

2. General.

a. If relevant winds are present in the objective data, the wind vector should be clearly noted as part of the data presentation, expressed in conventional terminology, and related to the runway being used for test near the ground.

b. The reader is encouraged to review the Airplane Flight Simulator Evaluation Handbook, Volumes I and II, published by the Royal Aeronautical Society, London, UK, and FAA Advisory Circulars (AC) 25-7, as may be amended, Flight Test Guide for Certification of Transport Category Airplanes, and (AC) 23-8, as may be amended, Flight Test Guide for Certification of Part 23 Airplanes, for references and examples regarding flight testing requirements and techniques.

End Information

Begin Information

3. Control Dynamics

a. General

The characteristics of an airplane flight control system have a major effect on handling qualities. A significant consideration in pilot acceptability of an airplane is the "feel" provided through the flight controls. Considerable effort is expended on airplane feel system design so that pilots will be comfortable and will consider the airplane desirable to fly. In order for a flight simulator to be representative, it too shall present the pilot with the proper feel: that of the airplane being simulated. Compliance with this requirement shall be determined by comparing a recording of the control feel dynamics of the flight simulator to actual airplane measurements in the takeoff, cruise and landing configurations.

(1) Recordings such as free response to an impulse or step function are classically used to estimate the dynamic properties of electromechanical systems. In any case, it is only possible to estimate the dynamic properties as a result of only being able to estimate true inputs and responses. Therefore, it is imperative that the best possible data be collected since close matching of the flight simulator control loading system to the airplane systems is essential. The required dynamic control tests are described in 2.b.1.through 2.b.3. in Table A2A in this attachment.

(2) For initial and upgrade evaluations, it is required that control dynamics characteristics be measured at and recorded directly from the flight controls. This procedure is usually accomplished by measuring the free response of the controls using a step or impulse input to excite the system. The procedure shall be accomplished in the takeoff, cruise and landing flight conditions and configurations.

(3) For airplanes with irreversible control systems, measurements may be obtained on the ground if proper pitot-static inputs are provided to represent airspeeds typical of those encountered in flight. Likewise, it may be shown that for some airplanes, takeoff, cruise, and landing configurations have like effects. Thus, one may suffice for another. If either or both considerations apply, engineering validation or airplane manufacturer rationale shall be submitted as justification for ground tests or for eliminating a configuration. For flight simulators requiring static and dynamic tests at the controls, special test fixtures will not be required during initial and upgrade evaluations if the QTG shows both test fixture results and the results of an alternate approach, such as computer plots which were produced concurrently and show satisfactory agreement. Repeat of the alternate method during the initial evaluation would then satisfy this test requirement.

b. Control Dynamics Evaluation. The dynamic properties of control systems are often stated in terms of frequency, damping and a number of other classical measurements, which can be found in texts on control systems. In order to establish a consistent means of validating test results for flight simulator control loading, criteria are needed that will clearly define the interpretation of the measurements and the tolerances to be applied. Criteria are needed for underdamped, critically damped and overdamped systems. In the case of an underdamped system with very light damping, the system may be quantified in terms of frequency and damping. In critically damped or overdamped systems, the frequency and damping are not readily measured from a response time history. Therefore, some other measurement must be used.

(1) For Level C and D simulators. Tests to verify that control feel dynamics represent the airplane shall show that the dynamic damping cycles (free response of the controls) match those of the airplane within specified tolerances. An acceptable method of evaluating the response and the tolerance to be applied is described below for the underdamped and critically damped cases.

(a) Underdamped response. Two measurements are required for the period, the time to first zero crossing (in case a rate limit is present) and the subsequent frequency of oscillation. It is necessary to measure cycles on an individual basis in case there are non-uniform periods in the response. Each period will be independently compared to the respective period of the airplane control system and, consequently, will enjoy the full tolerance specified for that period. The damping tolerance will be applied to overshoots on an individual basis. Care should be taken when applying the tolerance to small overshoots since the significance of such overshoots becomes questionable. Only those overshoots larger than 5 per cent of the total initial displacement should be considered. The residual band, labeled $T(A_d)$ on Figure A2A is ±5 per cent of the initial displacement amplitude A_d from the steady state value of the oscillation. Only oscillations outside the residual band are considered significant. When comparing flight simulator data to airplane data, the process should begin by overlaying or aligning the flight simulator and airplane steady state values and then comparing amplitudes of oscillation peaks, the time of the first zero crossing and individual periods of oscillation. The flight simulator should show the same number of significant overshoots to within one when compared against the airplane data. The procedure for evaluating the response is illustrated in Figure A2A.

(b) Critically damped and overdamped response. Due to the nature of critically damped and overdamped responses (no overshoots), the time from 90 percent to 10 percent of the initial steady-state amplitude should be the same as the airplane within ±10 per cent. Figure A2B illustrates the procedure.

(c) Special considerations. Control systems which exhibit characteristics other than classical overdamped or underdamped responses should meet specified tolerances. In addition, special consideration should be given to ensure that significant trends are maintained.

(2) Tolerances.

(a) The following table summarizes the tolerances, T, for underdamped systems, and "n" is the sequential period of a full cycle of oscillation. See Figure A2A of this attachment for an illustration of the referenced measurements.

$T(P_0)$	±10% of P_0
$T(P_1)$	±20% of P_1
$T(P_2)$	±30% of P_2
$T(P_n)$	±10(n+1)% of P_n
$T(A_n)$	±10% of A_1
$T(A_d)$	±5% of A_d = residual band
Significant overshoots	first overshoot and ±1 subsequent overshoots

(b) The following tolerance applies to critically damped and overdamped systems only. See Figure A2B for an illustration of the reference measurements:

$T(P_0)$ $\pm 10\%$ of P_0

c. Alternate method for Control Dynamics Evaluation. An alternative means for dealing with control dynamics applies to airplanes with hydraulically powered flight controls and artificial feel systems. Instead of free response measurements, the system would be validated by measurements of control force and rate of movement.

(1) For each axis of pitch, roll and yaw, the control shall be forced to its maximum extreme position for the following distinct rates. These tests would be conducted at typical taxi, takeoff, cruise and landing conditions.

(a) Static test. Slowly move the control such that approximately 100 seconds are required to achieve a full sweep. A full sweep is defined as movement of the controller from neutral to the stop, usually aft or right stop, then to the opposite stop, then to the neutral position.

(b) Slow dynamic test. Achieve a full sweep in approximately 10 seconds.

(c) Fast dynamic test. Achieve a full sweep in approximately 4 seconds.

(Note: Dynamic sweeps may be limited to forces not exceeding 100 lb (44.5 daN).

(2) Tolerances.

(a) Static test._Same as tests 2.a.1., 2.a.2., and 2.a.3. in Table A2A in this attachment.

(b) Dynamic test. ±2 lb (±0.9 daN)or ±10 per cent on dynamic increment above static test.

(c) The NSPM are open to alternative means such as the one described above. Such alternatives, however, would have to be justified and appropriate to the application. For example, the method described here may not apply to all manufacturers' systems and certainly not to airplanes with reversible control systems. Hence, each case shall be considered on its own merit on an ad hoc basis. If the NSPM finds that alternative methods do not result in satisfactory performance, then more conventionally accepted methods must be used.

End Information

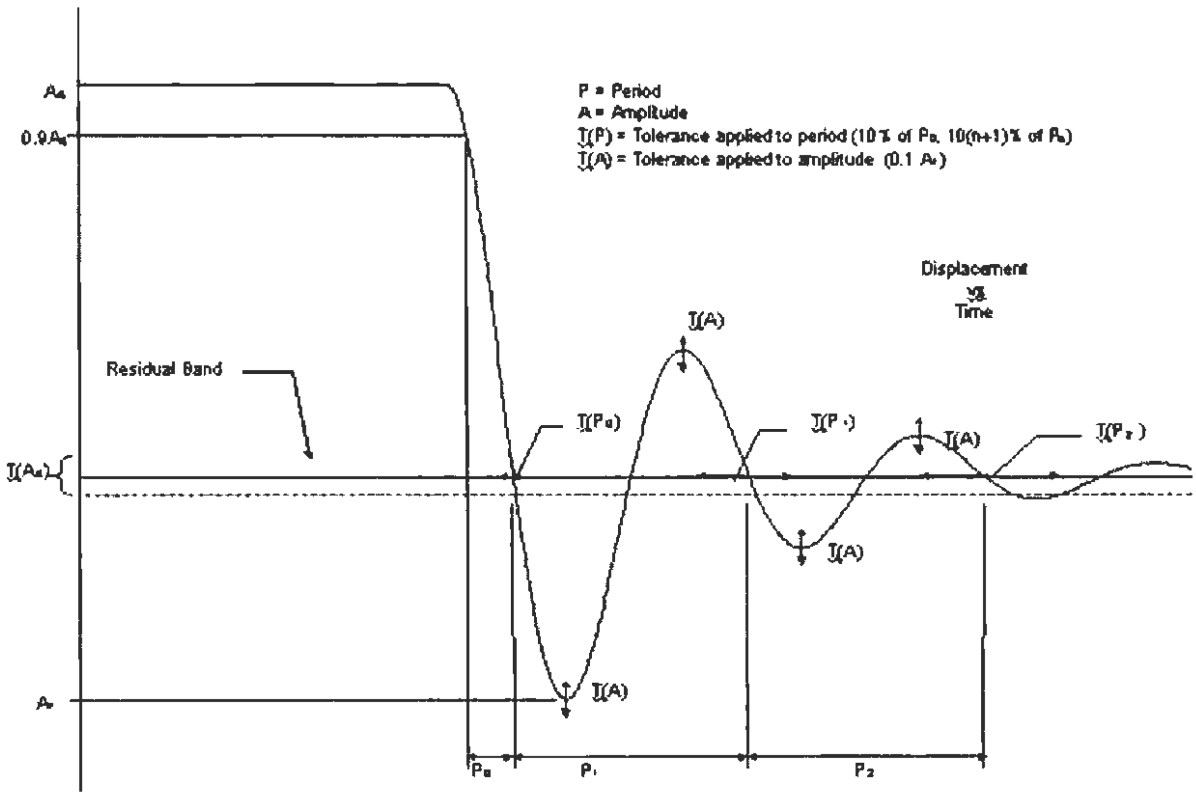


Figure A2A
Underdamped Step Response

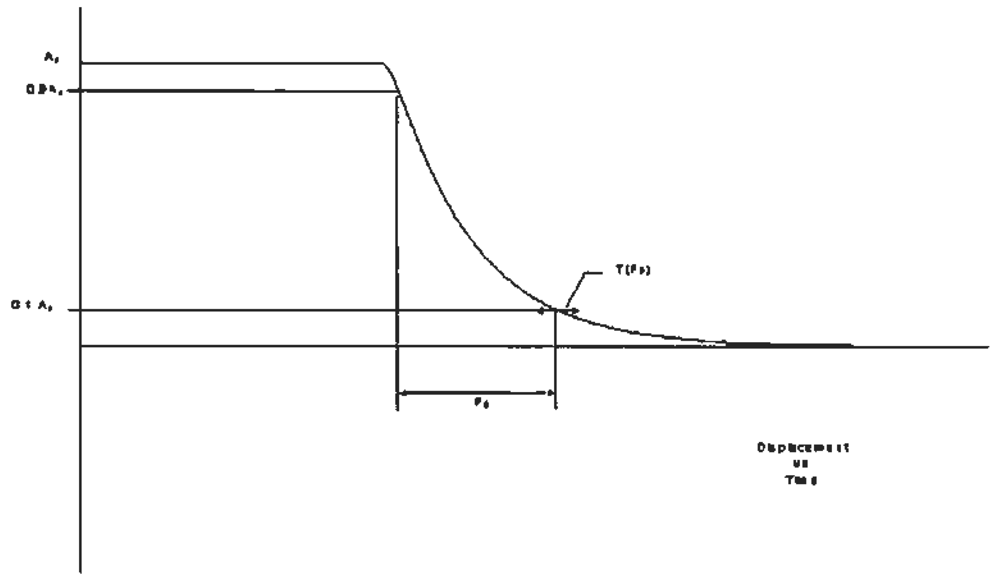


Figure A2B
Critically and Overdamped Step Response

Begin Information

10. Validation Test Tolerances

a. Non-Flight-Test Tolerances

(1) Where engineering simulator data or other non-flight-test data are used as an allowable form of reference validation data for the objective tests listed in Table A2A of this attachment, the match obtained between the reference data and the flight simulator results should be very close. It is not possible to define a precise set of tolerances as the reasons for other than an exact match will vary depending upon a number of factors discussed in sub-paragraph b of this paragraph.

(2) As guidance, unless a rationale justifies a significant variation between the reference data and the flight simulator results, 20% of the corresponding 'flight-test' tolerances would be appropriate.

(3) For this guideline (20% of flight-test tolerances) to be applicable, the data provider should supply a well-documented mathematical model and testing procedure that enables an exact replication of their engineering simulation results.

b. Background

(1) The tolerances listed in Table A2A in this attachment are designed to be a measure of quality of match using flight-test data as a reference.

(2) There are many reasons, however, why a particular test may not fully comply with the prescribed tolerances:

(a) Flight-test is subject to many sources of potential error, e.g., instrumentation errors and atmospheric disturbance during data collection;

(b) Data that exhibit rapid variation or noise may also be difficult to match;

(c) Engineering simulator data and other calculated data may exhibit errors due to a variety of potential differences discussed below.

(3) When applying tolerances to any test, good engineering judgment should be applied. Where a test clearly falls outside the prescribed tolerance(s) for no apparent reasons, then it should be judged to have failed.

(4) The use of non-flight-test data as reference data was in the past quite small, and therefore these tolerances were used for all tests. The inclusion of this type of data as a validation source has rapidly expanded, and will probably continue to expand.

(5) When engineering simulator data are used, the basis for their use is that the reference data are produced using the same simulation models as used in the equivalent flight training simulator; i.e., the two sets of results should be 'essentially' similar. The use of flight-test based tolerances may undermine the basis for using engineering simulator data, because an essential match is needed to demonstrate proper implementation of the data package.

(6) There are, of course, reasons why the results from the two sources can be expected to differ. Some of those reasons:

(a) Hardware (avionics units and flight controls);

(b) Iteration rates;

(c) Execution order;
(d) Integration methods;
(e) Processor architecture;
(f) Digital drift, including:
    (i) Interpolation methods;
    (ii) Data handling differences;
    (iii) Auto-test trim tolerances, etc.

(7) Any differences should, however, be small and the reasons for any differences, other than those listed above, should be clearly explained.

(8) Historically, engineering simulation data were used only to demonstrate compliance with certain extra modeling features:
(a) Flight test data could not reasonably be made available;
(b) Data from engineering simulations made up only a small portion of the overall validation data set;
(c) Key areas were validated against flight-test data.

(9) The current rapid increase in the use and projected use of engineering simulation data is an important issue because:
(a) Flight-test data are often not available due to sound technical reasons;
(b) Alternative technical solutions are being advanced;
(c) Cost is an ever-present issue.

(10) Guidelines are therefore needed for the application of tolerances to engineering-simulator-generated validation data.

End Information

Begin Information

11. Validation Data Roadmap

a. Airplane manufacturers or other sources of data should supply a validation data roadmap (VDR) document as part of the data package. A VDR document contains guidance material from the airplane validation data supplier recommending the best possible sources of data to be used as validation data in the QTG. A VDR is of special value in the cases of requests for 'interim' qualification, requests for qualification of simulations of airplanes certificated prior to 1992, and for qualification of alternate engine or avionics fits. A VDR should be submitted to the NSPM as early as possible in the planning stages for any flight simulator planned for qualification to the standards contained in this QPS appendix. The NSPM is the final authority to approve the data to be used as validation material for the QTG. The NSPM and the Joint Aviation Authorities' Synthetic Training Devices Advisory Board have committed to maintain a list of agreed VDR's.

b. The validation data roadmap should clearly identify (in matrix format) sources of data for all required tests. It should also provide guidance regarding the validity of these data for a specific engine type and thrust rating configuration and the revision levels of all avionics affecting airplane handling qualities and performance. The document should include rationale or explanation in cases where data or parameters are missing, engineering simulation data are to be used, flight test methods require explanation, etc., together with a brief narrative describing the cause/effect of any deviation from data requirements. Additionally, the document should make reference to other appropriate sources of validation data (e.g., sound and vibration data documents).

c. The Validation Data Roadmap table, shown in Table A2C, depicts a generic roadmap matrix identifying sources of validation data for an abbreviated list of tests. A complete matrix should address all test conditions.

d. Additionally, two examples of 'rationale pages' are presented in Appendix F of the International Air Transport Association (IATA) Flight Simulator Design & Performance Data Requirements document. These illustrate the type of airplane and avionics configuration information and descriptive engineering rationale used to describe data anomalies, provide alternative data, or provide an acceptable basis to the authority for obtaining deviations from QTG validation requirements.

End Information

ICAO or IATA #	Test Description	CCA Mode*1	Validation Source: Aircraft Flight Test Data *2	Validation Source: Engineering Simulator Data (DEF-73 Engines)	Validation Document: Aerodynamics POM Doc. # xxx123, Rev A	Validation Document: Flight Controls POM Doc. # xxx456, NEW	Validation Document: Ground Handling POM Doc. # xxx789, Rev B	Validation Document: Propulsion POM Doc. # xxx321, Rev C	Validation Document: Integrated POM Doc. # xxx654, Rev A	Validation Document: Appendix to this VDR Doc. # xxx987, NEW	Comments
	Notes: 1. Only one page is shown; and some test conditions were deleted for brevity; 2. Relevant regulatory material should be consulted and all applicable tests addressed; 3. Validation source, document and comments provided herein are for reference only and do not constitute approval for use										D71 = Engine Type: DEF-71, Thrust Rating: 71.5K D73 = Engine Type: DEF-73, Thrust Rating: 73K **BOLD** upper case denotes primary validation source Lower case denotes alternate validation source R = Rationale included in the VDR Appendix
1 a 1	Minimum Radius Turn		X				D71				
1 a 2	Rate of Turn vs. Nosewheel Angle (2 speeds)		X				D71				
1 b 1	Ground Acceleration Time and Distance		X				d73		D73		Primary data contained in IPOM
1 b 2	Minimum Control Speed, Ground (Vmcg)		x	X	d71					D73	See engineering rationale for test data in VDR
1 b 3	Minimum Unstick Speed (Vmu)		X		D71						
1 b 4	Normal Takeoff		X		d73				D73		Primary data contained in IPOM
1 b 5	Critical Engine Failure on Takeoff		X		d71					D73	Alternate engine thrust rating flight test data in VDR
1 b 6	Crosswind Takeoff		X		d71					D73	Alternate engine thrust rating flight test data in VDR
1 b 7	Rejected Takeoff		X		D71					R	Test procedure anomaly, see rationale
1 b 8	Dynamic Engine Failure After Takeoff			X						D73	No flight test data available, see rationale
1 c 1	Normal Climb - All Engine		X		d71				D71		Primary data contained in IPOM
1 c 2	Climb - Engine-Out, Second Segment		X		d71					D73	Alternate engine thrust rating flight test data in VDR
1 c 3	Climb - Engine-Out, Enroute		X		d71					D73	AFM data available (73K)
1 c 4	Engine-Out Approach Climb		X		D71						
1 c 5 a	Level Flight Acceleration		x	X	d73					D73	Eng sim data w/ modified EEC accel rate in VDR
1 c 5 b	Level Flight Deceleration		x	X	d73					D73	Eng sim data w/ modified EEC decel rate in VDR
1 d 1	Cruise Performance		X		D71						
1 e 1 a	Stopping Time & Distance (Wheel Brakes / Light weight)			X	D71					d73	No flight test data available, see rationale
1 e 1 b	Stopping Time & Distance (Wheel Brakes / Med weight)		X	x	D71					d73	
1 e 1 c	Stopping Time & Distance (Wheel Brakes / Heavy weight)		X	x	D71					d73	
1 e 2 a	Stopping Time & Distance (Reverse Thrust / Light weight)		X	x	D71					d73	
1 e 2 b	Stopping Time & Distance (Reverse Thrust / Med weight)			X	d71					D73	No flight test data available, see rationale

*1 CCA mode shall be described for each test condition.

*2 If more than one aircraft type (e.g., derivative and baseline) are used as validation data more columns may be necessary.

Table A2C

Validation Data Roadmap

Begin Information

12. Acceptance Guidelines for Alternative Engines Data

a. Background

(1) For a new airplane type, the majority of flight validation data are collected on the first airplane configuration with a 'baseline' engine type. These data are then used to validate all flight simulators representing that airplane type.

(2) In the case of flight simulators representing an airplane with engines of a different type than the baseline, or a different thrust rating than that of previously validated configurations, additional flight test validation data may be needed.

(3) When a flight simulator with additional and/or alternate engine fits is to be qualified, the QTG should contain tests against flight test validation data for selected cases where engine differences are expected to be significant.

b. Approval Guidelines For Validating Alternate Engine Applications.

(1) The following guidelines apply to flight simulators representing airplanes with alternate engine applications; or, with more than one engine type or thrust rating.

(2) Validation tests can be segmented into those that are dependent on engine type or thrust rating and those that are not.

(3) For tests that are independent of engine type or thrust rating, the QTG can be based on validation data from any engine application. Tests in this category should be clearly identified.

(4) For tests that are affected by engine type, the QTG should contain selected engine-specific flight test data sufficient to validate that particular airplane-engine configuration. These effects may be due to engine dynamic characteristics, thrust levels and/or engine-related airplane configuration changes. This category is primarily characterized by differences between different engine manufacturers' products, but also includes differences due to significant engine design changes from a previously flight-validated configuration within a single engine type. See Table A2D, Alternate Engine Validation Flight Tests in this section for a list of acceptable tests.

(5) For those cases where the engine type is the same, but the thrust rating exceeds that of a previously flight-validated configuration by five percent (5%) or more, or is significantly less than the lowest previously validated rating (a decrease of fifteen percent (15%) or more), the QTG should contain selected engine-specific flight test data sufficient to validate the alternate thrust level. See Table A2D in this section for a list of acceptable tests. However, if an airplane manufacturer, as a validation data supplier, shows that a thrust increase greater than 5% will not significantly change the airplane's flight characteristics, then flight validation data are not needed.

(6) No additional flight test data are required for thrust ratings which are not significantly different from that of the baseline or other applicable flight-validated engine-airframe configuration (i.e., less than 5% above or 15% below), except as noted in paragraphs (7) and (8), below. As an example, for a configuration validated with 50,000 pound-thrust-rated engines, no additional flight validation data are required for ratings between 42,500

and 52,500 lbs. If multiple engine ratings are tested concurrently, only test data for the highest rating are needed.

(7) Throttle calibration data (i.e., commanded power setting parameter versus throttle position) should be provided to validate all alternate engine types, and engine thrust ratings which are higher or lower than a previously validated engine. Data from a test airplane or engineering test bench are acceptable, provided the correct engine controller (both hardware and software) is used.

(8) The validation data described in paragraphs (4) through (7) in this section should he based on flight test data, except as noted in those paragraphs, or where other data are specifically allowed. However, if certification of the flight characteristics of the airplane with a new thrust rating (regardless of percentage change) does require certification flight testing with a comprehensive stability and control flight instrumentation package, then the conditions described in Table A2D in this section, should be obtained from flight testing and presented in the QTG. Conversely, flight test data other than throttle calibration as described above are not required if the new thrust rating is certified on the airplane without need for a comprehensive stability and control flight instrumentation package.

(9) As a supplement to the engine-specific flight tests listed in Table A2D and baseline engine-independent tests, additional engine-specific engineering validation data should be provided in the QTG, as appropriate, to facilitate running the entire QTG with the alternate engine configuration. The specific validation tests to be supported by engineering simulation data should be agreed with the authority well in advance of flight simulator evaluation.

(10) A matrix, or 'roadmap,' should be provided with the QTG indicating the appropriate validation data source for each test (see paragraph 11 of this attachment).

(11) The following flight test conditions (one per test number) are appropriate and should be sufficient to validate implementation of alternate engine fits in a flight simulator.

Table A2D
Alternate Engine Validation Flight Tests

<table>
<tr><th>TEST NUMBER</th><th colspan="2">TEST DESCRIPTION</th><th>ALTERNATE ENGINE TYPE</th><th>ALTERNATE THRUST RATING [2]</th></tr>
<tr><td>1.b.1.
1.b.4.</td><td colspan="2">Normal take-off/ground acceleration time & distance</td><td>X</td><td>X</td></tr>
<tr><td>1.b.2.</td><td colspan="2">V_{mcg}, if performed for airplane certification</td><td>X</td><td>X</td></tr>
<tr><td>1.b.5.</td><td>Engine-out take-off</td><td rowspan="2">Either test may be performed.</td><td rowspan="2">X</td><td rowspan="2"></td></tr>
<tr><td>1.b.8.</td><td>Dynamic engine failure after take-off</td></tr>
<tr><td>1.b.7.</td><td colspan="2">Rejected take-off if performed for airplane certification</td><td>X</td><td></td></tr>
<tr><td>1.d.1.</td><td colspan="2">Cruise performance</td><td>X</td><td></td></tr>
<tr><td>1.f.1.
1.f.2.</td><td colspan="2">Engine acceleration and deceleration</td><td>X</td><td>X</td></tr>
<tr><td>2.a.7.</td><td colspan="2">Throttle calibration [1]</td><td>X</td><td>X</td></tr>
<tr><td>2.c.1.</td><td colspan="2">Power change dynamics (acceleration)</td><td>X</td><td>X</td></tr>
<tr><td>2.d.1.</td><td colspan="2">V_{mca} if performed for airplane certification</td><td>X</td><td>X</td></tr>
<tr><td>2.d.5.</td><td colspan="2">Engine inoperative trim</td><td>X</td><td>X</td></tr>
<tr><td>2.e.1.</td><td colspan="2">Normal landing</td><td>X</td><td></td></tr>
</table>

[1] should be provided for all changes in engine type or thrust rating; see paragraph 12.b.(7).
[2] See paragraphs 12.b.(5) through 12.b.(8), for a definition of applicable thrust ratings.

End Information

Begin Information

13. Acceptance Guidelines for Alternative Avionics (Flight-Related Computers & Controllers)

a. Background

(1) For a new airplane type, the majority of flight validation data are collected on the first airplane configuration with a 'baseline' flight-related avionics ship-set; (see subparagraph b.(2) in this paragraph.) These data are then used to validate all flight simulators representing that airplane type.

(2) In the case of flight simulators representing an airplane with avionics of a different hardware design than the baseline, or a different software revision than that of previously validated configurations, additional validation data may be required.

(3) When a flight simulator with additional and/or alternate avionics configurations is to be qualified, the QTG should contain tests against validation data for selected cases where avionics differences are expected to be significant.

b. Approval Guidelines For Validating Alternate Avionics

(1) The following guidelines apply to flight simulators representing airplanes with a revised, or more than one, avionics configuration.

(2) The baseline validation data should be based on flight test data, except where other data are specifically allowed.

(3) The airplane avionics can be segmented into two groups, those systems or components whose functional behavior contributes to the aircraft response presented in the QTG results and those that do not. The following avionics are examples of contributory systems for which hardware design changes or software revision updates may lead to significant differences in the aircraft response relative to the baseline avionics configuration: flight control computers and controllers for engines, autopilot, braking system, nose wheel steering system, and high lift system. Related avionics such as stall warning and augmentation systems should also be considered.

(4) The acceptability of validation data used in the QTG for an alternative avionics fit should be determined as follows:

(a) For changes to an avionics system or component that do not affect QTG validation test response, the QTG test can be based on validation data from the previously validated avionics configuration.

(b) For an avionics change to a contributory system, , but where a specific test is not affected by this particular change (e.g., the avionics change is a BITE update or a modification in a different flight phase), that QTG test can be based on validation data from the previously-validated avionics configuration. The QTG should include authoritative justification (e.g., from the airplane manufacturer or system supplier) that this avionics change does not affect the test.

(c) For an avionics change to a contributory system, but where no new functionality is added and the impact of the avionics change on the airplane response is a small, well-understood effect, the QTG may be based on validation data from the previously-validated avionics configuration. This should be supplemented with avionics-specific validation data from the airplane manufacturer's engineering simulation, generated with the revised avionics configuration. In such cases, the QTG should include an authoritative rationale explaining the nature of the change and its effect on the airplane response.

(d) For an avionics change to a contributory system that significantly affects some tests in the QTG, especially where new functionality is added, the QTG should be based on validation data from the previously validated avionics configuration and supplemental avionics-specific flight test data sufficient to validate the alternate avionics revision. However, additional flight validation data may not be needed if the avionics changes were certified without need for testing with a comprehensive flight instrumentation package. The airplane manufacturer should coordinate flight simulator data requirements in this situation, in advance, with the NSPM.

(8) A matrix or 'roadmap' should be provided with the QTG indicating the appropriate validation data source for each test and, while not specifically required, it is expected that this should include identification of the revision state of those contributory avionics systems which, if changed, could affect specific test responses.

End Information

---

14. Transport Delay Testing

a. The purpose of this paragraph is to demonstrate how to determine the introduced transport delay through the flight simulator system such that it does not exceed a specific time delay. That is, measure the transport delay from control inputs through the interface, through each of the host computer modules and back through the interface to motion, flight instrument and visual systems, and show that it is no more than the maximum allowable interval.

b. Four specific examples of transport delay are described as follows:

(1) Simulation of classic non-computer controlled airplanes;
(2) Simulation of computer controlled airplanes using real airplane black boxes;
(3) Simulation of computer controlled airplanes using software emulation of airplane boxes;
(4) Simulation using software avionics or re-hosted instruments.

c. Figure A2C illustrates the total transport delay for a non-computer-controlled airplane, or the classic transport delay test.

d. Since there are no airplane-induced delays for this case, the total transport delay is equivalent to the introduced delay.

e. Figure A2D illustrates the transport delay testing method employed on a flight simulator that uses the real airplane controller system.

f. To obtain the induced transport delay for the motion, instrument and visual signal, the delay induced by the airplane controller should be subtracted from the total transport delay. This difference represents the introduced delay and should not exceed 150 msec.

g. Introduced transport delay is measured from the cockpit control input to the reaction of the instruments, and motion and visual systems (See Figure A2C).

h. Alternatively, the control input may be introduced after the airplane controller system and the introduced transport delay measured directly from the control input to the reaction of the instruments, and simulator motion and visual systems (See Figure A2D).

i. Figure A2E illustrates the transport delay testing method employed on a flight simulator that uses a software emulated airplane controller system.

j. By using the simulated airplane controller system architecture for the pitch, roll and yaw axes, it is not possible to measure simply the introduced transport delay. Therefore, the signal should be measured directly from the pilot controller. Since in the real airplane the controller system has an inherent delay as provided by the airplane manufacturer, the flight simulator manufacturer should measure the total transport delay and subtract the inherent delay of the actual airplane components and ensure that the introduced delay does not exceed 150 msec.

k. Special measurements for instrument signals for flight simulators using a real airplane instrument display system, versus a simulated or re-hosted display. For the case of the flight instrument systems, the total transport delay should be measured, and the inherent delay of the actual airplane components subtracted to ensure that the introduced delay does not exceed 150 msec.

(1) Figure A2FA illustrates the transport delay procedure without the simulation of airplane displays. The introduced delay consists of the delay between the control movement and the instrument change on the data bus.

(2) Figure A2FB illustrates the modified testing method required to correctly measure introduced delay due to software avionics or re-hosted instruments. The total simulated instrument transport delay is measured and the airplane delay should be subtracted from this total. This difference represents the introduced delay and should not exceed 150 msec. The inherent delay of the airplane between the data bus and the displays is indicated as 150 msec (See figure A2FA). The display manufacturer should provide this delay time.

l. Recorded signals. The signals recorded to conduct the transport delay calculations should be explained on a schematic block diagram. The flight simulator manufacturer should also provide an explanation of why each signal was selected and how they relate to the above descriptions.

m. Interpretation of results. It is normal that flight simulator results vary over time from test to test. This easily can be explained by a simple factor called 'sampling uncertainty.' All flight simulators run at a specific rate where all modules are executed sequentially in the host computer. The flight controls input can occur at any time in the iteration, but these data will not be processed before the start of the new iteration. For a flight simulator running at 60 Hz a worst-case difference of 16.67 msec can be expected. Moreover, in some conditions, the host simulator and the visual system do not run at the same iteration rate, therefore the output of the host computer to the visual will not always be synchronized.

n. The transport delay test should account for both daylight and night modes of operation of the visual system. In both cases, the tolerance is 150 msec and motion response should occur before the end of the first video scan containing new information.

Figure A2C
Transport Delay for simulation of classic non-computer controlled airplanes.

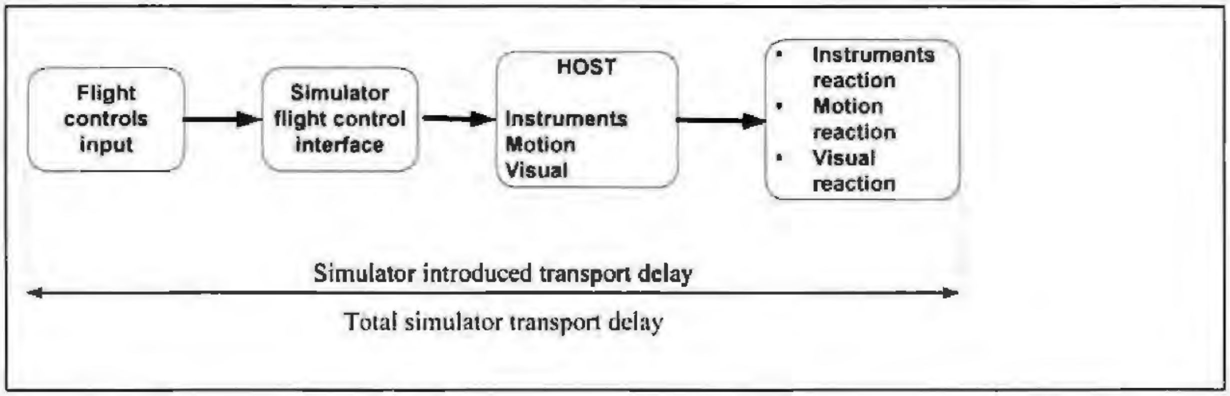


Figure A2D
Transport Delay for simulation of computer controlled airplanes using real airplane black boxes

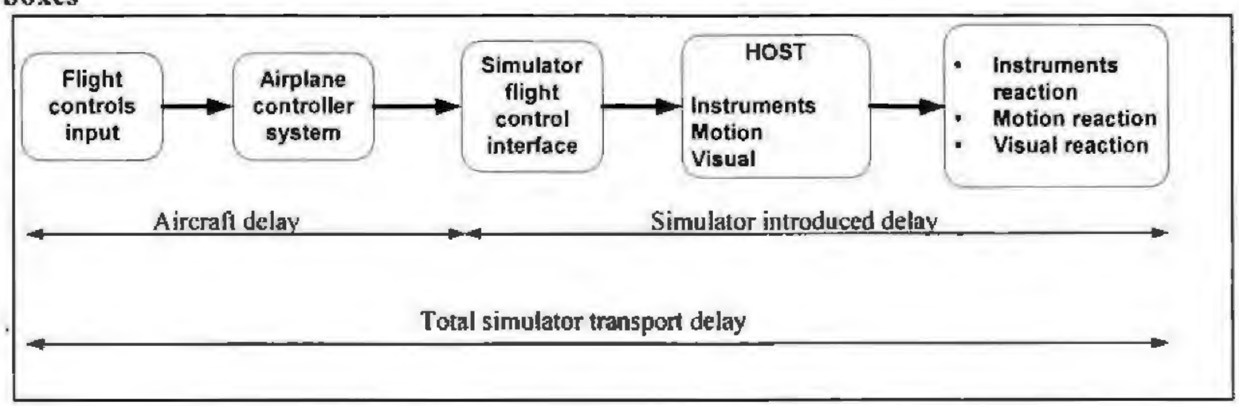


Figure A2E
Transport Delay for simulation of computer controlled airplanes using software emulation of airplane boxes

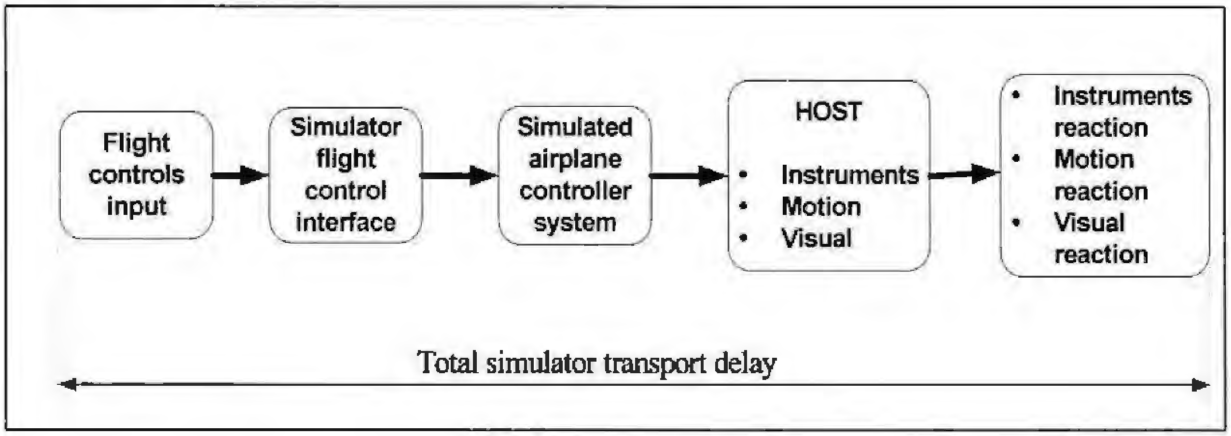
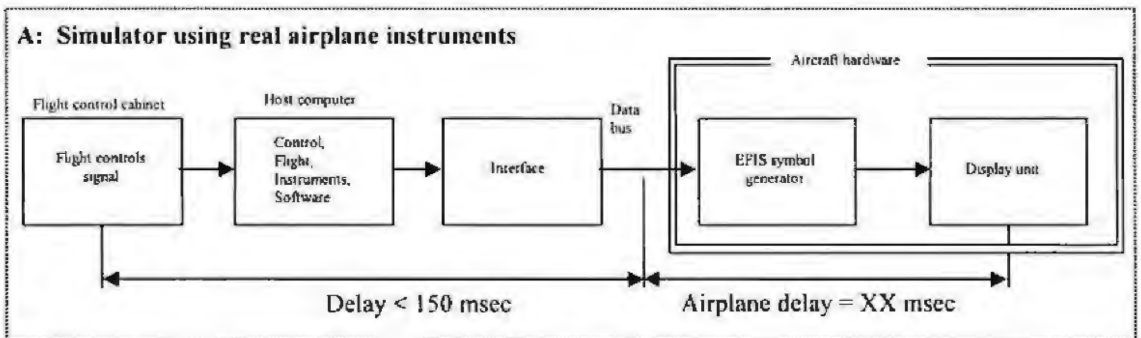
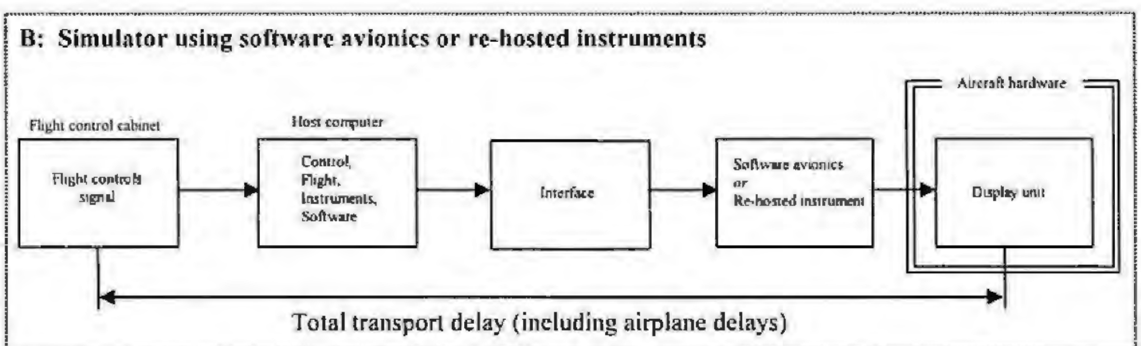


Figure A2FA and A2FB
Transport delay for simulation of airplanes using real or re-hosted instrument drivers





End Information

Begin Information

15. Continuing Qualification Evaluations - Validation Test Data Presentation

a. Background

(1) During the initial evaluation of a flight simulator the MQTG is created. This is the master document, as amended, to which flight simulator continuing qualification evaluation test results are compared.

(2) The currently accepted method of presenting continuing qualification evaluation test results is to provide flight simulator results over-plotted with reference data. Test results are carefully reviewed to determine if the test is within the specified tolerances. This can be a time consuming process, particularly when reference data exhibits rapid variations or an apparent anomaly requiring engineering judgment in the application of the tolerances. In these cases the solution is to compare the results to the MQTG. If the continuing qualification results are the same as those in the MQTG, the test is accepted. Both the flight simulator operator and the NSPM look for any change in the flight simulator performance since initial qualification.

b. Continuing Qualification Evaluation Test Results Presentation

(1) To promote a more efficient continuing qualification evaluation, flight simulator operators are encouraged to over-plot continuing qualification validation test results with MQTG flight simulator results recorded during the initial evaluation and as amended. Any change in a validation test will be readily apparent. In addition to plotting continuing qualification validation test and MQTG results, operators may elect to plot reference data as well.

(2) There are no suggested tolerances between flight simulator continuing qualification and MQTG validation test results. Investigation of any discrepancy between the MQTG and continuing qualification flight simulator performance is left to the discretion of the flight simulator operator and the NSPM.

(3) Differences between the two sets of results, other than minor variations attributable to repeatability issues that cannot easily be explained may require investigation.

(4) The flight simulator should still retain the capability to over-plot both automatic and manual validation test results with reference data.

End Information

Begin Information

16. Alternative Data Sources, Procedures, and Instrumentation: Level A and Level B Simulators Only

a. In recent years, considerable progress has been made by highly experienced aircraft and simulator manufacturers in improvement of aerodynamic modeling techniques. In conjunction with increased accessibility to very high powered computer technology, these techniques have become quite sophisticated. Additionally, those who have demonstrated success in combining these modeling techniques with minimal flight testing have incorporated the use of highly mature flight controls models and have had extensive experience in comparing the output of their effort with actual flight test data - and they have been able to do so on an iterative basis over a period of years.

b. It has become standard practice for experienced simulator manufacturers to use such techniques as a means of establishing data bases for new simulator configurations while awaiting the availability of actual flight test data; and then comparing this new data with the newly available flight test data. The results of such comparisons have, as reported by some recognized and experienced simulation experts, become increasingly consistent and indicate that these techniques, applied with appropriate experience, are becoming dependably accurate for the development of aerodynamic models for use in Level A and Level B simulators.

c. In reviewing this history, the NSPM has concluded that, with proper care, those who are experienced in the development of aerodynamic models for simulator application can successfully use these modeling techniques to acceptably alter the method by which flight test data may be acquired and, when applied to Level A or Level B simulators, does not compromise the quality of that simulation.

d. The information in Table A2D (Alternative Data Sources, Procedures, and Information) is presented to describe an acceptable alternative to data sources for simulator modeling and validation and as an acceptable alternative to the procedures and instrumentation found in the traditionally accepted flight test methods used to gather such modeling and validation data.

(1) Alternative data sources which may be used for part or all of a data requirement are the Airplane Maintenance Manual, the Airplane Flight Manual (AFM), Airplane Design Data, the Type Inspection Report (TIR), Certification Data or acceptable supplemental flight test data.

(2) The NSPM recommends that use of the alternative instrumentation noted in the following Table be coordinated with the NSPM prior to employment in a flight test or data gathering effort.

e. The NSPM position regarding the use of these alternative data sources, procedures, and instrumentation is based on three primary preconditions and presumptions regarding the objective data and simulator aerodynamic program modeling.

(1) While the data gathered through the alternative means does not require angle of attack (AOA) measurements or control surface position measurements for any flight test, AOA can be sufficiently derived if the flight test program insures the collection of acceptable level, unaccelerated, trimmed flight data. All of the simulator time history tests that begin in level, unaccelerated, and trimmed flight, including the three basic trim tests and "fly-by" trims, can be a successful validation of angle of attack by comparison with flight test pitch angle. (Note: Due to the criticality of angle of attack in the development of the ground effects model, particularly critical for normal landings and landings involving cross-control input applicable to Level B simulators, stable "fly-by" trim data will be the acceptable norm for normal and cross-control input landing objective data for these applications.)

(2) A rigorously defined and fully mature simulation controls system model that includes accurate gearing and cable stretch characteristics (where applicable), determined from actual aircraft measurements, will be used. Such a model does not require control surface position measurements in the flight test objective data in these limited applications.

(3) The authorized uses of Level A and Level B simulators (as listed in the appropriate Commercial, Instrument, or Airline Transport Pilot and/or Type Rating Practical Test Standards) for "initial," "transition," or "upgrade" training, still requires additional flight training and/or flight testing/checking in the airplane or in a Level C or Level D simulator.

f. The sponsor is urged to contact the NSPM for clarification of any issue regarding airplanes with reversible control systems. This table is not applicable to Computer Controlled Aircraft flight simulators.

g. Utilization of these alternate data sources, procedures, and instrumentation does not relieve the sponsor from compliance with the balance of the information contained in this document relative to Level A or Level B flight simulators.

h. When the term, "inertial measurement system" is used in the following table, this is meant to include the use of a functional global positioning system (GPS).

End Information

Table A2D

Alternative Data Sources, Procedures, and Instrumentation Information				
--Table of Objective Tests -- Test Reference Number and Title	Sim Level A	Sim Level B	Alternative Data Sources, Procedures, and Instrumentation	Notes and Reminders
1.a.1. Performance. Taxi. Minimum Radius turn	X	X	TIR, AFM, or Design data may be used.	
1.a.2. Performance. Taxi Rate of Turn vs. Nosewheel Steering Angle		X	Data may be acquired by using a constant tiller position, measured with a protractor or full rudder pedal application for steady state turn, and synchronized video of heading indicator. If less than full rudder pedal is used, pedal position must be recorded.	A single procedure may not be adequate for all airplane steering systems, therefore appropriate measurement procedures must be devised and proposed for NSPM concurrence.
1.b.1. Performance. Takeoff. Ground Acceleration Time and Distance	X	X	Preliminary certification data may be used. Data may be acquired by using a stop watch, calibrated airspeed, and runway markers during a takeoff with power set before brake release. Power settings may be hand recorded. If an inertial measurement system is installed, speed and distance may be derived from acceleration measurements.	
1.b.2. Performance. Takeoff. Minimum Control Speed - ground (V_{mcg}) using aerodynamic controls only (per applicable airworthiness standard) or low speed, engine inoperative ground control characteristics	X	X	Data may be acquired by using an inertial measurement system and a synchronized video of: the calibrated airplane instruments and the force/position measurements of cockpit controls.	Rapid throttle reductions at speeds near V_{mcg} may be used while recording appropriate parameters. The nose wheel must be free to caster, or equivalently freed of sideforce generation.
1.b.3. Performance. Takeoff. Minimum Unstick Speed (V_{mu}) or equivalent test to demonstrate early rotation takeoff characteristics.	X	X	Data may be acquired by using an inertial measurement system and a synchronized video of: the calibrated airplane instruments and the force/position measurements of cockpit controls.	
1.b.4. Performance. Takeoff. Normal Takeoff	X	X	Data may be acquired by using an inertial measurement system and a synchronized video of: the calibrated airplane instruments and the force/position measurements of cockpit controls. AOA can be calculated from pitch attitude and flight path.	
1.b.5. Performance. Takeoff.	X	X	Data may be acquired by using an inertial measurement system and a	Record airplane dynamic response to engine

Table A2D

Alternative Data Sources, Procedures, and Instrumentation Information				
--Table of Objective Tests -- Test Reference Number and Title	Sim Level A	Sim Level B	Alternative Data Sources, Procedures, and Instrumentation	Notes and Reminders
Critical Engine Failure during Takeoff			synchronized video of: the calibrated airplane instruments and the force/position measurements of cockpit controls.	failure and control inputs required to correct flight path.
1.b. 6. Performance. Takeoff. Crosswind Takeoff	X	X	Data may be acquired by using an inertial measurement system and a synchronized video of: the calibrated airplane instruments and the force/position measurements of cockpit controls.	The "1:7 law" to 100 feet (30 meters) is an acceptable wind profile.
1.b. 7. Performance. Takeoff. Rejected Takeoff	X	X	Data may be acquired with a synchronized video of: calibrated airplane instruments, thrust lever position, engine parameters, and distance (e.g., runway markers). A stop watch is required.	
1.c. 1. Performance. Climb. Normal Climb all engines operating.	X	X	Data may be acquired with a synchronized video of: calibrated airplane instruments and engine power throughout the climb range.	
1.c.2. Performance. Climb. One engine Inoperative Climb	X	X	Data may be acquired with a synchronized video of: calibrated airplane instruments and engine power throughout the climb range.	
1.c.4. Performance. Climb. One Engine Inoperative Approach Climb (if approved AFM requires specific performance in icing conditions)	X	X	Data may be acquired with a synchronized video of calibrated airplane instruments and engine power throughout the climb range.	
1.d.1. Cruise / Descent. Level flight acceleration.	X	X	Data may be acquired with a synchronized video of: calibrated airplane instruments, thrust lever position, engine parameters, and elapsed time.	
1.d.2. Cruise / Descent. Level flight deceleration.	X	X	Data may be acquired with a synchronized video of: calibrated airplane instruments, thrust lever position, engine parameters, and elapsed time.	
1.d.4. Cruise / Descent. Idle descent.	X	X	Data may be acquired with a synchronized video of: calibrated airplane instruments, thrust lever position, engine parameters, and elapsed time.	

Table A2D

Alternative Data Sources, Procedures, and Instrumentation Information				
--Table of Objective Tests -- Test Reference Number and Title	Sim Level A	Sim Level B	Alternative Data Sources, Procedures, and Instrumentation	Notes and Reminders
1.d.5. Cruise / Descent. Emergency Descent.	X	X	Data may be acquired with a synchronized video of: calibrated airplane instruments, thrust lever position, engine parameters, and elapsed time.	
1.e.1. Performance. Stopping. Deceleration time and distance, using manual application of wheel brakes and no reverse thrust on a dry runway.	X	X	Data may be acquired during landing tests using a stop watch, runway markers, and a synchronized video of: calibrated airplane instruments, thrust lever position and the pertinent parameters of engine power.	
1.e.2. Performance. Ground. Deceleration Time and Distance, using reverse thrust and no wheel brakes.	X	X	Data may be acquired during landing tests using a stop watch, runway markers, and a synchronized video of: calibrated airplane instruments, thrust lever position and the pertinent parameters of engine power.	
1.f.1. Performance. Engines. Acceleration	X	X	Data may be acquired with a synchronized video recording of: engine instruments and throttle position.	
1.f.2. Performance. Engines. Deceleration	X	X	Data may be acquired with a synchronized video recording of: engine instruments and throttle position.	
2.a.1.a. Handling Qualities. Static Control Checks. Pitch Controller Position vs. Force and Surface Position Calibration	X	X	Surface position data may be acquired from flight data recorder (FDR) sensor or, if no FDR sensor, at selected, significant column positions (encompassing significant column position data points), acceptable to the NSPM, using a control surface protractor on the ground (for airplanes with reversible control systems, this function should be accomplished with winds less than 5 kt). Force data may be acquired by using a hand held force gauge at the same column position data points.	
2.a.2.a. Handling Qualities. Static Control Checks. Roll Controller Position vs. Force and Surface Position Calibration	X	X	Surface position data may be acquired from flight data recorder (FDR) sensor or, if no FDR sensor, at selected, significant wheel positions (encompassing significant wheel position data points), acceptable to the NSPM, using a control surface protractor on the ground (for airplanes	

Table A2D

Alternative Data Sources, Procedures, and Instrumentation Information				
--Table of Objective Tests -- Test Reference Number and Title	Sim Level A	Sim Level B	Alternative Data Sources, Procedures, and Instrumentation	Notes and Reminders
			with reversible control systems, this function should be accomplished with winds less than 5 kt). Force data may be acquired by using a hand held force gauge at the same wheel position data points.	
2.a.3. Handling Qualities. Static Control Checks. Rudder Pedal Position vs. Force and Surface Position Calibration	X	X	Surface position data may be acquired from flight data recorder (FDR) sensor or, if no FDR sensor, at selected, significant rudder pedal positions (encompassing significant rudder pedal position data points), acceptable to the NSPM, using a control surface protractor on the ground (for airplanes with reversible control systems, this function should be accomplished with winds less than 5 kt). Force data may be acquired by using a hand held force gauge at the same rudder pedal position data points.	
2.a.4. Handling Qualities. Static Control Checks. Nosewheel Steering Controller Force & Position	X	X	Breakout data may be acquired with a hand held force gauge. The remainder of the force to the stops may be calculated if the force gauge and a protractor are used to measure force after breakout for at least 25% of the total displacement capability.	
2.a.5. Handling Qualities. Static Control Checks. Rudder Pedal Steering Calibration	X	X	Data may be acquired through the use of force pads on the rudder pedals and a pedal position measurement device, together with design data for nose wheel position.	
2.a.6. Handling Qualities. Static Control Checks. Pitch Trim Indicator vs. Surface Position Calibration.	X	X	Data may be acquired through calculations.	
2.a.7. Handling qualities. Static control tests. Pitch trim rate.	X	X	Data may be acquired by using a synchronized video of pitch trim indication and elapsed time through range of trim indication.	
2.a.8. Handling Qualities. Static Control tests. Alignment of Cockpit Throttle Lever Angle vs. Selected	X	X	Data may be acquired through the use of a temporary throttle quadrant scale to document throttle position. Use a synchronized video to record steady state instrument readings or hand-record	

Table A2D

Alternative Data Sources, Procedures, and Instrumentation Information				
--Table of Objective Tests -- Test Reference Number and Title	Sim Level A	Sim Level B	Alternative Data Sources, Procedures, and Instrumentation	Notes and Reminders
engine parameter .			steady state engine performance readings.	
2.a.9. Handling qualities. Static control tests. Break pedal position vs. force and brake system pressure calibration.	X	X	Use of design or predicted data is acceptable. Data may be acquired by measuring deflection at "zero" and "maximum" and calculating deflections between the extremes using the airplane design data curve.	
2.c.1. Handling qualities. Longitudinal control tests. Power change dynamics	X	X	Data may be acquired by using an inertial measurement system and a synchronized video of: the calibrated airplane instruments and throttle position.	
2.c.2. Handling qualities. Longitudinal control tests. Flap/slat change dynamics	X	X	Data may be acquired by using an inertial measurement system and a synchronized video of: calibrated airplane instruments and flap/slat position.	
2.c.3. Handling qualities. Longitudinal control tests. Spoiler/speedbrake change dynamics	X	X	Data may be acquired by using an inertial measurement system and a synchronized video of: the calibrated airplane instruments and spoiler/speedbrake position.	
2.c.4. Handling qualities. Longitudinal control tests. Gear change dynamics	X	X	Data may be acquired by using an inertial measurement system and a synchronized video of: the calibrated airplane instruments and gear position.	
2.c.5. Handling qualities. Longitudinal control tests. Longitudinal trim	X	X	Data may be acquired through use of an inertial measurement system and a synchronized video of: the cockpit controls position (previously calibrated to show related surface position) and the engine instrument readings.	
2.c.6. Handling qualities. Longitudinal control tests. Longitudinal maneuvering stability (stick force/g)	X	X	Data may be acquired through the use of an inertial measurement system and a synchronized video of: the calibrated airplane instruments; a temporary, high resolution bank angle scale affixed to the attitude indicator; and a wheel and column force measurement indication.	
2.c.7. Handling qualities. Longitudinal control tests. Longitudinal static stability	X	X	Data may be acquired through the use of a synchronized video of: the airplane flight instruments and a hand held force gauge.	
2.c.8. Handling qualities.	X	X	Data may be acquired through a synchronized video recording of: a stop	Airspeeds may be cross checked with those in

Table A2D

Alternative Data Sources, Procedures, and Instrumentation Information				
--Table of Objective Tests -- Test Reference Number and Title	Sim Level A	Sim Level B	Alternative Data Sources, Procedures, and Instrumentation	Notes and Reminders
Longitudinal control tests. Stall characteristics			watch and the calibrated airplane airspeed indicator. Hand-record the flight conditions and airplane configuration.	the TIR and AFM.
2.c.9. Handling qualities. Longitudinal control tests. Phugoid dynamics	X	X	Data may be acquired by using an inertial measurement system and a synchronized video of: the calibrated airplane instruments and the force/position measurements of cockpit controls.	
2.c.10. Handling qualities. Longitudinal control tests. Short period dynamics	X	X	Data may be acquired by using an inertial measurement system and a synchronized video of: the calibrated airplane instruments and the force/position measurements of cockpit controls.	
2.d.1. Handling qualities. Lateral directional tests. Minimum control speed, air (V_{mca} or V_{mci}), per applicable airworthiness standard or Low speed engine inoperative handling characteristics in the air	X	X	Data may be acquired by using an inertial measurement system and a synchronized video of: the calibrated airplane instruments and the force/position measurements of cockpit controls.	
2.d.2. Handling qualities. Lateral directional tests. Roll response (rate).	X	X	Data may be acquired by using an inertial measurement system and a synchronized video of: the calibrated airplane instruments and the force/position measurements of cockpit lateral controls.	May be combined with step input of cockpit roll controller test, 2.d.3.
2.d.3. Handling qualities. Lateral directional tests. Roll response to cockpit roll controller step input	X	X	Data may be acquired by using an inertial measurement system and a synchronized video of: the calibrated airplane instruments and the force/position measurements of cockpit lateral controls.	
2.d.4. Handling qualities. Lateral directional tests. Spiral stability	X	X	Data may be acquired by using an inertial measurement system and a synchronized video of: the calibrated airplane instruments; the force/position measurements of cockpit controls; and a stop watch.	
2.d.5. Handling qualities. Lateral directional tests.	X	X	Data may be hand recorded in-flight using high resolution scales affixed to trim controls that have been calibrated	Trimming during second segment climb is not a certification task and

Table A2D

Alternative Data Sources, Procedures, and Instrumentation Information				
--Table of Objective Tests -- Test Reference Number and Title	Sim Level A	Sim Level B	Alternative Data Sources, Procedures, and Instrumentation	Notes and Reminders
Engine inoperative trim			on the ground using protractors on the control / trim surfaces with winds less than 5 kts.. OR Data may be acquired during second segment climb (with proper pilot control input for an engine-out condition) by using a synchronized video of: the calibrated airplane instruments; and the force/position measurements of cockpit controls.	should not be conducted until a safe altitude is reached.
2.d.6. Handling qualities. Lateral directional tests. Rudder response.	X	X	Data may be acquired by using an inertial measurement system and a synchronized video of: the calibrated airplane instruments; the force/position measurements of rudder pedals.	
2.d.7. Handling qualities. Lateral directional tests. Dutch roll, (yaw damper OFF)	X	X	Data may be acquired by using an inertial measurement system and a synchronized video of: the calibrated airplane instruments; the force/position measurements of cockpit controls.	
2.d.8. Handling qualities. Lateral directional tests. Steady state sideslip	X	X	Data may be acquired by using an inertial measurement system and a synchronized video of: the calibrated airplane instruments; the force/position measurements of cockpit controls. Ground track and wind corrected heading may be used for sideslip angle.	
2.e.1. Handling qualities. Landings. Normal landing.		X	Data may be acquired by using an inertial measurement system and a synchronized video of: the calibrated airplane instruments; the force/position measurements of cockpit controls.	
2.e.3. Handling qualities. Landings. Crosswind landing.		X	Data may be acquired by using an inertial measurement system and a synchronized video of: the calibrated airplane instruments; the force/position measurements of cockpit controls.	
2.e.4. Handling qualities. Landings. One engine inoperative landing.		X	Data may be acquired by using an inertial measurement system and a synchronized video of: the calibrated airplane instruments; the force/position measurements of cockpit controls. Normal and lateral accelerations may be recorded in lieu of AOA and sideslip.	
2.e.5.		X	Data may be acquired by using an	

Table A2D

Alternative Data Sources, Procedures, and Instrumentation Information				
--Table of Objective Tests -- Test Reference Number and Title	Sim Level A	Sim Level B	Alternative Data Sources, Procedures, and Instrumentation	Notes and Reminders
Handling qualities. Landings. Autopilot landing (if applicable)			inertial measurement system and a synchronized video of: the calibrated airplane instruments; the force/position measurements of cockpit controls. Normal and lateral accelerations may be recorded in lieu of AOA and sideslip.	
2.e.6. Handling qualities. Landings. All engines operating, autopilot, go around.		X	Data may be acquired by using an inertial measurement system and a synchronized video of: the calibrated airplane instruments; the force/position measurements of cockpit controls. Normal and lateral accelerations may be recorded in lieu of AOA and sideslip.	
2.e.7. Handling qualities. Landings. One engine inoperative go around.		X	Data may be acquired by using an inertial measurement system and a synchronized video of: the calibrated airplane instruments; the force/position measurements of cockpit controls. Normal and lateral accelerations may be recorded in lieu of AOA and sideslip.	
2.e.8. Handling qualities. Landings. Directional control (rudder effectiveness with symmetric thrust).		X	Data may be acquired by using an inertial measurement system and a synchronized video of: the calibrated airplane instruments; the force/position measurements of cockpit controls. Normal and lateral accelerations may be recorded in lieu of AOA and sideslip.	
2.e.9. Handling qualities. Landings. Directional control (rudder effectiveness with asymmetric reverse thrust).		X	Data may be acquired by using an inertial measurement system and a synchronized video of: the calibrated airplane instruments; the force/position measurements of cockpit controls. Normal and lateral accelerations may be recorded in lieu of AOA and sideslip.	
2.f. Handling qualities. Ground effect. Test to demonstrate ground effect		X	Data may be acquired by using calibrated airplane instruments, an inertial measurement system, and a synchronized video of: the calibrated airplane instruments; the force/position measurements of cockpit controls.	

Attachment 3 to Appendix A to Part 60--
SIMULATOR SUBJECTIVE EVALUATION

1. Requirements.

Begin QPS Requirements

a. Except for special use visual models, airports represented in visual models required by this part should be representations of real-world, operational airports or representations of fictional airports and should meet the requirements set out in Tables A3B and A3C of this attachment, as appropriate.

b. If fictional airports are used, the sponsor should ensure that navigational aids and all appropriate maps, charts, and other navigational reference material for such airports (and surrounding areas as necessary), are compatible, complete, and accurate with respect to the visual presentation and scene content of the visual model of this fictional airport. An SOC should be submitted that addresses navigation aid installation and performance and other criteria (including obstruction clearance protection, etc.) for all instrument approaches that are available in the simulator. The SOC should reference and account for information in the terminal instrument procedures manual and the construction and availability of the required maps, charts, and other navigational material. This material should be appropriately marked "for training purposes only."

c. The airport visual models available in a simulator should be classified as one of the following:

(1) Class I (whether modeling real world airports or fictional airports) for those visual models that meet the minimum requirements set out in Table A3B of this attachment for qualification at a specified level. These models will be evaluated by the NSP and, if found acceptable, will be listed on the Statement of Qualification (SOQ).

(2) Class II (whether modeling real world airports or fictional airports) for those visual models that meet the minimum requirements set out in Table A3C of this attachment for qualification at a specified level and may be available on the simulator without further involvement of the NSPM or the TPAA.

(3) Class III (whether modeling real world airports or fictional airports) for those visual models available on the simulator and approved by the TPAA for specific purposes; e.g., specific airport or runway qualification; very low visibility operations training; use of a specific airport visual model aligned with an instrument procedure for another airport for instrument training; etc. These models may be referred to as "special use models."

d. Neitber the Class II nor the Class III airport visual models are required to appear on the SOQ.

e. When a person sponsors an FSTD maintained by a person other than a US certificate holder, the sponsor remains accountable for the airport visual models in that simulator; however –

(1) If that FSTD is maintained under a qualification by a non-FAA regulatory authority and that authority and the NSPM have agreed to accept each other's simulator evaluations (e.g., under a Bilateral Aviation Safety Agreement, BASA, and associated Simulator Implementation Procedures, SIP, such as the Joint Aviation Authorities, JAA, of Europe), no additional requirements should be met for airport visual models;

(2) If that FSTD is maintained under qualification of a regulatory authority where there is no BASA/SIP as described in e(1), or that authority and the NSPM have not agreed to accept each other's qualification programs, the sponsor will be required to reach an agreement with the NSPM regarding airport visual models available in this specific FSTD.

End QPS Requirements

2. Discussion

Begin Information

a. The subjective tests provide a basis for evaluating the capability of the simulator to perform over a typical utilization period; determining that the simulator competently simulates each required maneuver, procedure, or task; and verifying correct operation of the simulator controls, instruments, and systems. The items listed in the following Tables are for simulator evaluation purposes only. They must not be used to limit or exceed the authorizations for use of a given level of simulator as described on the Statement of Qualification or as may be approved by the TPAA. All items in the following paragraphs are subject to an examination.

b. The tests in Table A3A, Operations Tasks, in this attachment. address pilot functions, including maneuvers and procedures (called flight tasks), and is divided by flight phases. The performance of these tasks by the NSPM includes an operational examination of the visual system and special effects. There are flight tasks included to address some features of advanced technology airplanes and innovative training programs. For example, "high angle-of-attack maneuvering" is included to provide a required alternative to "approach to stalls" for airplanes employing flight envelope protection functions.

c. The tests in Tahle A3A, Operations Tasks, and Table A3G, Instructor Operating Station, in this attachment, address the overall function and control of the simulator including the various simulated environmental conditions; simulated airplane system operation (normal, abnormal, and emergency); visual system displays; and special effects necessary to meet flightcrew training, evaluation, or flight experience requirements.

d. All simulated airplane systems functions will be assessed for normal and, where appropriate, alternate operations. Normal, abnormal, and emergency operations associated with a flight phase will be assessed during the evaluation of flight tasks or events within that flight phase. Simulated airplane systems are listed separately under "Any Flight Phase" to ensure appropriate attention to systems checks. Operational navigation systems (including inertial navigation systems, global positioning systems, or other long-range systems) and the associated electronic display systems will be evaluated if installed. The NSP pilot will include in his report to the TPAA, the effect of the system operation and any system limitation.

e. Simulators demonstrating a satisfactory circling approach will be qualified for the circling approach maneuver and may be approved for such use by the TPAA in the sponsor's FAA-approved flight training program. To be considered satisfactory, the circling approach will be flown at maximum gross weight for landing, with minimum visibility for the airplane approach category, and must allow proper alignment with a landing runway at least 90° different from the instrument approach course while allowing the pilot to keep an identifiable portion of the airport in sight throughout the maneuver (reference - 14CFR, §91.175(e)).

f. At the request of the TPAA, the NSP Pilot may assess the simulator for a special aspect of a sponsor's training program during the functions and subjective portion of an evaluation. Such an assessment may include a portion of a Line Oriented Flight Training (LOFT) scenario or special emphasis items in the sponsor's training program. Unless directly related to a requirement for the qualification level, the results of such an evaluation would not affect the qualification of the simulator.

g. The NSPM acknowledges that there are previously qualified simulators with certain, early generation Computer Generated Image (CGI) visual systems, that are limited by either the capability of the Imgage Generator or the display system used. As a result, the NSPM has agreed to discuss the specific circumstances that may be determined to exist and has agreed to reach a mutually acceptable course of action to address these limitations beyond those that are listed in the QPS requirements of this table. The following are examples:

(1) Early CGI visual systems that are exempt from the necessity of including runway numbers as a part of the specific runway marking requirements are:

(a) Link NVS and DNVS.
(b) Novoview 2500 and 6000.
(c) FlightSafety VITAL series up to, and including, VITAL III, but not beyond.
(d) Redifusion SP1, SP1T, and SP2.

(2) Early CGI visual systems that are exempt from the necessity of including runway numbers except for those runways used for LOFT training sessions. These LOFT airport models require runway numbers but only for the specific runway end (one direction) used in the LOFT session. The systems required to display runway numbers only for LOFT scenes are:

(a) FlightSafety VITAL IV.
(b) Redifusion SP3 and SP3T.
(c) Link-Miles Image II.

(3) Previously qualified CGI and/or display systems that are incapable of generating blue lights, and therefore will not be required to have accurate taxi-way edge lighting are:

(a) Redifusion SP1 and SP1T.
(b) FlightSafety Vital IV.
(c) Link-Miles Image II and Image IIT
(d) XKD displays (even though the XKD image generator is capable of generating blue colored lights, the display cannot accommodate that color).

End Information

TABLE A3A

FUNCTIONS AND SUBJECTIVE TESTS					
<<< QPS REQUIREMENTS >>>					
Item Number	**Operations Tasks**	**Simulator Level**			
		A	**B**	**C**	**D**

Tasks in this table are subject to evaluation if appropriate for the airplane simulated as indicated in the SOQ Configuration List and/or the level of simulator qualification involved. Items not installed or not functional on the simulator and, therefore, not appearing on the SOQ Configuration List, are not required to be listed as exceptions on the SOQ.

1.	**Preparation For Flight** Preflight. Accomplish a functions check of all switches, indicators, systems, and equipment at all crewmembers' and instructors' stations and determine that the flight deck design and functions are identical to that of the airplane simulated.	X	X	X	X
2.	**Surface Operations (Pre-Take-Off).**				
2.a.	**Engine Start.**				
2.a.1.	Normal start.	X	X	X	X
2.a.2.	Alternate start procedures.	X	X	X	X
2.a.3.	Abnormal starts and shutdowns (e.g., hot/hung start, tail pipe fire).	X	X	X	X
2.b.	**Pushback/Powerback.**		X	X	X
2.c.	**Taxi.**				
2.c.1.	Thrust response.	X	X	X	X
2.c.2.	Power lever friction.	X	X	X	X
2.c.3.	Ground handling.	X	X	X	X
2.c.4.	Nose wheel scuffing.			X	X
2.c.5.	Brake operation (normal and alternate/emergency).	X	X	X	X
2.c.6.	Brake fade (if applicable).	X	X	X	X
3.	**Take-off.**				
3.a.	Normal.				
3.a.1.	Airplane/engine parameter relationships.	X	X	X	X
3.a.2.	Acceleration characteristics (motion).	X	X	X	X
3.a.3.	Nose wheel and rudder steering.	X	X	X	X
3.a.4.	Crosswind (maximum demonstrated).	X	X	X	X
3.a.5.	Special performance (e.g. reduced V_1, max de-rate, short field operations).	X	X	X	X
3.a.6.	Low visibility take-off.	X	X	X	X
3.a.7.	Landing gear, wing flap leading edge device operation.	X	X	X	X
3.a.8.	Contaminated runway operation.			X	X
3.b.	Abnormal/emergency.				
3.b.1.	Rejected Take-off.	X	X	X	X
3.b.2.	Rejected special performance (e.g. reduced V_1, max de-rate, short field operations).	X	X	X	X
3.b.3.	With failure of most critical engine at most critical point, continued take-off.	X	X	X	X
3.b.4.	With wind shear.	X	X	X	X
3.b.5.	Flight control system failures, reconfiguration modes, manual reversion and associated handling.	X	X	X	X
3.b.6.	Rejected takeoff with brake fade.			X	X

TABLE A3A

FUNCTIONS AND SUBJECTIVE TESTS					
<<< QPS REQUIREMENTS >>>					
Item Number	Operations Tasks	Simulator Level			
		A	B	C	D
3.b.7.	Rejected, contaminated runway.			X	X
4.	**Climb.**				
4.a.	Normal.	X	X	X	X
4.b.	One or more engines inoperative.	X	X	X	X
5.	**Cruise.**				
5.a.	Performance characteristics (speed vs. power).	X	X	X	X
5.b.	High altitude handling.	X	X	X	X
5.c.	High Mach number handling (Mach tuck, Mach buffet) and recovery (trim change).	X	X	X	X
5.d.	Overspeed warning (in excess of V_{mo} or M_{mo}).	X	X	X	X
5.e.	High IAS handling.	X	X	X	X
6.	**Maneuvers.**				
6.a.	High angle of attack, approach to stalls, stall warning, buffet, and g-break (take-off, cruise, approach, and landing configuration).	X	X	X	X
6.b.	Flight envelope protection (high angle of attack, bank limit, overspeed, etc).	X	X	X	X
6.c.	Turns with/without speedbrake/spoilers deployed.	X	X	X	X
6.d.	Normal and steep turns.	X	X	X	X
6.e.	In flight engine shutdown and restart (assisted and windmill).	X	X	X	X
6.f.	Maneuvering with one or more engines inoperative, as appropriate.	X	X	X	X
6.g.	Specific flight characteristics (e.g. direct lift control).	X	X	X	X
6.h.	Flight control system failures, reconfiguration modes, manual reversion and associated handling.	X	X	X	X
7.	**Descent.**				
7.a.	Normal.	X	X	X	X
7.b.	Maximum rate (clean and with speedbrake, etc).	X	X	X	X
7.c.	With autopilot.	X	X	X	X
7.d.	Flight control system failures, reconfiguration modes, manual reversion and associated handling.	X	X	X	X
8.	**Instrument Approaches And Landing.** Those instrument approach and landing tests relevant to tbe simulated airplane type are selected from the following list. Some tests are made with limiting wind velocities, under windshear conditions, and witb relevant system failures, including the failure of the Flight Director. If Standard Operating Procedures allow use autopilot for non-precision approaches, evaluation of the autopilot will be included. Level A simulators are not authorized to credit the landing maneuver.				
8.a.	Precision.				
8.a.1.	PAR	X	X	X	X
8.a.2.	CAT I/GBAS (ILS/MLS) published approaches.	X	X	X	X
	(i) Manual approach with/without flight director including landing.	X	X	X	X
	(ii) Autopilot/autothrottle coupled approach and manual landing.	X	X	X	X
	(iii) Manual approach to DH and go-around all engines.	X	X	X	X

TABLE A3A

FUNCTIONS AND SUBJECTIVE TESTS					
<<< QPS REQUIREMENTS >>>					
Item Number	Operations Tasks	Simulator Level			
		A	B	C	D
	(iv) Manual one engine out approach to DH and go-around.	X	X	X	X
	(v) Manual approach controlled with and without flight director to 30 m (100 ft) below CAT I minima.	X	X	X	X
	A. With cross-wind (maximum demonstrated)	X	X	X	X
	B. With windshear	X	X	X	X
	(vi) Autopilot/autothrottle coupled approach, one engine out to DH and go-around.	X	X	X	X
	(vii) Approach and landing with minimum/standby electrical power.	X	X	X	X
8.a.3.	CAT II/GBAS (ILS/MLS) published approaches.	X	X	X	X
	(i) Autopilot/autothrottle coupled approach to DH and landing.	X	X	X	X
	(ii) Autopilot/autothrottle coupled approach to DH and go-around.	X	X	X	X
	(iii) Autocoupled approach to DH and manual go-around.	X	X	X	X
	(iv) Category II published approach (auto-coupled, autothrottle).	X	X	X	X
8.a.4.	CAT III/GBAS (ILS/MLS) published approaches.	X	X	X	X
	(i) Autopilot/autothrottle coupled approach to land and rollout.	X	X	X	X
	(ii) Autopilot/autothrottle coupled approach to DH/Alert Height and go-around.	X	X	X	X
	(iii) Autopilot/autothrottle coupled approach to land and rollout with one engine out.	X	X	X	X
	(iv) Autopilot/autothrottle coupled approach to DH/Alert Height and go-around with one engine out.	X	X	X	X
	(v) Autopilot/autothrottle coupled approach (to land or to go around).	X	X	X	X
	A. With generator failure	X	X	X	X
	B. With 10 knot tail wind	X	X	X	X
	C. With 10 knot crosswind	X	X	X	X
8.b.	Non-precision.				
8.b.1.	NDB.	X	X	X	X
8.b.2.	VOR, VOR/DME, VOR/TAC.	X	X	X	X
8.b.3.	RNAV (GNSS/GPS).	X	X	X	X
8.b.4.	ILS LLZ (LOC), LLZ(LOC)/BC.	X	X	X	X
8.b.5.	ILS offset localizer.	X	X	X	X
8.b.6.	Direction finding facility (ADF/SDF).	X	X	X	X
8.b.7.	Airport surveillance radar (ASR).	X	X	X	X
9.	**Visual Approaches (Visual Segment) And Landings.** Level A simulators are not authorized to credit the landing maneuver.				
9.a.	Maneuvering, normal approach and landing, all engines operating with and without visual approach aid guidance.	X	X	X	X
9.b.	Approach and landing with one or more engines inoperative.	X	X	X	X
9.c.	Operation of landing gear, flap/slats and speedbrakes (normal and abnormal).	X	X	X	X
9.d.	Approach and landing with crosswind (max. demonstrated).	X	X	X	X

TABLE A3A

Item Number	Operations Tasks	Simulator Level			
	FUNCTIONS AND SUBJECTIVE TESTS				
	<<< QPS REQUIREMENTS >>>				
		A	B	C	D
9.e.	Approach to land with windshear on approach.	X	X	X	X
9.f.	Approach and landing with flight control system failures, reconfiguration modes, manual reversion and associated handling (most significant degradation which is probable).	X	X	X	X
9.g.	Approach and landing with trim malfunctions.	X	X	X	X
9.g.1.	Longitudinal trim malfunction.	X	X	X	X
9.g.2.	Lateral-directional trim malfunction.	X	X	X	X
9.h.	Approach and landing with standby (minimum) electrical/hydraulic power.	X	X	X	X
9.i.	Approach and landing from circling conditions (circling approach).	X	X	X	X
9.j.	Approach and landing from visual traffic pattern.	X	X	X	X
9.k.	Approach and landing from non-precision approach.	X	X	X	X
9.l.	Approach and landing from precision approach.	X	X	X	X
9.m.	Approach procedures with vertical guidance (APV), e.g., SBAS.	X	X	X	X
10.	**Missed Approach.**				
10.a.	All engines.	X	X	X	X
10.b.	One or more engine(s) out.	X	X	X	X
10.c.	With flight control system failures, reconfiguration modes, manual reversion and associated handling.	X	X	X	X
11.	**Surface Operations** (Landing roll and taxi).				
11.a.	Spoiler operation.	X	X	X	X
11.b.	Reverse thrust operation.	X	X	X	X
11.c.	Directional control and ground handling, both with and without reverse thrust.		X	X	X
11.d.	Reduction of rudder effectiveness with increased reverse thrust (rear pod-mounted engines).		X	X	X
11.e.	Brake and anti-skid operation with dry, wet, and icy conditions.			X	X
11.f.	Brake operation, to include auto-braking system where applicable.	X	X	X	X
12.	**Any Flight Phase.**				
12.a.	Airplane and engine systems operation.				
12.a.1.	Air conditioning and pressurization (ECS).	X	X	X	X
12.a.2.	De-icing/anti-icing.	X	X	X	X
12.a.3.	Auxiliary power unit (APU).	X	X	X	X
12.a.4.	Communications.	X	X	X	X
12.a.5.	Electrical.	X	X	X	X
12.a.6.	Fire and smoke detection and suppression.	X	X	X	X
12.a.7.	Flight controls (primary and secondary).	X	X	X	X
12.a.8.	Fuel and oil, hydraulic and pneumatic.	X	X	X	X
12.a.9.	Landing gear.	X	X	X	X
12.a.10.	Oxygen.	X	X	X	X
12.a.11.	Engine.	X	X	X	X
12.a.12.	Airborne radar.	X	X	X	X

TABLE A3A

FUNCTIONS AND SUBJECTIVE TESTS					
<<< QPS REQUIREMENTS >>>					
Item Number	**Operations Tasks**	**Simulator Level**			
		A	**B**	**C**	**D**
12.a.13.	Autopilot and Flight Director.	X	X	X	X
12.a.14.	Collision avoidance systems. [e.g. (E)GPWS, TCAS]	X	X	X	X
12.a.15.	Flight control computers including stability and control augmentation.	X	X	X	X
12.a.16.	Flight display systems.	X	X	X	X
12.a.17.	Flight management computers.	X	X	X	X
12.a.18.	Head-up guidance, head-up displays	X	X	X	X
12.a.19.	Navigation systems	X	X	X	X
12.a.20.	Stall warning/avoidance	X	X	X	X
12.a.21.	Wind shear avoidance equipment	X	X	X	X
12.a.22.	Automatic landing aids.	X	X	X	X
12.b.	Airborne procedures.				
12.b.1.	Holding.	X	X	X	X
12.b.2.	Air hazard avoidance. (Traffic, Weather)			X	X
12.b.3.	Windshear.			X	X
12.b.4.	Effects of airframe and/or engine ice.			X	X
12.c.	Engine shutdown and parking.				
12.c.1.	Engine and systems operation.	X	X	X	X
12.c.2.	Parking brake operation..	X	X	X	X

TABLE A3B					
FUNCTIONS AND SUBJECTIVE TESTS					
<<< QPS REQUIREMENTS >>>					
Item Number	Visual Scene Content Requirements For Qualification At The Stated Level.	Simulator Level			
		A	B	C	D
This table specifies the minimum airport visual model content and functionality to qualify a simulator at the indicated level. This table applies only to the airport scenes required for simulator qualification; i.e., one airport scene for Level A and Level B simulators; three airport scenes for Level C and Level D simulators.					
1.	**Functional test content requirements for Level A and Level B simulators.** Except as may be authorized by the NSPM, the following is the minimum airport model content requirement to satisfy visual capability tests, and provides suitable visual cues to allow completion of all functions and subjective tests described in this attachment for simulators at Levels A and B.				
1.a.	A minimum of one representative airport model (must be listed on the Statement of Qualification)	X	X		
1.b.	The fidelity of the visual scene must be sufficient for the aircrew to visually identify the airport; determine the position of the simulated airplane within the visual scene; successfully accomplish take-offs, approaches, and landings; and maneuver around the airport on the ground as necessary.	X	X		
1.c.	Visible runway number.	X	X		
1.d.	Runway threshold elevations and locations must be modeled to provide sufficient correlation with airplane systems (e.g., altimeter).	X	X		
1.e.	Runway surface and markings.	X	X		
1.f.	Lighting for the runway in use including runway edge and centerline.	X	X		
1.g.	Lighting, visual approach aids and approach lighting of appropriate colors.	X	X		
1.h.	Representative taxiway lights.	X	X		
2.	**Functional test content requirements for Level C and Level D simulators.** Except as may be authorized by the NSPM, the following is the minimum airport model content requirement to satisfy visual capability tests, and provides suitable visual cues to allow completion of all functions and subjective tests described in this attachment for simulators at Levels C and D. Not all of the elements described in this section must be found in a single airport scene. However, all of these elements must be found throughout a combination of the airport scenes available for training, testing, checking, and/or experience activities.				
2.a.	A minimum of three representative airport models (must be listed on the Statement of Qualification).			X	X
2.a.1.	Night and Twilight (Dusk) scenes required.			X	X
2.a.2.	Daylight scenes required				X
2.b.	Two parallel runways and one crossing runway, displayed simultaneously; at least two of the runways must be able to be lighted fully and simultaneously. Note: *This requirement may be demonstrated at either a fictional airport or at a real-world airport. However, if a fictional airport is used, this airport must be listed on the Statement of Qualification.*			X	X
2.c.	Runway threshold elevations and locations must be modeled to			X	X

TABLE A3B

FUNCTIONS AND SUBJECTIVE TESTS					
<<< QPS REQUIREMENTS >>>					
Item Number	**Visual Scene Content Requirements For Qualification At The Stated Level.**	**Simulator Level**			
		A	**B**	**C**	**D**
	provide sufficient correlation with airplane systems (e.g., HGS, GPS, altimeter); slopes in runways, taxiways, and ramp areas must not cause distracting or unrealistic effects, including pilot eye-point height variation.				
2.d.	Representative airport buildings, structures and lighting.			X	X
2.e.	At least one useable gate, at the appropriate height (required only for those airplanes that typically operate from terminal gates).			X	X
2.f.	Representative moving and static gate clutter (e.g., other airplane, power carts, tugs, fuel trucks, additional gates, etc.).			X	X
2.g.	Representative gate/apron markings (e.g., hazard markings, lead-in lines, gate numbering, etc.) and lighting.			X	X
2.h.	Representative runway markings, lighting, and signage, including a windsock that gives appropriate wind cues.			X	X
2.i.	Representative taxiway markings, lighting, and signage necessary for position identification, and to taxi from parking to a designated runway and return to parking.			X	X
2.j.	A low visibility taxi route (e.g., Surface Movement Guidance Control System, follow-me truck, daylight taxi lights) must also be demonstrated.				X
2.k.	Representative moving and static ground traffic (e.g., vehicular and airplane), including the capability to present ground hazards (e.g., another airplane crossing the active runway).			X	X
2.l.	Representative moving airborne traffic, including the capability to present air hazards (e.g., airborne traffic on a possible collision course, etc.).			X	X
2.m.	Representative depiction of terrain and obstacles as well as significant and identifiable natural and cultural features, within 25 NM of the reference airport.			X	X
2.n.	Appropriate approach lighting systems and airfield lighting for a VFR circuit and landing, non-precision approaches and landings, and Category I, II and III precision approaches and landings.			X	X
2.o.	Representative gate docking aids or a marshaller.			X	X
2.p.	Portrayal of physical relationships known to cause landing illusions (e.g., short runways, landing approaches over water, uphill or downhill runways, rising terrain on the approach path, etc.). This requirement may be met by a Statement of Compliance and Capability (SOC) and a demonstration of two such illusions. The illusions are not required to be beyond the normal operational capabilities of the airplane being simulated. The demonstrated illusions must be available to the instructor/check airman at the IOS for training, testing, checking, and/or experience activities.				X
2.q.	Portrayal of runway surface contaminants, including runway lighting reflections when wet and partially obscured lights when snow is present, or suitable alternative effects.				X

TABLE A3B					
FUNCTIONS AND SUBJECTIVE TESTS					
<<< QPS REQUIREMENTS >>>					
Item Number	Visual Scene Content Requirements For Qualification At The Stated Level.	Simulator Level			
		A	B	C	D
3.	**Visual scene management.** Except as may be authorized by the NSPM, the following is the minimum visual scene management requirements for simulators at Levels A, B, C, and D.				
3.a.	Runway and approach lighting should fade into view appropriately in accordance with the environmental conditions set in the simulator;	X	X	X	X
3.b.	The directionality of strobe lights, approach lights, runway edge lights, visual landing aids, runway centerline lights, threshold lights, and touchdown zone lights should be realistically replicated.	X	X	X	X
4.	**Visual feature recognition.** Except as may be authorized by the NSPM, the following is the minimum distances at which runway features must be visible for simulators at Levels A, B, C, and D. Distances are measured from runway threshold to an airplane aligned with the runway on an extended 3° glide-slope in suitable simulated meteorological conditions. For circling approaches, all tests apply both to the runway used for the initial approach and to the runway of intended landing.				
4.a.	Strobe lights, approach lights, and runway edge white lights from 5 sm (8 km) of the runway threshold.	X	X	X	X
4.b.	Visual Approach Aids lights from 5 sm (8 km) of the runway threshold.			X	X
4.c.	Visual Approach Aids lights from 3 sm (5 km) of the runway threshold.	X	X		
4.d.	Runway centerline lights and taxiway definition from 3 sm (5 km).	X	X	X	X
4.e.	Threshold lights and touchdown zone lights from 2 sm (3 km).	X	X	X	X
4.f.	Runway markings within range of landing lights for night scenes as required by the surface resolution test on day scenes.	X	X	X	X
4.g.	For circling approaches, the runway of intended landing and associated lighting should fade into view in a non-distracting manner.	X	X	X	X
5.	**Airport model content.** Except as may be authorized by the NSPM, the following sets out the minimum requirements for what must be provided in an airport visual model and also identifies the other aspects of the airport environment that must correspond with that model for simulators at Levels A, B, C, and D. For circling approaches, all tests apply both to the runway used for the initial approach and to the runway of intended landing. If all runways in an airport model used to meet the requirements of this attachment are not designated as "in use," then the "in use" runways must be listed on the Statement of Qualification (e.g., KORD, Rwys 9R, 14L, 22R). Models of airports with more than one runway must have all significant runways not "in-use" visually depicted for airport / runway recognition purposes. The use of white or off white light strings that identify the runway threshold, edges, and ends for twilight and night scenes are acceptable for this requirement; and rectangular surface depictions are acceptable for daylight scenes. A visual system's capabilities must balanced between providing airport models with an accurate representation of the airport and a realistic representation of the surrounding environment.				

TABLE A3B

FUNCTIONS AND SUBJECTIVE TESTS					
<<< QPS REQUIREMENTS >>>					
Item Number	Visual Scene Content Requirements For Qualification At The Stated Level.	Simulator Level			
		A	B	C	D
5.a.	**The surface and markings for each "in-use" runway must include the following:**				
5.a.1.	Threshold markings.	X	X	X	X
5.a.2.	Runway numbers.	X	X	X	X
5.a.3.	Touchdown zone markings.	X	X	X	X
5.a.4.	Fixed distance markings.	X	X	X	X
5.a.5.	Edge markings.	X	X	X	X
5.a.6.	Centerline stripes.	X	X	X	X
5.b.	**Each runway designated as an "in-use" runway must include the following detail that is either modeled using airport pictures, constructiou drawings and maps, ARINC 424 data, or other appropriate data, or modeled in accordance with published regulatory material. The FAA realizes that it is not possible, nor is it required to provide every detail of a runway, but the detail that is provided should be correct within reasonable limits.**				
5.b.1.	The lighting for each "in-use" runway must include the following:				
	(i) Threshold lights.	X	X	X	X
	(ii) Edge lights.	X	X	X	X
	(iii) End lights.	X	X	X	X
	(iv) Centerline lights, if appropriate.	X	X	X	X
	(v) Touchdown zone lights, if appropriate.	X	X	X	X
	(vi) Leadoff lights, if appropriate.	X	X	X	X
	(vii) Appropriate visual landing aid(s) for that runway.	X	X	X	X
	(viii) Appropriate approach lighting system for that runway.	X	X	X	X
5.b.2.	The taxiway surface and markings associated with each "in-use" runway must include the following:				
	(i) Edge.	X	X	X	X
	(ii) Centerline.	X	X	X	X
	(iii) Runway hold lines.	X	X	X	X
	(iv) ILS critical area marking.	X	X	X	X
5.b.3.	The taxiway lighting associated with each "in-use" runway must include the following:				
	(i) Edge.	X	X	X	X
	(ii) Centerline.	X	X	X	X
	(iii) Runway hold and ILS critical area lights.	X	X	X	X
5.b.4.	Airport signage associated with each "in-use" runway must include the following:				
	(i) Distance remaining signs, if appropriate.	X	X	X	X
	(ii) Signs at intersecting runways and taxiways.	X	X	X	X
	(iii) Signs described in items "2h" and "2i" of this table.	X	X	X	X
5.b.5.	Required visual model correlation with other aspects of the airport environment simulation:				
	(i) The airport model must be properly aligned with the navigational aids that are associated with operations at the runway "in-use."	X	X	X	X
	(ii) The simulation of runway contaminants must be correlated with the displayed runway surface and lighting where applicable.				X

Item Number	TABLE A3B FUNCTIONS AND SUBJECTIVE TESTS <<< OPS REQUIREMENTS >>> Visual Scene Content Requirements For Qualification At The Stated Level.	Simulator Level A	B	C	D
6.	Correlation with airplane and associated equipment. Except as may be authorized by the NSPM, the following are the minimum correlation comparisons that must be made for simulators at Levels A, B, C, and D.				
6.a.	Visual system compatibility with aerodynamic programming.	X	X	X	X
6.b.	Visual cues to assess sink rate and depth perception during landings.	X	X	X	X
6.c.	Accurate portrayal of environment relating to flight simulator attitudes.	X	X	X	X
6.d.	The visual scene should correlate with integrated airplane systems, where fitted (e.g. terrain, traffic and weather avoidance systems and Head-up Guidance System (HGS)).	X	X	X	X
6.e.	Representative visual effects for each visible, own-ship, airplane external light(s).	X	X	X	X
6.f.	The effect of rain removal devices.				X
7.	Scene quality. Except as may be authorized by the NSPM, the following are the minimum scene quality tests that must be conducted for simulators at Levels A, B, C, and D.				
7.a.	Surfaces and textural cues should be free from apparent quantization (aliasing).			X	X
7.b.	System capable of portraying full color realistic textural cues.			X	X
7.c.	The system light points should be free from distracting jitter, smearing or streaking.	X	X	X	X
7.d.	Demonstration of occulting through each channel of the system in an operational scene.	X	X		
7.e.	Demonstration of a minimum of ten levels of occulting through each channel of the system in an operational scene.			X	X
7.f.	System capable of providing focus effects that simulate rain.				X
7.g.	System capable of providing focus effects that simulate light point perspective growth.			X	X
7.h.	System capable of six discrete light step controls (0-5).	X	X	X	X
8.	**Environmental effects.** Except as may be authorized by the NSPM, the following are the minimum environmental effects that must be available in simulators at Levels A, B, C, and D.				
8.a.	The displayed scene corresponding to the appropriate surface contaminants and include runway lighting reflections for wet, partially obscured lights for snow, or suitable alternative effects.				X
8.a.1.	Special weather representations which include:				
	(i) The sound, motion and visual effects of light, medium and heavy precipitation near a thunderstorm on take-off, approach, and landings at and below an altitude of 2,000 ft (600 m) above the airport surface and within a radius of 10 sm (16 km) from the airport.				X
	(ii) One airport with a snow scene to include terrain snow and snow-covered taxiways and runways.				X

TABLE A3B

FUNCTIONS AND SUBJECTIVE TESTS					
<<< QPS REQUIREMENTS >>>					
Item Number	Visual Scene Content Requirements For Qualification At The Stated Level.	Simulator Level			
		A	B	C	D
8.b.	In - cloud effects such as variable cloud density, speed cues and ambient changes.			X	X
8.c.	The effect of multiple cloud layers representing few, scattered, broken and overcast conditions giving partial or complete obstruction of the ground scene.			X	X
8.d.	Gradual break-out to ambient visibility/RVR, defined as up to 10% of the respective cloud base or top, 20 ft $\leq$transition layer $\leq$200 ft; cloud effects should be checked at and below a height of 2,000 ft (600 m) above the airport and within a radius of 10 sm (16 km) from the airport.				X
8.e.	Visibility and RVR measured in terms of distance. Visibility/RVR checked at and below a height of 600 m 2,000 ft (600 m) above the airport and within a radius of 16 km 10 sm (16 km) from the airport	X	X	X	X
8.f.	Patchy fog giving the effect of variable RVR.				X
8.g.	Effects of fog on airport lighting such as halos and defocus.			X	X
8.h.	Effect of own-ship lighting in reduced visibility, such as reflected glare, to include landing lights, strobes, and beacons.			X	X
8.i.	Wind cues to provide the effect of blowing snow or sand across a dry runway or taxiway selectable from the instructor station.				X
9.	**Instructor control of the following:** Except as may be authorized by the NSPM, the following are the minimum instructor controls that must be available in simulators at Levels A, B, C, and D.				
9.a.	Environmental effects, e.g. cloud base, cloud effects, cloud density, visibility in statute miles/ kilometers and RVR in feet/meters.	X	X	X	X
9.b.	Airport selection.	X	X	X	X
9.c.	Airport lighting, including variable intensity.	X	X	X	X
9.d.	Dynamic effects including ground and flight traffic.			X	X
	End QPS Requirement				

	Begin Information				
10.	In some limited cases, more than one runway must be designated as an "in-use" runway in a given visual model (see item 2b of Table A3B). In other cases two "in-use" runways at a single airport may be displayed through the use of two airport visual models of the same airport; one with one runway designated as the "in use" runway, and the second model having the second runway designated as the "in use" runway. An example consider an approach to the airport in Memphis, TN. The clearance is for the ILS approach to Runway 27, Circle to Land on Runway 18 right. Two airport visual models of Memphis might be used: the first with Runway 27 designated as the "in use" runway for the approach to runway 27, and the second with Runway 18 Right designated as the "in use" runway. When the pilot breaks off the ILS approach to runway 27, the instructor may change to the second airport visual				

TABLE A3B

FUNCTIONS AND SUBJECTIVE TESTS					
<<< QPS REQUIREMENTS >>>					
Item Number	Visual Scene Content Requirements For Qualification At The Stated Level.	Simulator Level			
		A	B	C	D
	model of Memphis in which runway 18 Right is designated as the "in use" runway, and the pilot would make his/her visual approach and landing. As long as the temporary interruption due to the visual model change is not distracting to the pilot, this process is acceptable to the FAA.				
	End Information				

TABLE A3C

Item Number	Visual Scene Content Requirements Additional Visual Models Beyond Minimum Required for Qualification <<< QPS REQUIREMENTS >>> Requirement	Simulator Level A	B	C	D
	This table specifies the minimum airport visual model content and functionality necessary to add airport visual models to a simulator's visual model library, beyond those necessary for qualification at the stated level, without the necessity of further involvement of the NSPM or TPAA.				
1.	**Visual scene management.** Except as may be authorized by the NSPM, the following is the minimum visual scene management requirements for simulators at Levels A, B, C, and D.				
1.a.	The directionality of strobe lights, approach lights, runway edge lights, visual landing aids, runway centerline lights, threshold lights, and touchdown zone lights on the "in-use" runway must be realistically replicated.	X	X	X	X
2.	**Visual feature recognition.** Except as may be authorized by the NSPM, the following is the minimum distances at which runway features must be visible for simulators at Levels A, B, C, and D. Distances are measured from runway threshold to an airplane aligned with the runway on an extended 3° glide-slope in suitable simulated meteorological conditions. For circling approaches, all tests apply both to the runway used for the initial approach and to the runway of intended landing.				
2.a.	Runway definition, strobe lights, approach lights, and runway edge white lights from 5 sm (8 km) from the runway threshold.	X	X	X	X
2.b.	Visual Approach Aids lights from 5 sm (8 km) from the runway threshold.			X	X
2.c.	Visual Approach Aids lights from 3 sm (5 km) from the runway threshold.	X	X		
2.d.	Runway centerline lights and taxiway definition from 3 sm (5 km) from the runway threshold.	X	X	X	X
2.e.	Threshold lights and touchdown zone lights from 2 sm (3 km) from the runway threshold.	X	X	X	X
2.f.	Runway markings within range of landing lights for night scenes and as required by the surface resolution test on day scenes.	X	X	X	X
2.g.	For circling approaches, the runway of intended landing and associated lighting should fade into view in a non-distracting manner.	X	X	X	X
3.	**Airport model content.** Except as may be authorized by the NSPM, the following sets out the minimum requirements for what must be provided in an airport visual model and also identifies the other aspects of the airport environment that must correspond with that model for simulators at Levels A, B, C, and D. The detail must be modeled using airport pictures, construction drawings and maps, ARINC 424 data, or other appropriate data, or modeled in accordance with published regulatory material. The FAA realizes that it is not possible, nor is it required to provide every detail of a runway, but the detail that is provided should be correct within reasonable limits. For circling approaches, all tests apply both to the runway used for the initial approach and to the runway of intended landing.				
3.a.	The surface and markings for each "in-use" runway:				

TABLE A3C

Visual Scene Content Requirements

Additional Visual Models Beyond Minimum Required for Qualification

<<< QPS REQUIREMENTS >>>

Item Number	Requirement	Simulator Level			
		A	B	C	D
3.a.1.	Threshold markings.	X	X	X	X
3.a.2.	Runway numbers.	X	X	X	X
3.a.3.	Touchdown zone markings.	X	X	X	X
3.a.4.	Fixed distance markings.	X	X	X	X
3.a.5.	Edge markings.	X	X	X	X
3.a.6.	Centerline stripes.	X	X	X	X
3.b.	The lighting for each "in-use" runway.				
3.b.1.	Threshold lights.	X	X	X	X
3.b.2.	Edge lights.	X	X	X	X
3.b.3.	End lights.	X	X	X	X
3.b.4.	Centerline lights.	X	X	X	X
3.b.5.	Touchdown zone lights, if appropriate.	X	X	X	X
3.b.6.	Leadoff lights, if appropriate.	X	X	X	X
3.b.7.	Appropriate visual landing aid(s) for that runway.	X	X	X	X
3.b.8.	Appropriate approach lighting system for that runway.	X	X	X	X
3.c.	The taxiway surface and markings associated with each "in-use" runway:				
3.c.1.	Edge.	X	X	X	X
3.c.2.	Centerline.	X	X	X	X
3.c.3.	Runway hold lines.	X	X	X	X
3.c.4.	ILS critical area markings.	X	X	X	X
3.d.	The taxiway lighting associated with each "in-use" runway:				
3.d.1.	Edge.	X	X	X	X
3.d.2.	Centerline.	X	X	X	X
3.d.3.	Runway hold and ILS critical area lights.	X	X	X	X
4.	**Required visual model correlation with other aspects of the airport environment simulation.** Except as may be authorized by the NSPM, the following are the minimum visual model correlation tests that must be conducted for simulators at Levels A, B, C, and D.				
4.a.	The airport model must be properly aligned with the navigational aids that are associated with operations at the "in-use" runway.	X	X	X	X
4.b.	Slopes in runways, taxiways, and ramp areas must not cause distracting or unrealistic effects.	X	X	X	X
5.	**Correlation with airplane and associated equipment.** Except as may be authorized by the NSPM, the following are the minimum correlation comparisons that must be made for simulators at Levels A, B, C, and D.				
5.a.	Visual system compatibility with aerodynamic programming.	X	X	X	X
5.b.	Accurate portrayal of environment relating to flight simulator attitudes.	X	X	X	X
5.c.	Visual cues to assess sink rate and depth perception during landings.		X	X	X
5.d.	Visual effects for each visible, own-ship, airplane external light(s).		X	X	X

TABLE A3C

Visual Scene Content Requirements Additional Visual Models Beyond Minimum Required for Qualification					
<<< QPS REQUIREMENTS >>>					
Item Number	Requirement	Simulator Level			
		A	B	C	D
6.	**Scene quality.** Except as may be authorized by the NSPM, the following are the minimum scene quality tests that must be conducted for simulators at Levels A, B, C, and D.				
6.a.	Surfaces and textural cues should be free from apparent quantization (aliasing).				X
6.b.	Full color, realistic textural cues.				X
6.c.	Light points free from distracting jitter, smearing or streaking.	X	X	X	X
7.	**Instructor controls of the following:** Except as may be authorized by the NSPM, the following are the minimum instructor controls that must be available in simulators at Levels A, B, C, and D.				
7.a.	Environmental effects, e.g., cloud base (if used), cloud effects, cloud density, visibility in statute miles/kilometers and RVR in feet/meters.	X	X	X	X
7.b.	Airport selection.	X	X	X	X
7.c.	Airport lighting including variable intensity.	X	X	X	X
7.d.	Dynamic effects including ground and flight traffic.			X	X

TABLE A3D

FUNCTIONS AND SUBJECTIVE TESTS

<<< QPS REQUIREMENTS >>>

Item Number	Motion System Effects	Simulator Level			
		A	B	C	D
This table specifies motion effects that are required to indicate the threshold at which a flight crewmember must be able to recognize an event or situation. Where applicable, flight simulator pitch, side loading and directional control characteristics must be representative of the airplane.					
1.	**Runway rumble, oleo deflection, ground speed, uneven runway, runway and taxiway centerline light characteristics:** Procedure: After the airplane has been pre-set to the takeoff position and then released, taxi at various speeds, first with a smooth runway, and note the general characteristics of the simulated runway rumble effects of oleo deflections. Repeat the maneuver with a runway roughness of 50%, then finally with maximum roughness. The associated motion vibrations should be affected by ground speed and runway roughness. If time permits, different gross weights can also be selected as this may also affect the associated vibrations depending on airplane type. The associated motion effects for the above tests should also include an assessment of the effects of rolling over centerline lights, surface discontinuities of uneven runways, and various taxiway characteristics.		X	X	X
2.	**Buffets on the ground due to spoiler and/or speedbrake extension and reverse thrust:** Procedure: Perform a normal landing and use ground spoilers and reverse thrust – either individually or in combination with each other – to decelerate the simulated airplane. Do not use wheel braking so that only the buffet due to the ground spoilers and thrust reversers is felt.		X	X	X
3.	**Bumps associated with the landing gear:** Procednre: Perform a normal take-off paying special attention to the bumps that could be perceptible due to maximum oleo extension after lift-off. When the landing gear is extended or retracted, motion bumps could be felt when the gear locks into position.		X	X	X
4.	**Buffet during extension and retraction of landing gear:** Procedure: Operate the landing gear. Check that the motion cues of the buffet experienced are reasonably representative of the actual airplane.		X	X	X
5.	**Buffet in the air due to flap and spoiler/speedbrake extension and approach to stall buffet:** Procedure: First perform an approach and extend the flaps and slats, especially with airspeeds deliberately in excess of the normal approach speeds. In cruise configuration verify the buffets associated with the spoiler and/or speedbrake extension. The above effects could also be verified with different combinations of spoiler and/or speedbrake, flap, and landing gear settings to assess the interaction effects.		X	X	X
6.	**Approach to stall buffet:** Procedure: Conduct an approach-to-stall with engines at idle and a deceleration of 1 knot/second. Check that the motion cues of the buffet, including the level of buffet increase with decreasing speed, are reasonably representative of the actual airplane.		X	X	X

TABLE A3D					
FUNCTIONS AND SUBJECTIVE TESTS					
<<< QPS REQUIREMENTS >>>					
Item Number	Motion System Effects	Simulator Level			
		A	B	C	D
7.	**Touchdown cues for main and nose gear:** Procedure: Fly several normal approaches with various rates of descent. Check that the motion cues for the touchdown bumps for each descent rate are reasonably representative of the actual airplane.		X	X	X
8.	**Nose wheel scuffing:** Procedure: Taxi the simulated airplane at various ground speeds and manipulate the nose wheel steering to cause yaw rates to develop which cause the nose wheel to vibrate against the ground ("scuffing"). Evaluate the speed/nose wheel combination needed to produce scuffing and check that the resultant vibrations are reasonably representative of the actual airplane.		X	X	X
9.	**Thrust effect with brakes set:** Procedure: With the simulated airplane set with the brakes on at the take-off point, increase the engine power until buffet is experienced and evaluate its characteristics. This effect is most discernible with wing-mounted engines. Confirm that the buffet increases appropriately with increasing engine thrust.		X	X	X
10.	**Mach and maneuver buffet:** Procedure: With the simulated airplane trimmed in 1 g flight while at high altitude, increase the engine power such that the Mach number exceeds the documented value at which Mach buffet is experienced. Check that the buffet begins at the same Mach number as it does in the airplane (for the same configuration) and that buffet levels are a reasonable representation of the actual airplane. In the case of some airplanes, maneuver buffet could also be verified for the same effects. Maneuver buffet can occur during turning flight at conditions greater than 1 g, particularly at higher altitudes.		X	X	X
11.	**Tire failure dynamics:** Procedure: Dependent on airplane type, a single tire failure may not necessarily be noticed by the pilot and therefore there should not be any special motion effect. There may possibly be some sound and/or vibration associated with the actual tire losing pressure. With a multiple tire failure selected on the same side the pilot may notice some yawing, which should require the use of the rudder to maintain control of the airplane.			X	X
12	**Engine malfunction and engine damage:** Procedure: The characteristics of an engine malfunction as stipulated in the malfunction definition document for the particular flight simulator should describe the special motion effects felt by the pilot. The associated engine instruments should also vary according to the nature of the malfunction.		X	X	X

TABLE A3D

FUNCTIONS AND SUBJECTIVE TESTS					
<<< QPS REQUIREMENTS >>>					
Item Number	**Motion System Effects**	**Simulator Level**			
		A	**B**	**C**	**D**
13.	**Tail strikes and engine pod strikes:** Procedure: Tail-strikes can be checked by over-rotation of the airplane at a speed below V_r while performing a takeoff. The effects can also be verified during a landing. The motion effect should be felt as a noticeable bump. If the tail strike affects the airplane angular rates, the cueing provided by the motion system should have an associated effect. Excessive banking of the airplane during its take-off/landing roll can cause a pod strike. The motion effect should be felt as a noticeable bump. If the pod strike affects the airplane angular rates, the cueing provided by the motion system should have an associated effect.		X	X	X

TABLE A3E

FUNCTIONS AND SUBJECTIVE TESTS					
<<< QPS REQUIREMENTS >>>					
Item Number	Sound System	Simulator Level			
		A	B	C	D
The following checks are performed during a normal flight profile with motion system ON.					
1.	Precipitation.			X	X
2.	Rain removal equipment.			X	X
3.	Significant airplane noises perceptible to the pilot during normal operations.			X	X
4.	Abnormal operations for which there are associated sound cues including, but not limited to, engine malfunctions, landing gear/tire malfunctions, tail and engine pod strike and pressurization malfunction.			X	X
5.	Sound of a crash when the flight simulator is landed in excess of limitations.			X	X

TABLE A3F

FUNCTIONS AND SUBJECTIVE TESTS					
<<< QPS REQUIREMENTS >>>					
Item Number	Special Effects	Simulator Level			
		A	B	C	D
This table specifies the minimum special effects necessary for the specified simulator level.					
1.	**Braking Dynamics:** Representations of the dynamics of brake failure (flight simulator pitch, side-loading, and directional control characteristics representative of the airplane), including antiskid and decreased brake efficiency due to high brake temperatures (based on airplane related data), sufficient to enable pilot identification of the problem and implementation of appropriate procedures.			X	X
2.	**Effects of Airframe and Engine Icing:** **Required only for those airplanes authorized for operations in known icing conditions.** Procedure: With the simulator airborne, in a clean configuration, nominal altitude and cruise airspeed, autopilot on and auto-throttles off, engine and airfoil anti-ice/de-ice systems deactivated; activate icing conditions at a rate that allows monitoring of simulator and systems response. Icing recognition will include an increase in gross weight, airspeed decay, change in simulator pitch attitude, change in engine performance indications (other than due to airspeed changes), and change in data from pitot/static system. Activate heating, anti-ice, and/or de-ice systems independently. Recognition will include proper effects of these systems, eventually returning the simulated airplane to normal flight.			X	X

TABLE A3G

Item Number	Instructor Operating Station (IOS) (As appropriate)	Simulator Level			
		A	B	C	D
FUNCTIONS AND SUBJECTIVE TESTS					
<<< QPS REQUIREMENTS >>>					
Functions in this table are subject to evaluation only if appropriate for the airplane and/or the system is installed on the specific simulator.					
1.	**Simulator Power Switch(es)**	X	X	X	X
2.	**Airplane conditions.**				
2.a.	Gross weight, center of gravity, fuel loading and allocation, etc	X	X	X	X
2.b.	Airplane systems status.	X	X	X	X
2.c.	Ground crew functions (e.g., ext. power, push back, etc.)	X	X	X	X
3.	**Airports.**				
3.a.	Number and selection.	X	X	X	X
3.b.	Runway selection.	X	X	X	X
3.c.	Runway surface condition (e.g., rough, smooth, icy, wet, etc.)			X	X
3.d.	Preset positions (e.g. ramp, gate, #1 for takeoff, takeoff position, over FAF, etc.)	X	X	X	X
3.e.	Lighting controls.	X	X	X	X
4.	**Environmental controls.**				
4.a	Visibility (statute miles (kilometers)).	X	X	X	X
4.b.	Runway visual range (in feet (meters)).	X	X	X	X
4.c.	Temperature.	X	X	X	X
4.d.	Climate conditions (e.g., ice, snow, rain, etc.).	X	X	X	X
4.e.	Wind speed and direction.	X	X	X	X
4.f.	Windshear.			X	X
5.	**Airplane system malfunctions** (Insertion / deletion).	X	X	X	X
6.	**Locks, Freezes, and Repositioning.**				
6.a.	Problem (all) freeze / release.	X	X	X	X
6.b.	Position (geographic) freeze / release.	X	X	X	X
6.c.	Repositioning (locations, freezes, and releases).	X	X	X	X
6.d.	Ground speed control.	X	X	X	X
7.	Remote IOS.	X	X	X	X
8.	**Sound Controls.** On / off / adjustment	X	X	X	X
9.	**Motion / Control Loading System.**				
9.a.	On / off / emergency stop.	X	X	X	X
9.b.	Crosstalk (motion response in a given degree of freedom not perceptible in other degrees of freedom).	X	X	X	X
9.c.	Smoothness (no perceptible "turn-around bump" as the direction of motion reverses with the simulator being "flown" normally).	X	X	X	X
10.	**Observer Seats / Stations.** Position / Adjustment / Positive restraint system.	X	X	X	X

Begin Information

1. Introduction

a. The following is an example test schedule for an Initial/Upgrade evaluation, which covers the majority of the requirements set out in the Functions and Subjective test requirements. It is not intended that the schedule be followed line by line, rather that the example is used as a guide to preparing a schedule that is tailored to the airplane, sponsor, and training task.

b. Functions and subjective testing should be planned. This information has been organized as a reference document such that the considerations, method, and evaluation notes for each individual aspect of the simulator task has been presented as a stand alone item. In this way the evaluator can design his/her own test plan and then use the appropriate sections to provide guidance on method and evaluation criteria. Two aspects should be present in any test plan structure:
   (1) First, there should be an evaluation of the simulator to assess that it replicates the aircraft and will perform reliably for an uninterrupted period equivalent to the length of a typical training session.
   (2) Second, the simulator should be capable of operating reliably after the use of training device functions such as repositions, malfunctions, etc.

c. A detailed understanding of the training task will naturally lead to a list of objectives, which should be satisfied by the simulator. This list will form the basis of the test plan. Additionally, once the test plan has been formulated then the initial conditions and the evaluation criteria should be established. To make a successful test plan, all factors which may have an influence on the characteristics observed during a particular training tasks should be considered.

2. Events:

a. Initial Conditions. [Record the following as a minimum:]
   (1) Airport;
   (2) QNH;
   (3) Temperature;
   (4) Wind/Crosswind;
   (5) Zero Fuel Weight /Fuel/Gross Weight /Center of Gravity

b. Initial Checks.
   (1) Documentation of Simulator
      (a) Simulator Acceptance Test Manuals.
      (b) Simulator Approval Test Guide.
      (c) Technical Logbook Open Item List.
      (d) Daily Functional Pre-flight Check.
   (2) Documentation of User/Carrier Flight Logs.
      (a) Simulator Operating/Instructor Manual.
      (b) Difference List (Aircraft/Simulator).

(c) Flight Crew Operating Manuals.
(d) Performance Data for Different Fields.
(e) Crew Training Manual.
(f) Normal/Abnormal/Emergency Checklists.

(3) Simulator External Checks.
(a) Appearance and Cleanliness.
(b) Stairway/Access Bridge.
(c) Emergency Rope Ladders.
(d) "Motion On"/"Flight in Progress" Lights.

(4) Simulator Internal Checks.
(a) Cleaning/Disinfecting Towels (for cleaning oxygen masks).
(b) Cockpit Layout (compare with difference list).

(5) Equipment.
(a) Quick Donning Oxygen Masks.
(b) Head Sets.
(c) Smoke Goggles.
(d) Sun Visors.
(e) Escape Rope.
(f) Chart Holders.
(g) Flashlights.
(h) Fire Extinguisher (inspection date).
(i) Crash Axe.
(j) Gear Pins.

d. Power Supply And Apu Start Checks.
(1) Batteries and Static Inverter.
(2) APU Start with Battery.
(3) APU Shutdown using Fire Handle.
(4) External Power Connection.
(5) APU Start with External Power.
(6) Abnormal APU Start/Operation.

d. Cockpit Checks.
(1) Cockpit Preparation Checks.
(2) FMC Programming.
(3) Communications and Navigational Aids Checks.

e. Engine Start.
(1) Before Start Checks.
(2) Battery start with Ground Air Supply Unit.
(3) Engine Crossbleed Start.
(4) Normal Engine Start.
(5) Abnormal Engine Starts.
(6) Engine Idle Readings.
(7) After Start Checks.

f. Taxi Checks.
  (1) Pushback/Powerback.
  (2) Taxi Checks.
  (3) Ground Handling Check:
    (a) Power required to initiate ground roll.
    (b) Thrust response.
    (c) Nose Wheel and Pedal Steering.
    (d) Nosewheel Scuffing.
    (e) Perform 180 degree turns.
    (f) Brakes Response and Differential Braking using Normal, Alternate and Emergency.
    (g) Brake Systems.
    (h) Eye height and fore/aft position
  (4) Runway Roughness

g. Visual Scene - Ground Assessment.
  (Select 3 different visual models and perform the following checks with Day, Dusk and Night selected, as appropriate):
  (1) Visual Controls.
    (a) Daylight, Dusk, Night Scene Controls.
    (b) Cockpit "Daylight" ambient lighting.
    (c) Environment Light Controls.
    (d) Runway Light Controls.
    (e) Taxyway Light Controls.
  (2) Scene Content.
    (a) Ramp area for buildings, gates, airbridges, maintenance ground Equipment, parked aircraft.
    (b) Daylight shadows, night time light pools.
    (c) Taxiways for correct markings, taxiway/runway, marker boards, CAT I & II/III hold points, taxiway shape/grass areas, taxiway light (positions and colors).
    (d) Runways for correct markings, lead-off lights, boards, runway slope, runway light positions, and colors, directionality of runway lights.
    (e) Airport environment for correct terrain and, significant features.
    (f) Visual scene aliasing, color, and occulting levels.
  (3) Ground Traffic Selection
  (4) Environment Effects.
    (a) Low cloud scene
      (i) Rain:
        (A) Runway surface scene.
        (B) Windshield wiper - operation and sound.
      (ii) Hail:
        (A) Runway surface scene
        (B) Windshield wiper - operation and sound.
    (b) Lightning/thunder.
    (c) Snow/ice runway surface scene.
    (d) Fog.

h. Takeoff.

(Select one or several of the following test cases):

(1) T/O Configuration Warnings

(2) Engine Takeoff Readings

(3) Rejected Takeoff (Dry/Wet/Icy Runway) and check the following:

(a) Autobrake function.

(b) Anti-skid operation.

(c) Motion/visual effects during deceleration.

(d) Record stopping distance (use runway plot or runway lights remaining)

[Continue taxiing along the runway while applying brakes and check the following]

(e) Center line lights alternating red/white for 2000 feet/600meters.

(f) Center line lights all red for 1000 feet/300m.

(g) Runway end, red stop bars.

(h) Braking fade effect.

(i) Brake temperature indications.

(4) Engine Failure between VI and V2

(5) Normal Takeoff:

(a) During ground roll check the following:

(i) Runway rumble.

(ii) Acceleration cues.

(iii) Groundspeed effects.

(iv) Engine sounds.

(v) Nosewheel and rudder pedal steering.

(b) During and after rotation, check the following:

(i) Rotation characteristics.

(ii) Column force during rotation.

(iii) Gear uplock sounds/bumps.

(iv) Effect of slat/flap retraction during climhout

(6) Crosswind Takeoff (check the following):

(a) Tendency to turn into or out of the wind.

(b) Tendency to lift upwind wing as airspeed increase

(7) Windshear during Takeoff (check the following):

(a) Controllable during windshear encounter.

(b) Performance adequate when using correct techniques.

(c) Windshear Indications satisfactory.

(d) Motion cues satisfactory (particularly turbulence).

(8) Normal Takeoff with Control Malfunction

(9) Low Visibility T/O (check the following):

(a) Visual cues.

(b) Flying by reference to instruments.

(c) SID Guidance on LNAV

i. Climb Performance.

Select one or several of the following test cases

(1) Normal Climb – Climb while maintaining recommended speed profile and note fuel, distance and time.

(2) Single Engine Climb – Trim aircraft in a zero wheel climb at V2
[Note: Up to 5° bank towards the operating engine(s) is permissible.) Climb for 3 minutes and note fuel, distance and time. Increase speed toward en route climb speed and retract flaps. Climb for 3 minutes and note fuel, distance and time.]

j. Systems Operation During Climb.
Check normal operation and malfunctions as appropriate for the following systems
(1) Air conditioning/Pressurization/Ventilation.
(2) Autoflight.
(3) Communications.
(4) Electrical.
(5) Fuel.
(6) Icing Systems.
(7) Indicating and Recording systems.
(8) Navigation/FMS.
(9) Pneumatics.

k. Cruise Checks.
(Select one or several of the following test cases):
(1) Cruise Performance.
(2) High Speed/High Altitude Handling (check the following):
(a) Overspeed warning.
(b) High Speed buffet.
(c) Aircraft control satisfactory.
(d) Envelope limiting functions on Computer Controlled Airplanes.
[Reduce airspeed to below level flight buffet onset speed, start a turn, and check the following:]
(e) High Speed buffet increases with G loading.
[Reduce throttles to idle and start descent, deploy the speedbrake, and check the following:]
(f) Speedbrake indications.
(g) Symmetrical deployment.
(h) Airframe buffet.
(i) Aircraft response hands off.
(3) Yaw Damper Operation
[Switch off yaw dampers and autopilot. Initiate a Dutch roll and check the following:]
(a) Aircraft dynamics.
(b) Simulator motion effects.
[Switch on yaw dampers, re-initiate a Dutch roll and check the following:]
(c) Damped aircraft dynamics.
(4) APU Operation
(5) Engine Gravity Feed
(6) Engine Shutdown and Driftdown Check: FMC operation Aircraft performance
(7) Engine Relight

l. Descent.

Select one of the following test cases
(1) Normal Descent Descend while maintaining recommended speed profile and note fuel, distance And time.
(2) Cabin Depressurization/Emergency Descent

m. Medium Altitude Checks.
[Select one or several of the following test cases]
  (1) High Angle of Attack/Stall. Trim the aircraft at 1.4 Vs, establish 1 kt/sec^2 deceleration rate, and check the following –
    (a) System displays/operation satisfactory.
    (b) Handling characteristics satisfactory.
    (c) Stall and Stick shaker speed.
    (d) Buffet characteristics and onset speed.
    (e) Envelope limiting functions on Computer Controlled Airplanes.
    [Recover to straight and level flight and check the following:]
    (f) Handling characteristics satisfactory.
  (2) Turning Flight
    [Roll aircraft to left, establish a 30° to 45° bank angle, and check the following:]
    (a) Stick force required, satisfactory.
    (b) Wheel requirement to maintain bank angle.
    (c) Slip ball response, satisfactory.
    (d) Time to turn 180°
    [Roll aircraft from 45° bank one way to 45° bank the opposite direction while maintaining altitude and airspeed – check the following:]
    (e) Controllability during maneuver.
  (3) Degraded flight controls.
  (4) Holding Procedure (check the following:)
    (a) FMC operation.
    (b) Auto pilot auto thrust performance.
  (5) Storm Selection (check the following:)
    (a) Weather radar controls.
    (b) Weather radar operation.
    (c) Visual scene corresponds with WXR pattern.
    [Fly through storm center, and check the following:]
    (d) Aircraft enters cloud.
    (e) Aircraft encounters representative turbulence.
    (f) Rain/hail sound effects evident.
    [As aircraft leaves storm area, check the following:]
    (g) Storm effects disappear.
  (6) TCAS (check the following:)
    (a) Traffic appears on visual display.
    (b) Traffic appears on TCAS display(s).
    [As conflicting traffic approaches, take relevant avoiding action, and check the following:]
    (c) Visual and TCAS system displays.

n. Approach And Landing.

Select one or several of the following test cases while monitoring flight control and hydraulic systems for normal operation and with malfunctions selected:

(1) Flaps/Gear Normal Operation (Check the following:)
  (a) Time for extension/retraction.
  (b) Buffet characteristics.
(2) Normal Visual Approach and Landing
  [Fly a normal visual approach and landing – check the following:]
  (a) Aircraft handling.
  (b) Spoiler operation.
  (c) Reverse thrust operation.
  (d) Directional control on the ground.
  (e) Touchdown cues for main and nose wheel.
  (f) Visual cues.
  (g) Motion cues.
  (h) Sound cues.
  (i) Brake and Anti-skid operation.
(3) Flaps/Gear Abnormal Operation or with hydraulic malfunctions.
(4) Abnormal Wing Flaps/Slats Landing.
(5) Manual Landing with Control Malfunction
  (a) Aircraft handling.
  (b) Aircraft handling.
  (c) Radio Aids and instruments.
  (d) Visual scene content and cues.
  (e) Motion cues.
  (f) Sound cues.
(6) Non-precision Approach - All Engines Operating.
  (a) Aircraft handling.
  (b) Aircraft handling.
  (c) Radio Aids and instruments.
  (d) Visual scene content and cues.
  (e) Motion cues.
  (f) Sound cues.
(7) Circling Approach.
  (a) Aircraft handling.
  (b) Aircraft handling.
  (c) Radio Aids and instruments.
  (d) Visual scene content and cues.
  (e) Motion cues.
  (f) Sound cues.
(8) Non-precision Approach - One Engine Inoperative.
  (a) Aircraft handling.
  (b) Aircraft handling.
  (c) Radio Aids and instruments.
  (d) Visual scene content and cues.
  (e) Motion cues.

(f) Sound cues.

(9) One Engine Inoperative Go-around.

(a) Aircraft handling.

(b) Aircraft handling.

(c) Radio Aids and instruments.

(d) Visual scene content and cues.

(e) Motion cues.

(f) Sound cues.

(10) CAT I Approach and Landing with raw-data ILS.

(a) Aircraft handling.

(b) Aircraft handling.

(c) Radio Aids and instruments.

(d) Visual scene content and cues.

(e) Motion cues.

(f) Sound cues.

(11) CAT I Approach and Landing with Limiting Crosswind.

(a) Aircraft handling.

(b) Aircraft handling.

(c) Radio Aids and instruments.

(d) Visual scene content and cues.

(e) Motion cues.

(f) Sound cues.

(12) CAT I Approach with Windshear [Check the following:]

(a) Controllable during windshear encounter.

(b) Performance adequate when using correct techniques.

(c) Windshear indications/warnings.

(d) Motion cues (particularly turbulence).

(13) CAT II Approach and Automatic Go-Around.

(14) CAT III Approach and Landing - System Malfunctions.

(15) CAT III Approach and Landing - 1 Engine Inoperative.

(16) GPWS evaluation.

o. Visual Scene - In-Flight Assessment.

Select three (3) different visual models and perform the following checks with "day," "dusk," and "night" (as appropriate) selected. Reposition the aircraft at or below 2000 feet within 10 nm of the airfield. Fly the aircraft around the airport environment and assess control of the visual system and evaluate the visual scene content as described below:

(1). Visual Controls.

(a) Daylight, Dusk, Night Scene Controls.

(b) Cockpit ambient lighting during "daylight" conditions.

(c) Environment Light Controls.

(d) Runway Light Controls.

(e) Taxyway Light Controls.

(f) Approach Light Controls.

(2) Scene Content.

(a) Airport environment for correct terrain and significant features.

(b) Runways for correct markings, runway slope, directionality of runway lights.
(c) Visual scene for aliasing, colour, and occulting.

Reposition the aircraft to a long, final approach for an "ILS runway." Select flight freeze when the aircraft is 5-statute miles (sm)/8-kilometers (km) out and on the glide slope. Check the following:

(3). Scene content.
(a) Airfield features.
(b) Approach lights.
(c) Runway definition.
(d) Runway definition.
(e) Runway edge lights and VASI lights.
(f) Strobe lights.

Release flight freeze. Continue flying the approach with NP engaged. Select flight freeze when aircraft is 3 sm/5 km out and on the glide slope. Check the following:

(4) Scene Content.
(a) Runway centerline light.
(b) Taxiway definition and lights.

Release flight freeze and continue flying the approach with A/P engaged. Select flight freeze when aircraft is 2 sm/3 km out and on the glide slope. Check the following:

(5) Scene content.
(a) Runway threshold lights.
(b) Touchdown zone lights.

At 200 ft radio altitude and still on glide slope, select Flight Freeze. Check the following:

(6) Scene content.
(a) Runway markings.

Set the weather to Category I conditions and check the following:

(7) Scene content.
(a) Visual ground segment.

Set the weather to Category II conditions, release Flight Freeze, re-select Flight Freeze at 100 feet radio altitude, and check the following:

(8) Scene content.
(a) Visual ground segment.

Select night/dusk(twilight) conditions and check the following:

(9) Scene content.
(a) Runway markings visible within landing light lobes.

Set the weather to Category III conditions, release Flight Freeze, re-select Flight Freeze at 50 feet radio altitude and check the following:

(10) Scene content.
(a) Visual ground segment.

Set WX to "missed approach" conditions, release Flight Freeze, re-select Flight Freeze at 15 feet radio altitude, and check the following:

(11) Scene content.
(a) Visual ground segment.

When on the ground, stop the aircraft. Set 0 feet RVR, ensure strobe/beacon tights are switched on and check the following:

(12) Scene content

(a) Visual effect of strobe and beacon

Reposition to final approach, set weather to "Clear," continue approach for an automatic landing, and check the following:

(13) Scene content.

(a) Visual cues during flare to assess sink rate.

(b) Visual cues during flare to assess Depth perception.

(c) Cockpit height above ground.

p. After Landing Operations.

(1) After Landing Checks.

(2) Taxi back to gate [Check the following:]

(a) Visual model satisfactory.

(b) Parking brake operation satisfactory.

(3) Shutdown Checks.

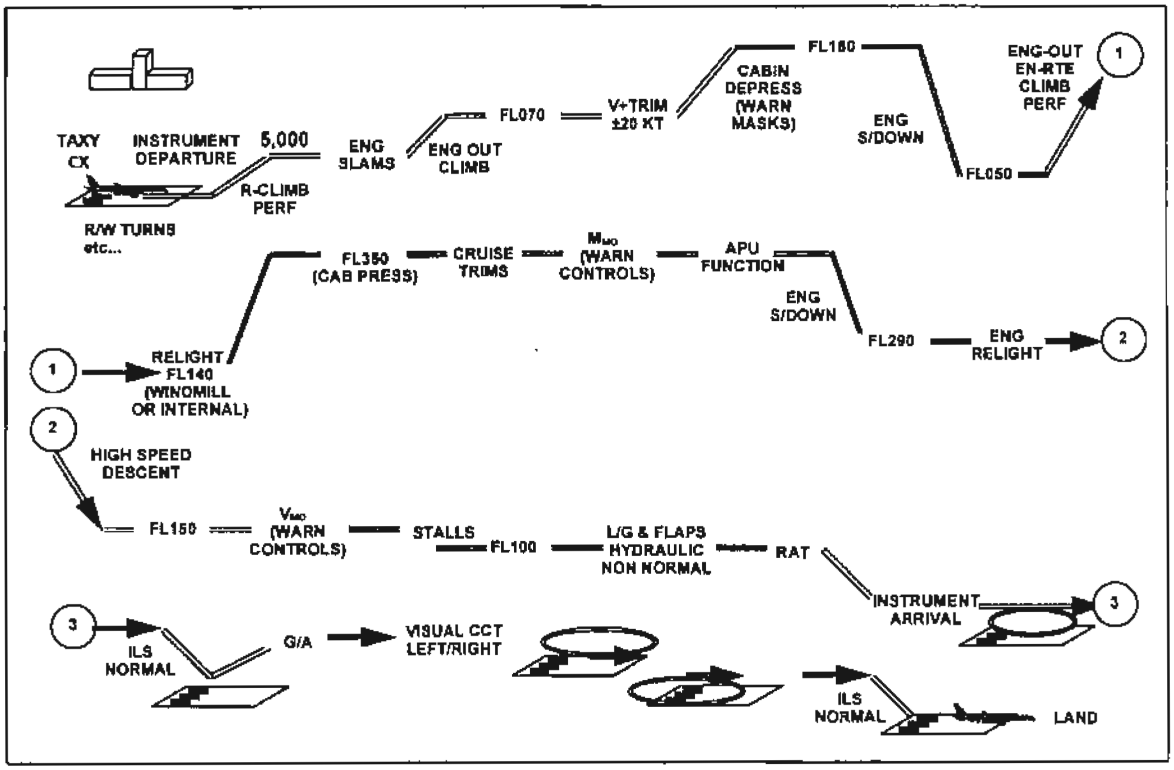
q. Crash Function.

(1) Gear-up Crash.

(2) Excessive rate of descent Crash.

(3) Excessive bank angle Crash.

Typical Subjective Continuing Qualification Evaluation Profile (2 hours)



End Information

Attachment 4 to Appendix A to Part 60–

SAMPLE DOCUMENTS

Table of Contents

ATTACHMENT 4 TO APPENDIX A TO PART 60—
Figure A4A – Sample Letter , Request for Initial, Upgrade, or Reinstatement Evaluation..
INFORMATION

Edward Cook, PhD.
Manager, National Simulator Program
Federal Aviation Administration
P.O. Box 20636 (AFS-205)
Atlanta, GA 30320

Dear Dr. Cook:

RE: Request for Initial [Upgrade / Reinstatement] Evaluation

(Sponsor's name) __________________ requests your evaluation of our (make, model, series) ________ airplane simulator for Level ______ qualification, located in (City/State) at the (Facility) on (proposed evaluation date). [The proposed evaluation date must not be more than 180 days following the date of this letter.] This simulator [has / has not] been previously qualified by the FAA [and had been issued FAA identification number XXX]. Under separate cover, we have asked our Principal Operations Inspector (POI) (Training Center Program Manager, TCPM), Mr./Ms.__________________(Name), to forward to you a letter concurring with this request.

[The history of this simulator is as follows: ____.]

We agree to provide a Qualification Test Guide (QTG) to your staff not later than 45 days prior to the proposed evaluation date [if tests not run at training site, an additional "1/3 on-site" tests must be provided not later than 14 days prior the proposed evaluation date]. If we are unable to meet the above date for the evaluation, this may result in a significant delay, perhaps 45 days or more, in rescheduling and completing the evaluation. With our forwarding the QTG, we acknowledge that the simulator meets all applicable requirements of Title 14 of the Code of Federal Regulation (14 CFR) Part 60; that it meets the requirements of the Airplane Flight Simulator Qualification Performance Standards (QPS); and that appropriate hardware and software configuration control procedures have been established.

We also agree to forward to you, not later than five (5) business days prior to the scheduled evaluation of this simulator, a confirmation statement that will include the following information:

1. That (a) pilot(s) we have designated, who is(are) qualified on the (make, model, series) _______ airplane, has(have) assessed the simulator and found that the performance and flying qualities of the simulator represent the (make, model, series) _______ airplane. This determination will be made after flying all the maneuvers and procedures and exercising the tasks listed in the Table of Functions and Subjective Tests in Attachment 3 to the Airplane Simulator QPS (except for those listed in the attachment to this letter).

2. That (a) pilot(s), or (an)other person(s) we have designated, has(have) found the simulator systems and sub-systems (including simulated aircraft systems) functionally represent the (make, model, series) ________ airplane. This determination will he made after having exercised the operation of the simulator and the functions available through the Instructor Operating Station.

3. That, for type specific airplanes, (a) pilot(s), or (an)other person(s) we have designated, has(have) found the cockpit configuration represents the configuration of the (make, model, and series) ________ aircraft.

The names of the person(s) providing this information will be available to you upon your request.

[Added comments from Operator/Sponsor, if any]

Please contact <u>(Name and Telephone Number of Sponsor's Contact)</u> to confirm the date for this initial (upgrade / re-instatement) evaluation. We understand a member of your National Simulator Program staff will respond to this request within 14 days.

Sincerely,

(Signature –Management Representative)

ATTACHMENT 4 TO APPENDIX A TO PART 60--
Figure A4B – Sample Qualification Test Guide Cover Page
INFORMATION

SPONSOR NAME

SPONSOR ADDRESS

FAA QUALIFICATION TEST GUIDE

(SPECIFIC AIRPLANE MODEL)
for example
Stratos BA797-320A

(Type of Simulator)

(Simulator Identification Including Manufacturer, Serial Number, Visual System Used)

(Simulator Level)

(Qualification Performance Standard Used)

(Simulator Location)

FAA Initial Evaluation

Date: ____________

________________________ Date: __________
(Sponsor)

________________________ Date: __________
Manager, National
Simulator Program, FAA

ATTACHMENT 4 TO APPENDIX A TO PART 60—

Figure A4C – Sample Simulator Information Page

INFORMATION

SPONSOR NAME	
SPONSOR SIMULATOR CODE:	BA-797 #1
AIRPLANE MODEL:	Stratos BA797-320A
AERODYNAMIC DATA REVISION:	BA797-320, CPX-8D, January 1988
ENGINE MODEL(S) AND REVISION:	CPX-8D; RPT-6, January 1988 DRQ-4002, RPT-3, April 1991
FLIGHT CONTROLS DATA REVISION:	BA707-320; May 1988
FLIGHT MANAGEMENT SYSTEM:	Berry XP
SIMULATOR MODEL AND MANUFACTURER:	MTD-797, Tinker Simulators, Inc.
DATE OF SIMULATOR MANUFACTURE:	1988
SIMULATOR COMPUTER:	CIA
VISUAL SYSTEM MODEL, MANUFACTURER, and DISPLAY TYPE:	ClearView, Inc. "Real World T2;" 5 Channel, 6-window CRT display
VISUAL SYSTEM COMPUTER:	LMB-6
MOTION SYSTEM:	Tinker 6 DOF

Information on this page must be updated and kept current with any modifications or changes made to the simulator and reflected on the log of revisions and the list of effective pages.

ATTACHMENT 4 TO APPENDIX A TO PART 60—
Figure A4D – Sample Statement of Qualification
INFORMATION

Federal Aviation Administration
National Simulator Program

Statement of Qualification

This is to certify that representatives of the National Simulator Program Completed an evaluation of the

Go-Fast Airlines
Farnsworth Z-100 Full Flight Simulator
FAA Identification Number 999

And found it to meet the standards set forth in
AC 120-40B

The Master Qualification Test Guide and the attached Configuration List and Restrictions List Provide the Qualification Basis for this device to operate at

Level D
Until April 1, 2003

Unless sooner rescinded or extended by the National Simulator Program Manager

March 15, 2002	I. B. Checkin, Jr.
(date)	(for the NSPM)

ATTACHMENT 4 TO APPENDIX A TO PART 60—

Figure A4D1 – Sample Statement of Qualification; Configuration List

INFORMATION

STATEMENT of QUALIFICATION
CONFIGURATION LIST

Go Fast Airline Training -- Farnsworth Z-100 -- Level D -- FAA ID# 999

AIRPLANE CONFIGURATION		DATE QUALIFIED
Airplane(s):		
☐ Model	Z320-232	November, 1999
Engine(s)		
☐ Make/Model	Israeli Motors / SH001 Capitol Engines / WZ33B	November, 1999 November, 1999
Flight Management System:		
☐ Make/Model	Israeli Flight-Right CEC-123	November, 1999 November, 1999
Flight Instruments:		
☐ Electro-Mechanical	Standby Instruments	November, 1999
☐ Display (CRT, LCD, etc.)	CRT Flight Instruments	November, 1999
☐ Combination	No	
☐ Heads-Up Display	No	
Autopilot/Autoflight:		
☐ Make/Model	Precision Electronics / AB-123	November, 1999
Flight Director:		
☐ Single Cue	No	
☐ Dual Cue	King	November, 1999
Engine Instruments:		
☐ Electro-Mechanical	No	
☐ Display (CRT, LCD, etc.)	CRT	November, 1999
☐ Combination	No	
Navigation Type(s):		
☐ ADF	Yes	November, 1999
☐ VOR/ILS	Yes	November, 1999
☐ GPS	No	
☐ INS	No	
☐ IRS/ADIRU	Yes	November, 1999
☐ FANS	No	
Weather Radar:		
☐ Make/Type	Eastinghouse / X-band	November, 1999
Windshear Equipment:		
☐ Reactive	Eastinghouse	November, 1999
☐ Predictive	No	November, 1999
Other Equipment:		
☐ TCAS	Lookout, Inc.	October, 2000
☐ ACARS	Merryweather	November, 1999
☐ EGPWS	No	November, 1999
☐ SATCOM	No	
☐ CRM Video/Voice Recording	Yes	November, 1999
		(Continued Next Page)

ATTACHMENT 4 TO APPENDIX A TO PART 60—

Figure A4D1 (cont) – Sample Statement of Qualification; Configuration List

INFORMATION

STATEMENT of QUALIFICATION
CONFIGURATION LIST
(Continued)

Go Fast Airline Training -- Farnsworth Z-100 -- Level D -- FAA ID# 999

VISUAL CONFIGURATION		DATE QUALIFIED
Visual System:		
☐ Manufacturer	Marconi & Smith	November, 1999
☐ Model	Wideye	November, 1999
☐ CRT Installation	N/A	
☐ Projected System	3 Channel – Wide: 150° x 40° Viewing Angle	November, 1999
Circling Approach(es):		
☐ Initial Circling Qualification	KMEM Rwy 27 circle to Rwy 18R	November, 1999
Fully Custom Visual Scenes (14 CFR part 60 QPS, Att 3):		
☐ Airports (3 minimum)	KORD KATL KJFK	

ATTACHMENT 4 TO APPENDIX A TO PART 60—
Figure A4D2 – Sample Statement of Qualification; Restrictions List
INFORMATION

STATEMENT of QUALIFICATION
RESTRICTIONS LIST

Go Fast Airline Training -- Farnsworth Z-100 – Level D -- FAA ID# 999

The FSTD is qualified to perform all of the tasks listed in
AC 120-40B Appendix 3,
for its assigned level of qualification *except* for the following listed tasks.

Non-Qualified Tasks*:

3.e(1)(i)	NDB approach
3.h(1)(v)	Electrical system, generator failure
3.h(3)(ii)	Air hazard avoidance

*Numbers refer to AC120-40B App 3 table of required tasks.

ATTACHMENT 4 TO APPENDIX A TO PART 60
Figure A4E – Sample Continuing Qualification Evaluation Requirements Page Information

Recurrent Evaluation Requirements
Completed at conclusion of Initial Evaluation

Recurrent Evaluations to be conducted each _(fill in)__ months Allotting ______ hours of FTD time. Signed: ______________________________ NSPM / Evaluation Team Leader	Recurrent evaluations are due as follows: _(month)__ and __(month)_ and __(month)_ (enter or strike out, as appropriate) ____________________ Date

Revision:

Based on (enter reasoning): ______________________________

Recurrent Evaluations are to be conducted each _(fill in)__ months. Allotting ______ hours. Signed: ______________________________ NSPM Evaluation Team Leader	Recurrent evaluations are due as follows: _(month)__ and __(month)_ and __(month)_ (enter or strike out, as appropriate) ____________________ Date

Revision:

Based on (enter reasoning): ______________________________

Recurrent Evaluations are to be conducted each _(fill in)__ months. Allotting ______ hours. Signed: ______________________________ NSPM Evaluation Team Leader	Recurrent evaluations are due as follows: _(month)__ and __(month)_ and __(month)_ (enter or strike out, as appropriate) ____________________ Date

(Repeat as Necessary)

ATTACHMENT 4 TO APPENDIX A TO PART 60—
Figure A4F – Sample MQTG Index of Effective FSTD Directives.

INFORMATION

Index of Effective FSTD Directives
Filed in this Section

Notification Number	Received From: (TPAA/NSPM)	Date of Notification	Date of Modification Completion

Continue as Necessary....

Attachment 5 to Appendix A to Part 60—
SIMULATOR QUALIFICATION REQUIREMENTS
FOR WINDSHEAR TRAINING PROGRAM USE

1. Applicability.

Begin QPS Requirements

This attachment applies to all simulators used to satisfy the training requirements of 14 CFR part 121 that pertain to the sponsor's approved low-altitude windshear flight training program, or the training permitted in accordance with an FAA-approved training program under 14CFR part 121, 135, or 142, that addresses low-altitude windshear encounters.

End QPS Requirements

2. Statement of Compliance and Capability (SOC).

Begin QPS Requirements

a. The sponsor must submit an SOC that confirms that the aerodynamic model is based on flight test data supplied by the airplane manufacturer, or other approved source, and that any change to environmental wind parameters, including variances in those parameters for windshear conditions, once inserted for computation, result in the correct simulated performance. This statement must also include examples of where environmental wind parameters are currently evaluated in the simulator (such as crosswind takeoffs, crosswind approaches, and crosswind landings).

b. For those simulators where windshear warning, caution, or guidance hardware was not provided as original equipment, the SOC must also state that the simulation of the added simulator hardware and/or software, including associated cockpit displays and annunciations, function the same or equivalent to the system(s) installed in the airplane and be accompanied by a block diagram that depicts the input and output signal flow, comparing that signal flow to the equipment installed in the airplane being simulated.

End QPS Requirements

3. Models.

Begin QPS Requirements

The windshear models installed in the simulator software that will be used for the qualification evaluation must do the following:

a. Provide cues necessary for recognition of the onset of a windshear phenomena and potential performance degradation that would require a pilot to initiate recovery procedures. The cues must include all of the following, as may be appropriate for the appropriate portion of the flight envelope:

(1) Rapid airspeed change of at least ±15 knots (kts).

(2) Stagnation of airspeed during the takeoff roll.
(3) Rapid vertical speed change of at least ±500 feet per minute (fpm).
(4) Rapid pitch change of at least $\pm 5^0$.

b. Be adjustable in intensity (or other parameter to achieve an intensity effect) to at least two (2) levels so that upon encountering the windshear the pilot may identify its presence by the cues described above, and that when the pilot applies the recommended procedures for escape from such a windshear:

(1) If the intensity is lesser, the performance capability of the simulated airplane in the windshear permits the pilot to maintain a satisfactory flightpath; and
(2) If the intensity is greater, the performance capability of the simulated airplane in the windshear does not permit the pilot to maintain a satisfactory flightpath (crash).

Note: The means used to accomplish the "nonsurvivable" scenario of paragraph 3.b.(2) of this attachment, that involve operational elements of the simulated airplane, must reflect parameters that fall within the dispatch limitations of the airplane.

c. Be availahle for use in the FAA-approved windshear flight training program.

End QPS Requirements

---

4. Demonstrations.

Begin QPS Requirements

a. The sponsor must identify two of the required, survivable training windshear models – one takeoff and one approach. The sponsor must identify the wind components of the two models selected and present this information in graphical format so that all components of the windshear are shown, including initiation point, variance in magnitude, and either time or distance correlation as may be appropriate. The simulator must be operated at the same gross weight, airplane configuration, and initial airspeed in all of the following situations:

(1) Takeoff – through calm air.
(2) Takeoff – through the first selected survivable windshear.
(3) Approach – through calm air.
(4) Approach – through the second selected survivable windshear.

b. In each of these four situations, at an "initiation point" (that point being where the onset of windshear conditions is, or would have been recognized, depending on the test being run), the recommended procedures for windshear recovery are applied, and the results are recorded, as specified in paragraph 5 of this attachment.

c. These recordings are made without the presence of programmed random turbulence. Turbulence that results from the windshear model is to be expected, and no attempt may be made to neutralize turbulence from this source.

d. The definition of the models and the results of the demonstrations of all four(4) cases described in paragraph 4.a of this attachment, must be made a part of the MQTG.

End QPS Requirements

---

5. Recording Parameters.

Begin QPS Requirements

a. In each of the four MQTG cases, an electronic recording (time history) must be made of the following parameters:

(1) Indicated or calibrated airspeed.
(2) Indicated vertical speed.
(3) Pitch attitude.
(4) Indicated or radio altitude.
(5) Angle of attack.
(6) Elevator position.
(7) Engine data (thrust, N_1, or throttle position).
(8) Wind magnitudes (simple windshear model assumed).

b. These recordings shall be initiated at least 10 seconds prior to the initiation point and continued until recovery is complete or ground contact is made.

End QPS Requirements

---

6. Equipment Installation and Operation.

Begin QPS Requirements

All windshear warning, caution, or guidance hardware installed in the simulator must operate as it operates in the airplane being simulated. For example: if the simulator encounters a rapidly changing wind speed and/or direction that would have resulted in a windshear warning in the airplane were the same conditions encountered, the simulator must respond equivalently, without instructor/evaluator intervention.

End QPS Requirements

---

7. Qualification Test Guide.

Begin QPS Requirements

a. All QTG material (performance demonstration recordings, etc.) will be forwarded to the NSPM.

b. The simulator will be scheduled for an evaluation in accordance with normal procedures. Use of recurrent evaluation schedules will be used to the maximum extent possible.

c. During the on-site evaluation, the evaluator will ask the operator to run the performance tests and record the results. The results of these on-site tests will be compared to those results previously approved and placed in the QTG or MQTG, as appropriate.

d. QTG's for new (or MQTG's for upgraded) simulators must contain or reference the information described in paragraphs 2, 3, 4, and 5 of this attachment.

End QPS Requirements

---

8. Subjective Evaluation.

Begin Information

The NSPM will fly the simulator in at least two of the available windshear scenarios to examine the function of the simulator and the simulated airplane and to evaluate subjectively the performance of the simulator as it encounters the programmed windshear conditions according to the following:

a. One scenario will include parameters that enable the pilot to maintain a satisfactory flightpath.

b. One scenario will include parameters that will not enable the pilot to maintain a satisfactory flightpath (crash).

c. Other scenarios may be examined at the discretion of the NSPM.

End Information

---

9. Qualification Basis.

Begin Information

The addition of windshear programming to a simulator in order to comply with the qualification for required windshear training does not change the original qualification basis of the simulator.

End Information

---

10. Demonstration Repeatability.

Begin Information

For the purposes of demonstration repeatability, it is recommended that the simulator be flown by means of the simulator's autodrive function (for those simulators that have autodrive capability) during the demonstrations.

End Information

Appendix B to Part 60—Qualification Performance Standards for Airplane Flight Training Devices

---

Begin Information

This appendix establishes the standards for Airplane Flight Training Device (FTD) evaluation and qualification atLevel 4, Level 5, or Level 6. The Flight Standards Service, National Simulator Program (NSP) staff, under the direction of the NSP Manager (NSPM), is responsible for the development, application, and interpretation of the standards contained within this appendix. The procedures and criteria specified in this appendix will be used by the NSPM, or a person or persons assigned by the NSPM (e.g., FAA pilots and/or FAA aeronautical engineers, assigned to and trained under the direction of the NSP – referred to as NSP pilots or NSP engineers, other FAA personnel, etc.) when conducting airplane FTD evaluations.

End Information

Table of Contents

22. Applications, Logbooks, Reports, and Records: Fraud, Falsification, or Incorrect Statements (§ 60.33).
23. [Reserved]
24. Levels of FTD.
25. FTD Qualification on the Basis of a Bilateral Aviation Safety Agreement (BASA) (§ 60.37).

Attachment 1 to Appendix B to Part 60—General FTD Requirements.
Attachment 2 to Appendix B to Part 60—Flight Training Device (FTD) Objective Tests.
Attachment 3 to Appendix B to Part 60—Flight Training Device (FTD) Subjective Tests.
Attachment 4 to Appendix B to Part 60—Sample Documents.

1. Introduction

Begin Information

a. This appendix contains background information as well as material that is either directive or informative in nature as described later in this section. Except for this Introduction section, the directive or the informative material is presented in sections that correspond with sections of part 60. This material provides additional requirements and/or provides information regarding that subject. Some sections will have neither additional regulatory or informational material.

b. To assist the reader in determining what areas are directive or required and what areas are guiding or permissive –
(1) The text in this appendix is contained within one of two sections: regulatory requirements that are in addition to the requirements in part 60 but are found only in this appendix, referred to as "QPS Requirements;" and advisory or informative material, referred to as "Information."
  (a) The FAA has chosen to place into special QPS Requirements sections those requirements that are more likely to change on a more regular basis for a variety of reasons, e.g., increased knowledge about human factors, analysis of incident/accident data, and/or changes in aircraft or simulation technology. Using this capability, the FAA will be able to use information resulting from these factors to expeditiously modify the regulatory requirements without compromising the timeliness of those changes and without violating the Administrative Procedure Act (APA). In accordance with the APA, the FAA intends to treat all such QPS Requirements changes as Notices of Proposed Rule Making (NPRM), will seek input and suggestions from a representative cross-section of the affected industry through an Aviation Rulemaking Committee, will seek public comment through announcement of any proposed change in the Federal Register, and will review changes before final action on them is complete. The FAA does not expect that many changes to these QPS Requirements will justify the expenditure of time and resources at the highest levels of the agency and will therefore streamline the process for making technical changes to these QPS Requirements by

delegating authority for final review and issuance from the Administrator to the Director, Flight Standards Service.

(b) Similarly, the FAA has chosen to place into special Information sections additional material regarding the adjacent regulatory requirements such as acceptable examples of practices and either additional or clarifying information that may be useful to the public in identifying the intent of the FAA.

(2) The text presented between horizontal lines beginning with the heading "Begin QPS Requirements" and ending with the heading "End QPS Requirements," provides clarification for, or contains additional details regarding, the regulatory requirements found in the part 60 rule language.

(3) The text presented between horizontal lines beginning with the heading "Begin Information" and ending with the heading "End Information," is advisory or informative and is presented to provide additional information and/or clarification regarding the relevant subject.

(4) The tables in this appendix have rows across the top of each table –

(a) The data presented in columns under the heading "QPS REQUIREMENTS" is regulatory but is found only in this appendix.

(b) The data presented in columns under the heading "INFORMATION" is advisory or informative.

c. Questions regarding the contents of this publication should be sent to: U.S. Department of Transportation, Federal Aviation Administration, Flight Standards Service, National Simulator Program Staff, AFS-205, 100 Hartsfield Centre Parkway, Suite 400, Atlanta, Georgia, 30354. Telephone contact numbers for the NSP are: phone, 404-832-4700; fax, 404-761-8906. The general email address for the NSP office is: 9-aso-avr-sim-team@faa.gov. The National Simulator Program Internet Web Site address is: http://www.faa.gov/nsp. On this Web Site you will find an NSP personnel list with telephone and email contact information for each NSP staff member, a list of qualified flight simulation devices, advisory circulars, a description of the qualification process, NSP policy, and an NSP "In-Works" section. Also linked from this site are additional information sources, handbook bulletins, frequently asked questions, a listing and text of the Federal Aviation Regulations, Flight Standards Inspector's handbooks, and other FAA links.

d. The NSPM encourages the use of electronic media for communication and the gathering, storage, presentation, or transmission of any record, report, request, test, or statement required by this appendix provided the media used has adequate provision for security and is acceptable to the NSPM. The NSPM recommends inquiries on system compatibility prior to any such activity. Minimum System requirements may be found on the NSP Website.

e. Related Reading References.

(1) 14CFR part 60

(2) 14CFR part 61.

(3) 14CFR part 63.

(4) 14CFR part 119

(5) 14CFR part 121.

(6) 14CFR part 125
(7) 14CFR part 135.
(8) 14CFR part 141
(9) 14CFR part 142
(10) Advisory Circular (AC) 120-28C, Criteria for Approval of Category III Landing Weather Minima.
(11) AC 120-29, Criteria for Approving Category I and Category II Landing Minima for part 121 operators.
(12) AC 120-35B, Line Operational Simulations: Line-Oriented Flight Training, Special Purpose Operational Training, Line Operational Evaluation.
(13) AC 120-41, Criteria for Operational Approval of Airborne Wind Shear Alerting and Flight Guidance Systems.
(14) AC 120-57A, Surface Movement Guidance and Control System (SMGS).
(15) AC 150/5300-13, Airport Design.
(16) AC 150/5340-1G, Standards for Airport Markings.
(17) AC 150/5340-4C, Installation Details for Runway Centerline Touchdown Zone Lighting Systems.
(18) AC 150/5340-19, Taxiway Centerline Lighting System.
(19) AC 150/5340-24, Runway and Taxiway Edge Lighting System.
(20) AC 150/5345-28D, Precision Approach Path Indicator (PAPI) Systems
(21) International Air Transport Association document, "Flight Simulator Design and Performance Data Requirements," as amended.
(22) AC 25-7, as amended, Flight Test Guide for Certification of Transport Category Airplanes.
(23) AC 23-8A, as amended, Flight Test Guide for Certification of Part 23 Airplanes.
(24) International Civil Aviation Organization (ICAO) Manual of Criteria for the Qualification of Flight Simulators, as amended.
(25) Airplane Flight Simulator Evaluation Handbook, Volume I, as amended and Volume II, as amended, The Royal Aeronautical Society, London, UK.
(26) FAA Publication FAA-S-8081 series (Practical Test Standards for Airline Transport Pilot Certificate, Type Ratings, Commercial Pilot, and Instrument Ratings).
(27) The FAA Aeronautical Information Manual (AIM), FAA Handbook XXXXX

f. Background.
(1) The primary objective of flight training continues to be one of providing a means for flightcrew members to acquire the skills and knowledge necessary to perform to a desired safe standard. By the same measure, flight simulation continues to provide the most effective, viable environment for the instruction, demonstration, and practice of the maneuvers and procedures (called training events) pertinent to a particular airplane and crew member position. The complexity, operating costs, and operating environment of modern airplanes, together with the steady technological advances in flight simulation, have continued to encourage, and, in fact, have demanded, the expanded use of flight simulation (both FTDs and simulators) in the training and checking of flightcrew members.
(2) The FAA has traditionally recognized the value of training devices and has awarded credit for their use in the completion of specific training and checking events in both general aviation and air carrier flight training programs and in pilot certification activities.

Such credits are delineated in 14CFR Parts 61 and 121; and in other appropriate sources such as handbooks and guidance documents. These CFR sources, however, have, in the past, referred only to a "training device" or to a "flight training device," with no further descriptive information. Other sources had referred to flight training devices in several categories such as Cockpit Procedures Trainers, Cockpit Systems Simulators, Fixed Base Simulators, and other descriptors. Prior to the advent of the predecessor to this document, these categories and names had no standard definition or design criteria within the industry and no single source guidance document had existed to categorize these devices, to provide qualification standards for each category, or to relate one category to another in terms of capability or technical complexity. As a result, approval of these devices for use in training programs had not always been equitable. This circumstance has changed. The recognizable and understood technical definitions and descriptions in previous documents has provided a foundation. Knowledge of the FAA-authorized uses of FTDs built on this foundation and has significantly influenced the flight training industry to increase the use of FTDs and has garnered support for multiplying that use in the future.
(3). For information purposes, the following is a chronological listing of the documents preceding part 60 that have addressed the qualification criteria for airplane flight training device (FTD) evaluation and qualification by the FAA, including the effective dates of those documents:
AC 120-45 05/11/87 to 02/05/92
AC 120-45A 02/05/92 to (date TBD)
(4) For information on devices other than FTD Levels 4, 5, 6, and 7 and all levels of FFS, please contact the General Aviation and Commercial Division, AFS-800, FAA Headquarters, 800 Independence Ave, SW, Washington, DC, 20591; phone 202-267-XXXX.
(5) In that there has been only a minimum utilization of the Level 7 FTD category since 1992, the FAA has concluded that no new FTD will be qualified at Level 7. Therefore, Level 7 is not referenced in this appendix. All existing Level 7 FTDs will retain a "grandfathered" status unless otherwise requested by the sponsor.

End Information

---

2. Applicability (§§ 60.1 & 60.2)

Begin Information

There is no additional regulatory or informational material that applies to § 60.1, Applicability, or to § 60.2, Applicability of sponsor rules to person who are not sponsors and who are engaged in certain unauthorized activities.

End Information

---

3. Definitions (§ 60.3)

Begin Information

See Appendix F of this part for a list of definitions and abbreviations from part 1 and part 60, including the appropriate appendices of part 60.

End Information

4. Qualification Performance Standards (§ 60.4)

Begin Information

There is no additional regulatory or informational material that applies to § 60.4, Qualification Performance Standards.

End Information

5. Quality Management System (§ 60.5).

Begin Information

Additional regulatory material and informational material regarding Quality Management Systems for Flight Simulation Training Devices may be found in appendix E of this part.

End Information

6. Sponsor Qualification Requirements. (§ 60.7).

Begin Information

a. The intent of the language used in § 60.7(b) is to have a specific FSTD, identified by the sponsor, used by the sponsor at least once in the sponsor's FAA-approved flight training program for the airplane simulated during the 12-month period described. The identification of the specific FSTD may change from one 12-month period to the next 12-month period as long as that sponsor sponsors and uses at least one FSTD at least once during the prescribed period. There is no minimum number of hours or minimum FSTD periods required.

b. To assist in avoiding confusion regarding the requirements for use of a qualified FSTD the following examples/descriptions are provided to describe acceptable operational practices:

(1) Example One.

(a) A sponsor is sponsoring a single, specific FSTD for their own use, in their own facility or elsewhere – this single FSTD forms the basis for the sponsorship. The sponsor uses that FSTD at least once in each 12-month period in that sponsor's FAA-approved flight training program for the airplane simulated. This 12-month period is established according to the following:

(i) If the FSTD was qualified prior to [insert the effective date of this rule] the 12-month period begins on the date of the first NSPM-conducted continuing qualification after [insert the effective date of this rule] and continues for each subsequent 12-month period;

(ii) If the FSTD satisfactorily completes an initial or upgrade evaluation on or after [insert the effective date of this rule] the 12-month period begins on the date of that completed initial or upgrade evaluation and continues for each subsequent 12-month period.

(b) There is no minimum number of hours or minimum FSTD periods required.

(c) The identification of the specific FSTD may change from one 12-month period to the next 12-month period as long as that sponsor sponsors and uses at least one FSTD at least once during the prescribed period.

(2) Example Two.

(a) A sponsor sponsors an additional number of FSTD's, in their facility or elsewhere. Each such additionally sponsored FSTD must be –

(i) Used by the sponsor in the sponsor's FAA-approved flight training program for the airplane simulated [as described in § 60.7(d)(1)] at least once in each 12-month period in that sponsor's FAA-approved flight training program for the airplane simulated (this 12-month period is established in the same manner as in example one);

OR

(ii) Used by another FAA certificate holder in that other certificate holder's FAA-approved flight training program for the airplane simulated [as described in § 60.7(d)(1)] at least once in each 12-month period in that certificate holder's FAA-approved flight training program for the airplane simulated (this 12-month period is established in the same manner as in example one);

OR

(iii) Provided a statement each year from a qualified pilot, (after having flown the airplane, not the subject FSTD or another FSTD, during the preceding 12-month period) stating that the subject FSTD's performance and handling qualities represent the airplane [as described in § 60.7(d)(2)]. This statement is provided at least once in each 12-month period established in the same manner as in example one.

(b) There is no minimum number of hours or minimum FSTD periods required.

(3) Example Three.

(a) A sponsor (in this example, a Part 142 certificate holder) in "New York" (having at least one FSTD used at least once per year in the sponsor's FAA-approved flight training program) establishes a "satellite" training center in "Chicago" and/or a satellite center in "Moscow."

(b) The satellite function means that the "Chicago" and/or "Moscow" center(s) must operate under the "New York" center's certificate (in accordance with all of the "New York" center's practices, procedures, and policies; e.g., instructor and/or technician training/checking requirements, record keeping, QMS program, etc.).

(c) All of the FSTD's in the "Chicago" center and/or the "Moscow" center could be dry-leased (i.e., the certificate holder does not have and utilize FAA-approved flight training programs for the FSTD's in the "Chicago" and/or the "Moscow" center) because –

(i) Each FSTD in the "Chicago" center and/or each FSTD in the "Moscow" center is used at least once each 12-month period by another FAA certificate holder in that other certificate holder's FAA-approved flight training program for the airplane [as described in § 60.7(d)(1)];or

(ii) A statement is obtained from a qualified pilot (having flown the airplane, not the subject FSTD or another FSTD during the preceding 12-month period) stating that the performance and handling qualities of each FSTD in the "Chicago" center and/or each FSTD in the "Moscow" center represent the airplane [as described in § 60.7(d)(2)].

End Information

7. Additional Responsibilities of the Sponsor (§ 60.9)..

Begin Information

The phrase "...as soon as practicable..." as found in §60.9(a) means without unnecessarily disrupting or delaying beyond a reasonable time the training, evaluation, or experience being conducted in the FSTD.

End Information

8. FTD Use (§ 60.11).

Begin Information

There is no additional regulatory or informational material that applies to § 60.11, FTD use.

End Information

9. FTD Objective Data Requirements (§ 60.13).

Begin QPS Requirements

a. When flight test data is used to validate FTD performance and handling qualities this data must have been gathered in accordance with a flight test program containing the following:
(1) A flight test plan, that contains:
  (a) The required maneuvers and procedures.
  (b) For each maneuver or procedure --
    (i) The procedures and control input the flight test pilot and/or engineer are to use.
    (ii) The atmospheric and environmental conditions.
    (iii) The initial flight conditions.
    (iv) The airplane configuration, including weight and center of gravity.
    (v) The data that is to be gathered.
    (vi) Any other appropriate factors.
(2) Appropriately qualified flight test personnel.
(3) An understanding of the accuracy of the data to be gathered using appropriately calibrated data acquisition equipment and airplane performance instrumentation.
(4) Appropriate and sufficient data acquisition equipment or system(s), including appropriate data reduction and analysis methods and techniques, as would be acceptable to the FAA's Aircraft Certification Service.

b. The data, regardless of source, must be presented:
(1) in a format that supports the FTD validation process;
(2) in a manner that is clearly readable and annotated correctly and completely;
(3) with resolution sufficient to determine compliance with the tolerances set forth in attachment 2 of this appendix.
(4) with any necessary guidance information provided; and

(5) without alteration, adjustments, or bias; however the data may be re-scaled, digitized, or otherwise manipulated to fit the desired presentation.

c. After completion of any additional flight test, a flight test report must be submitted in support of the validation data. The report must contain sufficient data and rationale to support qualification of the FTD at the level requested.

End QPS Requirements

Begin Information

d. The FTD sponsor is encouraged to maintain a liaison with the manufacturer of the aircraft being simulated (or with the holder of the aircraft type certificate for the aircraft being simulated if the manufacturer is no longer in business), and/or, if appropriate, with the person having supplied the aircraft data package for the FTD in order to facilitate the notification described in this paragraph. The NSPM requests that the sponsor notify the NSPM when an addition to or a revision of the flight related data or airplane systems related data is available if this data is used to program and/or operate a qualified FTD. The data referred to in this sub-section are those data that are used to validate the performance, handling qualities, or other characteristics of the aircraft, including data related to any relevant changes occurring after the type certification is issued. Such notification should also provide technical information about this data to the NSPM relative to the data's significance for training, evaluation, or flight experience activities in the FTD.

e. It is the intent of the NSPM that for new aircraft entering service, at a point well in advance of preparation of the Qualification Test Guide (QTG), the sponsor should submit to the NSPM for approval, a descriptive document (a validation data roadmap) containing the plan for acquiring the validation data, including data sources. This document should clearly identify sources of data for all required tests, a description of the validity of these data for a specific engine type and thrust rating configuration, and the revision levels of all avionics affecting the performance or flying qualities of the aircraft. Additionally, this document should provide rationale or explanations for cases where data or data parameters are missing, where engineering simulation data are used, where flight test methods require further explanations, etc. and provide a brief narrative describing the cause and effect of any deviation from data requirements. This document may be provided by the aircraft manufacturer.

f. There is no requirement for any flight test data supplier to submit a flight test plan/program prior to gathering flight test data. However, the NSP staff has experience that indicates at least some data gatherers, primarily those that do not have a satisfactory "history" of supplying such data, often provide data that is irrelevant, not properly marked, without adequate justification for selection, without adequate information regarding initial conditions, without adequate information regarding the test maneuver, etc. The NSP staff has been forced to not accept such data submissions as validation data for FTD evaluation. It is for this reason that the NSP staff recommends that any data supplier not previously experienced in this area review the data necessary for programming and for validating the performance of the FTD and discuss the flight test plan anticipated for acquiring such data with the NSP staff well in advance of commencing the flight tests.

g. In those cases where the objective test results authorize a "snapshot test" or a "series of snapshot tests" results in lieu of a time-history result, the sponsor, or other data provider, must ensure that a steady state condition exists at the instant of time captured by the "snapshot." This is often verified by showing that a steady state condition existed from some period prior to, through some period following, the snap shot. The time period most frequently used is from 5 seconds prior to, through 2 seconds following, the instant of time captured by the snap shot. This paragraph is primarily addressing the source data and the method by which the data provider ensures that the steady state condition for the snap shot is representative.

h. The NSPM will consider, on a case-by-case basis, whether or not to approve supplemental validation data derived from flight data recording systems such as a Quick Access Recorder or Flight Data Recorder.

End Information

---

10. Special Equipment and Personnel Requirements for Qualification of the FTD (§ 60.14).

Begin Information

a. In the event that the NSPM determines that special equipment or (a) specifically qualified person(s) will be required for the conduct of any evaluation, the NSPM will make every attempt to notify the sponsor at least one (1) week, but in no case less than 72 hours, in advance of the evaluation. Examples of special equipment include flight control measurement devices, accelerometers, oscilloscopes, etc. Examples of specially qualified personnel would be those specifically qualified to install or use any special equipment when its use is required.

b. Examples of a special evaluation would be an evaluation conducted after the move of an FTD; at the request of the TPAA; as a result of comments received from users of the FTD that, upon analysis and confirmation, might cause a question as to the continued qualification or use of the FTD; etc.

End Information

---

11. Initial (and Upgrade) Qualification Requirements (§ 60.15).

Begin QPS Requirement

a. In order to be qualified at the appropriate qualification level, the FTD must:

(1) Meet the general requirements listed in Attachment1 found in –

(a) The Table of Minimum FTD Requirements;

(b) The Table of Tasks vs. FTD Level, Subjective Requirements; and

(c) The Table of FTD Systems, Subjective Requirements.

(2) Meet the objective testing requirements in Attachment 2 (Level 4 does not require objective tests – see attachment 2, paragraph b(3)); and
(3) Satisfactorily perform the subjective tests listed in Attachment 3.

b. The request described in § 60.15(a) must include all of the following:
(1) A statement that the FTD meets all of the applicable provisions of this part and all applicable provisions of the QPS.
(2) A confirmation that the sponsor will forward to the NSPM the statement described in § 60.15(b) in such time as to be received no later than 5 business days prior to the scheduled evaluation and may be forwarded to the NSPM via traditional or electronic means.
(3) Except for a Level 4 FTD, a qualification test guide (QTG), acceptable to the NSPM, that includes all of the following:
(a) Objective data obtained from aircraft testing or another approved source.
(b) Correlating objective test results obtained from the performance of the FTD as prescribed in the appropriate QPS.
(c) The result of FTD subjective tests prescribed in the appropriate QPS.
(d) A description of the equipment necessary to perform the evaluation for initial qualification and the continuing qualification evaluations.

c. The QTG described in paragraph a(3) of this section, must provide the documented proof of compliance with the FTD objective tests in attachment 2 of this appendix.

d. The QTG is prepared and submitted by the sponsor, or the sponsor's agent on behalf of the sponsor, to the NSPM for review and approval, and must include, for each objective test:
(1) Parameters, tolerances, and flight conditions;
(2) Pertinent and complete instructions for the conduct of automatically and manually conducted tests;
(3) A means of comparing the FTD's test results to the objective data;
(4) Any other information necessary, to assist in the evaluation of the test results;
(5) Other information appropriate to the qualification level of the FTD.

e. The QTG described in paragraphs a(3) and b of this section, must include the following:
(1) A QTG cover page with sponsor and FAA approval signature blocks (see Attachment 4, Figure 2, for a sample QTG cover page).
(2) A continuing qualification evaluation schedule requirements page – to be used by the NSPM to establish and record the frequency with which continuing qualification evaluations must be conducted and any subsequent changes that may be determined by the NSPM. See Attachment 4, Figure 4, for a sample Continuing Qualification Evaluation Schedule Requirements page.
(3) An FTD information page that provides the information listed in this paragraph, if applicable (see Attachment 4, Figure 3, for a sample FTD information page). For convertible FTDs, the sponsor must submit at least a separate page for each configuration of the FTD.
(a) The sponsor's FTD identification number or code.
(b) The airplane model and series being simulated.

(c) The aerodynamic data revision number or reference.
(d) The engine model(s) and its data revision number or reference.
(e) The flight control data revision number or reference.
(f) The flight management system identification and revision level.
(g) The FTD model and manufacturer.
(h) The date of FTD manufacture.
(i) The FTD computer identification.
(j) The visual system model and manufacturer, including display type.
(k) The motion system type and manufacturer, including degrees of freedom

(4) A Table of Contents.
(5) A log of revisions and a list of effective pages.
(6) List of all relevant data references.
(7) A glossary of terms and symbols used (including sign conventions and units).
(8) Statements of compliance and capability (SOC's) with certain requirements. SOC's must provide references to the sources of information for showing the capability of the FTD to comply with the requirement, a rationale explaining how the referenced material is used, mathematical equations and parameter values used, and the conclusions reached; i.e. that the FTD complies with the requirement. Refer to the "General FTD Requirements" column, Table B1A, in attachment 1, or in the "Alternative Data Sources, Procedures, and Instrumentation" column, Table B2F, in attachment 2, to see when SOC's are required.
(9) Recording procedures or equipment required to accomplish the objective tests.
(10) The following information for each objective test designated in attachment 2, as applicable to the qualification level sought:

(a) Name of the test.
(b) Objective of the test.
(c) Initial conditions.
(d) Manual test procedures.
(e) Automatic test procedures (if applicable).
(f) Method for evaluating FTD objective test results.
(g) List of all relevant parameters driven or constrained during the automatically conducted test(s).
(h) List of all relevant parameters driven or constrained during the manually conducted test(s).
(i) Tolerances for relevant parameters.
(j) Source of Validation Data (document and page number).
(k) Copy of the Validation Data (if located in a separate binder, a cross reference for the identification and page number for pertinent data location must be provided).
(l) FTD Objective Test Results as obtained by the sponsor. Each test result must reflect the date completed and must be clearly labeled as a product of the device being tested.

f. A convertible FTD is addressed as a separate FTD for each model and series airplane to which it will be converted and for the FAA qualification level sought. The NSP will conduct an evaluation for each configuration. For example, if a sponsor seeks qualification for two models of an airplane type using a convertible FTD, the sponsor must submit two QTG's, or a supplemented QTG, and the NSP will conduct two evaluations.

g. Form and manner of presentation of objective test results in the QTG:
(1) The sponsor's FTD test results must be recorded in a manner, acceptable to the NSPM, that will allow easy comparison of the FTD test results to the validation data (e.g., use of a multi-channel recorder, line printer, cross plotting, overlays, transparencies, etc.).
(2) FTD results must be labeled using terminology common to airplane parameters as opposed to computer software identifications.
(3) Validation data documents included in a QTG may be photographically reduced only if such reduction will not alter the graphic scaling or cause difficulties in scale interpretation or resolution.
(4) Scaling on graphical presentations must provide the resolution necessary to evaluate the parameters shown in attachment 2 of this appendix.
(5) For tests involving time histories, data sheets (or transparencies thereof) and FTD test results must be clearly marked with appropriate reference points to ensure an accurate comparison between FTD and airplane with respect to time. Time histories recorded via a line printer are to be clearly identified for cross-plotting on the airplane data. Over-plots must not obscure the reference data.

h. The sponsor may elect to complete the QTG objective tests at the manufacturer's facility. Tests performed at this location must be conducted after assembly of the FTD has been essentially completed, the systems and sub-systems are functional and operate in an interactive manner, and prior to the initiation of disassembly for shipment. The sponsor must substantiate FTD performance at the sponsor's training facility by repeating a representative sampling of all the objective tests in the QTG and submitting these repeated test results to the NSPM. This sample must consist of at least one-third of the QTG objective tests. The QTG must be clearly annotated to indicate when and where each test was accomplished.

i. While the subjective tests are normally accomplished at the sponsor's training facility, the sponsor may elect to complete the subjective tests at the manufacturer's facility. Tests performed at this location will be conducted after assembly of the FTD has been essentially completed, the systems and sub-systems are functional and operate in an interactive manner, and prior to the initiation of disassembly for shipment. The sponsor must substantiate FTD performance at the sponsor's training facility by having the pilot(s) who performed these tests originally (or similarly qualified pilot(s)), repeat a representative sampling of these subjective tests (need not take more than one normal FTD period – e.g., 4 hours) and submit a statement to the NSPM that the FTD has not changed from the original determination. This statement must clearly indicate when and where these repeated tests were completed.

j.The sponsor must maintain a copy of the MQTG at the FTD location.

k. All FTDs for which the initial qualification is conducted after [insert 6 years after effective date of this rule] must have an electronic MQTG (eMQTG) including all objective data obtained from airplane testing, or another approved source (reformatted or digitized), together with correlating objective test results obtained from the performance of the FTD (reformatted or digitized) as prescribed in this appendix, the general FTD performance or demonstration results (reformatted or digitized) prescribed in this appendix, and a description of the equipment necessary to perform the evaluation for initial qualification and the continuing qualification evaluations for continuing qualification. This eMQTG must include the original validation data used to validate FTD performance and handling qualities in either the original digitized format from the data supplier or an electronic scan of the original time-history plots that were provided by the data supplier. An eMQTG must be provided to the NSPM.

l. All other FTDs (not covered in subparagraph "j") must have an electronic copy of the MQTG by and after [insert 6 years after effective date of this rule], a copy of which must be provided to the NSPM. This may be provided by an electronic scan presented in a Portable Document File (PDF), or similar format, acceptable to the NSPM.

End QPS Requirements

Begin Information

m. Only those FTDs that are sponsored by a certificate holder (as defined for use in part 60 and this QPS appendix) will be evaluated by the NSPM. However, other FTD evaluations may be conducted on a case-by-case basis as the Administrator deems appropriate, but only in accordance with applicable agreements.

n. Each FTD must be evaluated as completely as possible. To ensure a thorough and uniform evaluation, each FTD is subjected to the general FTD requirements and performance demonstrations in attachment 1, the objective tests listed in attachment 2, and the subjective tests listed in attachment 3 of this appendix. The evaluation(s) described herein will include, but not necessarily be limited to the following, as appropriate, for the qualification level of the FTD:
(1) Airplane responses, including longitudinal and lateral-directional control responses (see attachment 2 of this appendix);
(2) Performance in authorized portions of the simulated airplane's operating envelope, to include tasks evaluated by the NSPM in the areas of ground operations, takeoff, climb, cruise, descent, and approach, as well as abnormal and emergency operations (see attachment 2 of this appendix);
(3) Control checks (see attachment 1 and attachment 2 of this appendix);
(4) Cockpit configuration (see attachment 1 of this appendix);
(5) Pilot, flight engineer, and instructor station functions checks (see attachment 1 and attachment 3 of this appendix);
(6) Airplane systems and sub-systems (as appropriate) as compared to the airplane simulated (see attachment 1 and attachment 3 of this appendix);
(7) FTD systems and sub-systems, including force cueing (motion), visual, and aural (sound) systems, as appropriate (see attachment 1 and attachment 2 of this appendix); and
(8) Certain additional requirements, depending upon the complexity of the FTD qualification level sought, including equipment or circumstances that may become hazardous to the occupants. The sponsor may be subject to Occupational Safety and Health Administration requirements.

o. The NSPM administers the objective and subjective tests, which includes an examination of functions. The tests include a qualitative assessment of the simulator by an NSP pilot. The NSP evaluation team leader may assign other qualified personnel to assist in accomplishing the functions examination and/or the objective and subjective tests performed during an evaluation when required.
(1) Objective tests provide a basis for measuring and evaluating FTD performance and determining compliance with the requirements of this part.
(2) Subjective tests provide a basis for:
(a) Evaluating the capability of the FTD to perform over a typical utilization period;
(b) Determining that the FTD satisfactorily simulates each required task;
(c) Verifying correct operation of the FTD controls, instruments, and systems; and
(d) Demonstrating compliance with the requirements of this part.

p. The tolerances for the test parameters listed in attachment 2 of this appendix are the maximum acceptable to the NSPM for FTD validation and are not to be confused with design tolerances specified for FTD manufacture. In making decisions regarding tests and test results, the NSPM relies on the use of operational and engineering judgment in the application of data (including consideration of the way in which the flight test was flown and way the data was gathered and applied) data presentations, and the applicable tolerances for each test.

q. In addition to the scheduled continuing qualification evaluation (see paragraph 14), each FTD is subject to evaluations conducted by the NSPM at any time with no prior notification to the sponsor. Such evaluations would be accomplished in a normal manner (i.e., requiring exclusive use of the FTD for the conduct of objective and subjective tests and an examination of functions) if the FTD is not being used for flightcrew member training, testing, or checking. However, if the FTD were being used, the evaluation would be conducted in a non-exclusive manner. This non-exclusive evaluation will be conducted by the FTD evaluator accompanying the check airman, instructor, Aircrew Program Designee (APD), or FAA inspector aboard the FTD along with the student(s) and observing the operation of the FTD during the training, testing, or checking activities.

r. Problems with objective test results are handled according to the following:

(1) If a problem with an objective test result is detected by the NSP evaluation team during an evaluation, the test may be repeated and/or the QTG may be amended.
(2) If it is determined that the results of an objective test do not support the level requested but do support a lower level, the NSPM may qualify the FTD at that lower level. For example, if a Level 6 evaluation is requested and the FTD fails to meet the Level 6 Spiral Stability test tolerances but does meet the Level 5 tolerances, it could be qualified at Level 5.

s. After the NSPM issues a statement of qualification to the sponsor when an FTD is successfully evaluated, the FTD is recommended to the TPAA, who will exercise authority on behalf of the Administrator in approving the FTD in the appropriate airplane flight training program. It is the intent that the SOQ be issued at the satisfactory conclusion of the initial/continuing qualification; however, it is the responsibility of the sponsor to obtain TPAA approval prior to using the FSTD in any FAA-approved flight training program.

t. Under normal circumstances, the NSPM establishes a date for the initial or upgrade evaluation within 10 working days after determining that a complete QTG is acceptable. Unusual circumstances may warrant establishing an evaluation date before this determination is made; however, once a schedule is agreed to, any slippage of the evaluation date at the sponsor's request may result in a significant delay, perhaps 45 days or more, in rescheduling and completing the evaluation. A sponsor may commit to an initial evaluation date under this early process, in coordination with and the agreement of the NSPM, but the request must be in writing and must include an acknowledgment of the potential schedule impact if the sponsor slips the evaluation from this early-committed date. See Attachment 4, figure 5, of the appendix, Sample Request for Initial Evaluation Date.

u. The numbering system used for objective test results in the QTG should closely follow the numbering system set out in Attachment 2 of this appendix, FTD Objective Tests.

v. If additional information is needed regarding the preferred qualifications of pilots used to meet the requirements of §60.15(e), the reader should contact the NSPM or visit tbe NSPM website.

w. Examples of the exclusions for which the FTD might not have been subjectively tested by the sponsor or the NSPM and for which qualification might not be sought or granted, as described in §60.15(g)(6), might include steep turns or missed approach.

End Information

---

12. Additional Qualifications for Currently Qualified FTD's (§ 60.16).

Begin QPS Requirements

There is no additional regulatory or informational material that applies to § 60.16, Additional Qualifications for a Currently Qualified FTD.

End Information

---

13. Previously Qualified FTDs (§ 60.17).

Begin QPS Requirements

a. In instances where a sponsor plans to remove an FTD from active status for prolonged periods, the following procedures will apply:

(1) The NSPM must be advised in writing and the advisement must include an estimate of the period that the FTD will be inactive;

(2) Continuing Qualification evaluations would not be scheduled during the inactive period;

(3) The NSPM will remove the FTD from the list of qualified FSTD's on a mutually established date not later than the date on which the first missed continuing qualification evaluation would have been scheduled;
(4) Before the FTD may be restored to qualified status, it will require an evaluation by the NSPM. The evaluation content and time required for accomplishment will be based on the number of continuing qualification evaluations and sponsor-conducted quarterly inspections missed during the period of inactivity. For example, if the FTD were out of service for a 1 year period, it would be necessary to complete the entire QTG, since all of the quarterly evaluations would have been missed;
(5) The sponsor must notify the NSPM of any changes to the original scheduled time out of service;
(6) The FTD will normally be re-qualified using the FAA-approved MQTG and the criteria that was in effect prior to its removal from qualification; however, inactive periods of 2 years or more will require a review of the qualification basis and will likely result in the re-qualification to be against the standards in effect and current at the time of re-qualification.

b. FTDs qualified prior to [insert the effective date], are not required to meet the general FTD requirements, the objective test requirements, and the subjective test requirements of attachments 1, 2, and 3, respectively, of this appendix.

End QPS Requirements

Begin Information

c. Other certificate holders or persons desiring to use an FTD may contract with FTD sponsors to use those FTDs already qualified at a particular level for an airplane type or set of airplanes and approved for use within an FAA-approved flight training program. Such FTDs are not required to undergo an additional qualification process, except as described in § 60.16.

d. Each FTD user must obtain approval from the appropriate TPAA to use any FTD in an FAA-approved flight training program.

e. The intent of the requirement listed in § 60.17(b), for each FTD to have a Statement of Qualification within 6 years, is to have the availability of that statement (including the configuration list and the limitations to authorizations) to provide a complete picture of the FTD inventory regulated by the FAA. The issuance of the statement will not require any additional evaluation or require any adjustment to the evaluation basis for the FTD.

f. Downgrading of a FTD is a permanent change in qualification level and will necessitate the issuance of a revised Statement of Qualification to reflect the revised qualification level, as appropriate. If a temporary restriction is placed on a FTD because of a missing, malfunctioning, or inoperative component or some repair is in progress, the restriction is not a permanent change in qualification level and such a temporary restriction can, and is, removed when the reason for the restriction has been resolved. It would be inappropriate to permanently downgrade an FTD and, at some undetermined time in the future, allow that FTD to be returned to its original status (i.e., accomplish an "upgrade") using the original qualification standards.

g. It is not the intent of the NSPM to discourage the improvement of existing simulation (e.g., the "updating" of a control loading system, or the replacement of the IOS with a more capable unit) by requiring the "updated" device to meet the qualification standards current at the time of the update. While the NSPM may require that the updated device be evaluated and may require that evaluation to include all or just some of the elements of an initial evaluation, depending on the extent of the update, the standards against which the device would be evaluated would be those that are found in the MQTG for that device.

End Information

---

14. Inspection, Continuing Evaluation Qualification, and Maintenance Requirements (§ 60.19).

Begin QPS Requirement

a. The sponsor must conduct a minimum of four evenly spaced inspections throughout the year. The objective test sequence and content of each inspection in this sequence will be developed by the sponsor and will be acceptable to the NSPM.

b. The description of what constitutes the functional preflight inspection will be contained in the sponsor's QMS.

c. Record "functional preflight" in the FTD discrepancy log book or other acceptable location, including any item found to be missing, malfunctioning, or inoperative.

End QPS Requirements

Begin Information

d. In determining the acceptability of the sponsor's test sequence and the content of each quarterly inspection required in § 60.19(a)(1), the NSPM looks for a balance and a mix from the performance demonstrations and objective test requirement areas listed as follows:
(1) Performance.
(2) Handling qualities.
(3) Motion system (where appropriate).
(4) Visual system (where appropriate).
(5) Sound system (where appropriate).
(6) Other FTD systems.

e. If the NSP evaluator plans to accomplish specific tests during a normal continuing qualification evaluation that requires the use of special equipment or technicians, the sponsor will be notified as far in advance of the evaluation as practical; but not less than 72 hours. These tests, for example, include latencies, control sweeps, and/or some motion or visual system tests, if appropriate.

f. The continuing qualification evaluations described in § 60.19(b), normally will require 4 hours of FTD time. Flexibility is necessary to address those situations that are not normal or those that involve aircraft with additional levels of complexity (e.g. computer controlled aircraft) and may require additional time. The continuing qualification evaluations will consist of the following:

(1) Review of the results of the objective tests and all the designated FTD performance demonstrations (quarterly inspections) conducted by the sponsor since the last scheduled continuing qualification evaluation.

(2) At the discretion of the evaluator, a selection of approximately 8 to 15 objective tests from the MQTG, that will, in the opinion of the evaluator, provide an adequate opportunity to evaluate, first hand, the performance of the FTD. The tests chosen will be performed either automatically or manually, at the discretion of the evaluator and should be able to be conducted within approximately one-third (1/3) of the allotted FTD time.

(3) A subjective evaluation of the FTD to perform a representative sampling of the tasks set out in attachment 3 of this appendix, selected at the discretion of the evaluator. This portion of the evaluation should take approximately two-thirds (2/3) of the allotted FTD time.

(4) An examination of the functions of the FTD, to include, but not necessarily limited to, the motion system, visual system, sound system as applicable, the instructor operating station, and the normal functions and simulated malfunctions of the simulated airplane systems. This examination is normally accomplished simultaneously with the subjective evaluation requirements noted in subparagraph f(3).

g. The requirement established in § 60.19(b)(4) regarding the frequency of NSPM conducted continuing qualification evaluations for each FTD is typically 12 months. However, the establishment and satisfactory operation of an approved quality management system for a sponsor will provide a basis for adjusting the interval between evaluations on some FTDs at a given sponsor's location to exceed this 12-month interval.

End Information

15.Logging FTD Discrepancies (§ 60.20).

Begin Information

There is no additional regulatory or informational material that applies to § 60.20. Logging FTD Discrepancies.

End Information

---

16. Interim Qualification of FTDs for New Airplane Types or Models (§ 60.21).

Begin Information

There is no additional regulatory or informational material that applies to § 60.21, Interim Qualification of FTDs for New Airplane Types or Models.

End Information

---

17. Modifications to FTDs (§ 60.23).

Begin QPS Requirements

a. The notification described in § 60.23(c)(2) must include a complete description of the planned modification, with a description of the operational and engineering effect the proposed modification will have on the operation of the FTD and the results that are expected with the modification incorporated.

b. Prior to using the modified FTD:
(1) All the applicable objective tests that have been run with the modification incorporated, including any necessary updates to the MQTG must be acceptable to the NSPM; and
(2) The sponsor must provide the NSPM with a statement signed by the MR that the factors cited in § 60.15(b) are addressed by the appropriate personnel as described in that section.

End QPS Requirements

Begin Information

c. See Attachment 4 for a sample Index of Effective FSTD Directives.

End Information

---

18. Operation with Missing, Malfunctioning, or Inoperative Components (§ 60.25).

Begin Information

a. Once the sponsor fairly and accurately advises the user of an FTD's current status, including any missing, malfunctioning, or inoperative (MMI) component(s), the sponsor's responsibility with respect to § 60.25(a) will have been satisfied.

b. If the 29th or 30th day of the 30-day period described in § 60.25(b) is on a Saturday, a Sunday, or a holiday, the intent of the FAA is to automatically extend the deadline until the next business day.

c. In accordance with the authorization described in § 60.25(b), the NSPM may find as acceptable a discrepancy prioritizing system wherein the length of time authorized to repair or replace any given MMI component is based on the level of impact on the capability of the FTD to provide the required training, evaluation, or flight experience, with the larger impact on this capability associated with a higher priority for repair or replacement.

End Information

---

19. Automatic Loss of Qualification and Procedures for Restoration of Qualification (§ 60.27).

Begin Information

If the sponsor provides a plan for how the FTD is to be maintained during its out-of service period (e.g., periodic exercise of mechanical, hydraulic, and electrical systems; routine replacement of hydraulic fluid; control of the environmental factors in which the FTD is to be maintained, etc.) there is a greater likelihood of being able to more fairly determine the amount of testing that would be required for re-qualification.

End Information

20. Other Losses of Qualification and Procedures for Restoration of Qualification (§ 60.29).

Begin Information

If the sponsor provides a plan for how the FTD is to be maintained during its out-of-service period (e.g., periodic exercise of mechanical, hydraulic, and electrical systems; routine replacement of hydraulic fluid; control of the environmental factors in which the FTD is to be maintained, etc.) there is a greater likelihood of being able to more fairly determine the amount of testing that would be required for re-qualification.

End Information

21. Recordkeeping and Reporting (§ 60.31).

Begin QPS Requirements

a. The minimally acceptable record of programming changes, as described in § 60.31(a)(2), must consist of the name of the aircraft system software, aerodynamic model, or engine model change, the date of the change, a summary of the change, and the reason for the change.

b. If a coded form for record keeping is used, it must provide for the preservation and retrieval of information with appropriate security or controls to prevent the illegal or inappropriate alteration of such records after the fact.

End QPS Requirements

22. Applications, Logbooks, Reports, and Records: Fraud, Falsification, or Incorrect Statements (§ 60.33).

Begin Information

There are no additional QPS requirements or informational material that apply to § 60.33, Applications, Logbooks, Reports, and Records: Fraud, Falsification, or Incorrect Statements.

End Information

23. (Reserved)

24. Levels of FTD.

Begin Information

a. The following is a general description of each level of FTD. Detailed standards and tests for the various levels of FTDs are fully defined in attachments 1 through 3 of this appendix.

(1) Level 4. A device that may have an open, airplane-specific, flight deck area, or an enclosed, airplane specific cockpit; at least one operating system; and possessing at least air/ground logic (no aerodynamic programming required).). All instrumentation and display presentations may be portrayed using flat/LCD panel graphical representations or actual representations of displays in the aircraft. Relative orientation/arrangement, color and symbology of flight deck indications and controls must correspond to those of the actual flight deck. All controls, switches, knobs, etc. may be replicated by touch sensitive activation (not capable of manual manipulation of the flight controls) or may physically replicate the aircraft in control operation.

(2) Level 5. A device that may have an open, airplane-specific, flight deck area, or an enclosed, airplane specific cockpit, with a generic aerodynamic program; at least one operating system; and control loading that, as a minimum, is representative of the simulated airplane only at an approach speed and configuration. All instrumentation and display presentations may be portrayed using flat/LCD panel graphical representations or actual representations of displays in the aircraft. Relative orientation/arrangement, color and symbology of flight deck indications and controls must correspond to those of the actual flight deck. Primary and secondary flight controls (e.g., rudder, aileron, elevator, flaps, spoilers/speed brakes, engine controls, landing gear, nose wheel steering, trim, brakes) must be physical controls. All other controls, switches, knobs, etc. may be touch sensitive activation.

(3) Level 6. A device that has an enclosed, airplane-specific cockpit and aerodynamic program; all applicable airplane systems operating; control loading that is representative of the simulated airplane throughout it's ground and flight envelope; and significant sound representation. All instrumentation and display presentations may be portrayed using flat/LCD panel graphical representations or actual representations of displays in the aircraft. Relative orientation/arrangement, color and symbology of flight deck indications and controls must correspond to those of the actual flight deck. Primary and secondary flight controls (e.g., rudder, aileron, elevator, flaps, spoilers/speed brakes, engine controls, landing gear, nose wheel steering, trim, brakes) must be physical controls. All controls, switches, knobs, etc. must physically replicate the aircraft in control operation.

End Information

25. FTD Qualification on the Basis of a Bilateral Aviation Safety Agreement (BASA) (§ 60.37).

Begin Information

There are no additional QPS requirements or informational material that apply to § 60.37, FTD Qualification on the Basis of a Bilateral Aviation Safety Agreement (BASA).

End Information

Attachment 1 to Appendix B to Part 60--
General FTD REQUIREMENTS

Begin QPS Requirements

1. Requirements

a. Certain FTD requirements included in this appendix must be supported with a Statement of Compliance and Capability (SOC) and/or, in some designated cases, an Objective Test. The SOC will describe how the requirement was met. Other requirements are satisfied by either an Objective Test or a Subjective Test. The test results must show that the requirement has been attained. In the following tabular listing, requirements for SOCs and tests are indicated in the "General FTD Requirements" column.

b. The requirements described in Table B1A are the minimum required for the indicated level of FTD. However, devices may include operational systems or functions in excess of the minimum required, but the NSPM will test those systems or functions in accordance with this appendix to ensure proper operation.

End QPS Requirements

Begin Information

2. Discussion

a. This attachment describes the minimum general requirements for qualifying Level 4 through Level 6 flight training devices. To determine the complete requirements for a specific level FTD, the objective tests in attachment 2 and the subjective tests listed in attachment 3 for this QPS must also be consulted.

b. The material contained in this attachment is divided into the following categories:

(1) General Cockpit Configuration.
(2) Programming.
(3) Equipment Operation.
(4) Instructor or Evaluator Facilities.
(5) Motion System.
(6) Visual System
(7) Sound System

c. Table B1A sets out, and provides an overview of, the General FTD Requirements.

d. Table B1B sets out, and provides a reference for, the tasks for which the simulated airplane may be qualified, and provides a reference for the tasks that the sponsor-designated pilot will examine as part of his/her determination that the performance and handling qualities of the FTD represents those of the airplane within the airplane's normal operating envelope.

End Information

Begin Information

4. Ground Effect.

a. For a FFS to be used for take-off and landing (not applicable to Level A simulators in that the landing maneuver may not be credited in a Level A simulator) it should faithfully reproduce the aerodynamic changes, which occur in ground effect. The parameters chosen for flight simulator validation should be indicative of these changes.

(1) A dedicated test should be provided which will validate the aerodynamic ground effect characteristics.

(2) The selection of the test method and procedures to validate ground effect is at the option of the organization performing the flight tests; however, the flight test should be performed with enough duration near the ground to validate sufficiently the ground-effect model.

b. Acceptable tests for validation of ground effect include:

(1) Level fly-bys. The level fly-bys should be conducted at a minimum of three altitudes within the ground effect, including one at no more than 10% of the wingspan above the ground, one each at approximately 30% and 50% of the wingspan where height refers to main gear tire above the ground. In addition, one level-flight trim condition should be conducted out of ground effect, e.g., at 150% of wingspan.

(2) Shallow approach landing. The shallow approach landing should be performed at a glide slope of approximately one degree with negligible pilot activity until flare.

Note: If other methods are proposed, rationale should be provided to conclude that the tests performed validate the ground-effect model.

c. The lateral-directional characteristics are also altered by ground effect. For example, because of changes in lift, roll damping is affected. The change in roll damping will affect other dynamic modes usually evaluated for flight simulator validation. In fact, Dutch roll dynamics, spiral stability, and roll-rate for a given lateral control input are altered by ground effect. Steady heading sideslips will also be affected. These effects should be accounted for in the flight simulator modeling. Several tests such as 'crosswind landing', 'one engine inoperative landing', and 'engine failure on take-off' serve to validate lateral-directional ground effect since portions of them are accomplished while transiting heights at which ground effect is an important factor.

End Information

Begin Information

5. Motion System.

a. General.

(1) Pilots use continuous information signals to regulate the state of the airplane. In concert with the instruments and outside-world visual information, whole-body motion feedback is essential in assisting the pilot to control the airplane dynamics, particularly in the presence of external disturbances. The motion system should therefore meet basic objective performance criteria, as well as being subjectively tuned at the pilot's seat position to represent the linear and angular accelerations of the airplane during a prescribed minimum set of maneuvers and conditions. Moreover, the response of the motion cueing system should be repeatable.

(2) The Motion System tests in Section 3 of Table A2A are intended to qualify the FFS motion cueing system from a mechanical performance standpoint. Additionally, the list of motion effects provides a representative sample of dynamic conditions that should be present in the flight simulator. An additional list of representative, training-critical maneuvers, selected from Section 1, (Performance tests) and Section 2, (Handling Qualities tests) in Table A2A, that should be recorded during initial qualification (but without tolerance) to indicate the flight simulator motion cueing performance signature have been identified (reference Section 3.e). These tests are intended to help improve the overall standard of FFS motion cueing.

b. Motion System Checks. The intent of test 3a, Frequency Response, test 3b, Leg Balance, and test 3c, Turn-Around Check, as described in the Table of Objective Tests, is to demonstrate the performance of the motion system hardware, and to check the integrity of the motion set-up with regard to calibration and wear. These tests are independent of the motion cueing software and should be considered as robotic tests.

c. Motion System Repeatability. The intent of this test is to ensure that the motion system software and motion system hardware have not degraded or changed over time. This diagnostic test should be run during continuing qualification checks in lieu of the robotic tests. This will allow an improved ability to determine changes in the software or determine degradation in the hardware that have adversely affected the training value of the motion as was accepted during the initial qualification. The following information delineates the methodology that should be used for this test.

(1) Input: The inputs should be such that rotational accelerations, rotational rates, and linear accelerations are inserted before the transfer from airplane center of gravity to pilot reference point with a minimum amplitude of 5deg/sec/sec, 10deg/sec and 0.3g, respectively, to provide adequate analysis of the output.

(2) Recommended output:

(a) Actual platform linear accelerations; the output will comprise accelerations due to both the linear and rotational motion acceleration;

(b) Motion actuators position.

d. Motion Cueing Performance Signature.

(1) Background. The intent of this test is to provide quantitative time history records of motion system response to a selected set of automated QTG maneuvers during initial qualification. This is not intended to be a comparison of the motion platform accelerations against the flight test recorded accelerations (i.e., not to be compared against airplane cueing). If there is a modification to the initially qualified motion software or motion hardware (e.g., motion washout filter, simulator payload change greater than 10%) then a new baseline may need to be established.
(2) Test Selection. The conditions identified in Section 3.e. in Table A2A are those maneuvers that are the most important to pilot motion cueing. They are general tests applicable to all types of airplanes and should be run for motion cueing performance signature run at any time acceptable to the NSPM prior to or during the initial qualification, and the results included in the MQTG.
(3) Priority. Motion system should be designed with the intent of placing greater importance on those maneuvers that directly influence pilot perception and control of the airplane motions. For the maneuvers identified in section 3.e. in Table A2A, the flight simulator motion cueing system should have a high tilt co-ordination gain, high rotational gain, and high correlation with respect to the airplane simulation model.
(4) Data Recording. The minimum list of parameters provided should allow for the determination of the flight simulator's motion cueing performance signature for the initial qualification. The following parameters are recommended as being acceptable to perform such a function:
   (a) Flight model acceleration and rotational rate commands at the pilot reference point;
   (b) Motion actuators position;
   (c) Actual platform position;
   (d) Actual platform acceleration at pilot reference point.

e. Motion Vibrations.
(1) Presentation of results. The characteristic motion vibrations are a means to verify that the flight simulator can reproduce the frequency content of the airplane when flown in specific conditions. The test results should be presented as a Power Spectral Density (PSD) plot with frequencies on the horizontal axis and amplitude on the vertical axis. The airplane data and flight simulator data should be presented in the same format with the same scaling. The algorithms used for generating the flight simulator data should be the same as those used for the airplane data. If they are not the same then the algorithms used for the flight simulator data should be proven to be sufficiently comparable. As a minimum the results along the dominant axes should be presented and a rationale for not presenting the other axes should be provided.
(2) Interpretation of results. The overall trend of the PSD plot should be considered while focusing on the dominant frequencies. Less emphasis should be placed on the differences at the high frequency and low amplitude portions of the PSD plot. During the analysis it should be considered that certain structural components of the flight simulator have resonant frequencies that are filtered and thus may not appear in the PSD plot. If such filtering is required the notch filter bandwidth should be limited to 1 Hz to ensure that the buffet feel is not adversely affected. In addition, a

rationale should be provided to explain that the characteristic motion vibration is not being adversely affected by the filtering. The amplitude should match airplane data as per the description below; however, if for subjective reasons the PSD plot was altered a rationale should be provided to justify the change. If the plot is on a logarithmic scale it may be difficult to interpret the amplitude of the buffet in terms of acceleration. A $1x10^{-3}$ $grms^2/Hz$ would describe a heavy buffet and may be seen in the deep stall regime. On the other hand, a $1x10^{-6}$ $grms^2/Hz$ buffet is almost not perceivable; but may represent a flap buffet at low speed. The previous two examples differ in magnitude by 1000. On a PSD plot this represents three decades (one decade is a change in order of magnitude of 10; two decades is a change in order of magnitude of 100, etc.).

End Information

Begin Information

6. Sound System

a. General. The total sound environment in the airplane is very complex, and changes with atmospheric conditions, airplane configuration, airspeed, altitude, power settings, etc. Thus, flight deck sounds are an important component of the flight deck operational environment and as such provide valuable information to the flight crew. These aural cues can either assist the crew, as an indication of an abnormal situation, or hinder the crew, as a distraction or nuisance. For effective training, the flight simulator should provide flight deck sounds that are perceptible to the pilot during normal and abnormal operations, and that are comparable to those of the airplane. Accordingly, the flight simulator operator should carefully evaluate background noises in the location being considered. To demonstrate compliance with the sound requirements, the objective or validation tests in this attachment have been selected to provide a representative sample of normal static conditions typical of those experienced by a pilot.

b. Alternate propulsion. For FFS with multiple propulsion configurations, any condition listed in Table A2A in this attachment that is identified by the airplane manufacturer, or other data supplier, as significantly different due to a change in propulsion system (engine or propeller), should be presented for evaluation as part of the QTG.

c. Data and Data Collection System.

(1) Information provided to the flight simulator manufacturer should comply with "IATA Flight Simulator Design & Performance Data Requirements", 6th Edition, 2000. This information should contain calibration and frequency response data.

(2) The system used to perform the tests listed in Table A2A, should comply with the following standards:

(a) The specifications for octave, half octave, and third octave band filter sets may be found in ANSI S1.11-1986;

(b) Measurement microphones should be type WS2 or better, as described in IEC 1094-4-1995.

(3) Headsets. If headsets are used during normal operation of the airplane they should also be used during the flight simulator evaluation.

(4) Playback equipment. Playback equipment and recordings of the QTG conditions should be provided during initial evaluations.

(5) Background noise.

(a) Background noise is the noise in the flight simulator due to the flight simulator's cooling and hydraulic systems that is not associated with the airplane, and the extraneous noise from other locations in the building. Background noise can seriously impact the correct simulation of airplane sounds, so the goal should be to keep the background noise below the airplane sounds. In some cases, the sound level of the simulation can be increased to compensate for the background noise. However, this approach is limited by the specified tolerances and by the subjective acceptability of the sound environment to the evaluation pilot.

(b) The acceptability of the background noise levels is dependent upon the normal sound levels in the airplane being represented. Background noise levels that fall below the lines defined by the following points, may be acceptable:

(i) 70 dB @ 50 Hz;

(ii) 55 dB @ 1000 Hz;

(iii) 30 dB @ 16 kHz

(Note: These limits are for unweighted 1/3 octave band sound levels. Meeting these limits for background noise does not ensure an acceptable flight simulator. Airplane sounds, which fall below this limit require careful review and may require lower limits on the background noise.)

(6) Validation testing. Deficiencies in airplane recordings should be considered when applying the specified tolerances to ensure that the simulation is representative of the airplane. Examples of typical deficiencies are:

(a) Variation of data between tail numbers;

(b) Frequency response of microphones;

(c) Repeatability of the measurements;

Table A2B
Example of recurrent frequency response test tolerance.

Band Centre Freq.	Initial Results (dBSPL)	Recurrent Results (dBSPL)	Absolute Difference
50	75.0	73.8	1.2
63	75.9	75.6	0.3
80	77.1	76.5	0.6
100	78.0	78.3	0.3
125	81.9	81.3	0.6
160	79.8	80.1	0.3
200	83.1	84.9	1.8
250	78.6	78.9	0.3
315	79.5	78.3	1.2
400	80.1	79.5	0.6
500	80.7	79.8	0.9
630	81.9	80.4	1.5
800	73.2	74.1	0.9
1000	79.2	80.1	0.9
1250	80.7	82.8	2.1
1600	81.6	78.6	3.0
2000	76.2	74.4	1.8
2500	79.5	80.7	1.2
3150	80.1	77.1	3.0
4000	78.9	78.6	0.3
5000	80.1	77.1	3.0
6300	80.7	80.4	0.3
8000	84.3	85.5	1.2
10000	81.3	79.8	1.5
12500	80.7	80.1	0.6
16000	71.1	71.1	0.0
		Average	1.1

End Information

Begin Information

7. Additional Information Regarding Flight Simulator Qualification for New or Derivative Airplanes.

a. It is usual that airplane manufacturer's approved final data for performance, handling qualities, systems or avionics will not be available until well after a new or derivative airplane has entered service. It is often necessary to begin flight crew training and certification several months prior to the entry of the first airplane into service and consequently it may be necessary to use airplane manufacturer provided preliminary data for interim qualification of flight simulators.

b. In recognition of the sequence of events that should occur and the time required for final data to become available, the NSPM may accept certain partially validated preliminary airplane and systems data, and early release ('red label') avionics in order to permit the necessary program schedule for training, certification and service introduction.

c. Simulator sponsors seeking qualification based on preliminary data should, however, consult the NSPM as soon as it is known that special arrangements will be necessary or as soon as it is clear that the preliminary data will need to be used for flight simulator qualification. Airplane and flight simulator manufacturers should also be made aware of the needs and be cooperative parties to the data plan and flight simulator qualification plan. The plan should include periodic meetings to keep the interested parties informed of project status.

d. The precise procedure to be followed to gain NSPM acceptance of preliminary data will vary from case to case and between airplane manufacturers. Each airplane manufacturer's new airplane development and test program is designed to suit the needs of the particular project and may not contain the same events or sequence of events as another manufacturer's program or even the same manufacturer's program for a different airplane. Hence, there cannot be a prescribed invariable procedure for acceptance of preliminary data, but instead there should be a statement describing the final sequence of events, data sources, and validation procedures agreed by the simulator sponsor, the airplane manufacturer, the flight simulator manufacturer, and the NSPM.

> Note: A description of airplane manufacturer-provided data needed for flight simulator modeling and validation is to be found in the IATA Document "Flight Simulator Design and Performance Data Requirements," as amended.

e. There should be assurance that the preliminary data are the manufacturer's best representation of the airplane and reasonable certainty that final data will not deviate to a large degree from these preliminary, but refined, estimates. Data derived from these predictive or preliminary techniques should be validated by available sources including, at least, the following:

(1) Manufacturer's engineering report. Such report should explain the predictive method used and illustrating past success of the method on similar projects. For example, the manufacturer could show the application of the method to an earlier airplane model or

predict the characteristics of an earlier model and compare the results to final data for that model.

(2) Early flight test results. Such data will often be derived from airplane certification tests, and should be used to maximum advantage for early flight simulator validation. Certain critical tests, which would normally be done early in the airplane certification program, should be included to validate essential pilot training and certification maneuvers. These include cases in which a pilot is expected to cope with an airplane failure mode including engine failures. The early data available will, however, depend on the airplane manufacturer's flight test program design and may not be the same in each case. However it is expected that the flight test program of the airplane manufacturer include provisions for generation of very early flight tests results for flight simulator validation.

f. The use of preliminary data is not indefinite. The airplane manufacturer's final data should be available within 12 months after airplane first 'service entry' or as agreed by the NSPM, the simulator sponsor and the airplane manufacturer. In applying for an interim qualification, using preliminary data, the simulator sponsor and the NSPM should agree upon the update program. This will normally specify that the final data update will be installed in the flight simulator within a period of 12 months following the final data release unless special conditions exist and a different schedule is acceptable. The flight simulator performance and handling validation would then be based on data derived from flight test. Initial airplane systems data should be updated after engineering tests. Final airplane systems data should also be used for flight simulator programming and validation.

g. Flight simulator avionics should stay essentially in step with airplane avionics (hardware & software) updates. The permitted time lapse between airplane and flight simulator updates is not a fixed time, but should be minimal. It may depend on the magnitude of the update and whether the QTG and pilot training and certification are affected. Permitted differences in airplane and flight simulator avionics versions and the resulting effects on flight simulator qualification should be agreed between the simulator sponsor and the NSPM. Consultation with the flight simulator manufacturer is desirable throughout the qualification process.

h. The following describes an example of the design data and sources that might be used in the development of an interim qualification plan.

(1) The plan should consist of the development of a QTG based upon a mix of flight test and engineering simulation data. For data collected from specific airplane flight tests or other flights the required design model/data changes necessary to support an acceptable Proof of Match (POM) should be generated by the airplane manufacturer.

(2) In order that the two sets of data are properly validated, the airplane manufacturer should compare their simulation model responses against the flight test data, when driven by the same control inputs and subjected to the same atmospheric conditions as recorded in the flight test. The model responses should result from a simulation where the following systems are run in an integrated fashion and are consistent with the design data released to the flight simulator manufacturer:

(a) Propulsion

(b) Aerodynamics;

(c) Mass properties;

(d) Flight controls;
(e) Stability augmentation; and
(f) Brakes/landing gear.

i. For the qualification of flight simulators of new airplane types, it may be beneficial that the services of a suitably qualified test pilot are used for the purpose of assessing handling qualities and performance evaluation.

End Information

Begin Information

8. Engineering Simulator – Validation Data

a. When a fully validated simulation (i.e., validated with flight test results) is modified as a result of changes to the simulated airplane configuration, the airplane manufacturer, or other acceptable data supplier, may choose, with the prior agreement of the NSPM, to supply validation data from an "audited" engineering simulator/simulation to selectively supplement flight test data. This arrangement is confined to changes that are incremental in nature and which are both easily understood and well defined.

b. To be qualified to supply engineering simulator validation data, an airplane manufacturer or other acceptable data supplier should:

- (1) Have a proven track record of developing successful data packages;
- (2) Have demonstrated high quality prediction methods through comparisons of predicted and flight test validated data;
- (3) Have an engineering simulator which –
  - (a) Has models that run in an integrated manner;
  - (b) Uses the same models as released to the training community (which are also used to produce stand-alone proof-of-match and checkout documents); and
  - (c) Is used to support airplane development and certification.
- (4) Use the engineering simulation to produce a representative set of integrated proof-of-match cases; and
- (5) Have an acceptable configuration control system in place covering the engineering simulator and all other relevant engineering simulations.

c. Airplane manufacturers or other acceptable data suppliers seeking to take advantage of this alternative arrangement should contact the NSPM at the earliest opportunity.

d. For the initial application, each applicant should demonstrate an ability to qualify the FFS in accordance with the criteria contained in §60.15 and Appendix A, paragraph 11.

End Information

Begin Information

9. Approval Guidelines for Engineering Simulator Validation Data

a. Background

(1) In the case of fully flight-test validated simulation models of a new or major derivative airplane, it is likely that these models will become progressively unrepresentative as the airplane configuration is revised.

(2) Traditionally as the airplane configuration has been revised, the simulation models have been revised to reflect changes. In the case of aerodynamic, engine, flight control and ground handling models, this revision process normally results in the collection of additional flight-test data and the subsequent release of new models and validation data.

(3) The quality of the prediction of simulation models has advanced to the point where differences between the predicted and the flight-test validation models are often quite small.

(4) The major airplane manufacturers utilize the same simulation models in their engineering simulations as released to the training community. These simulations vary from physical engineering simulators with and without airplane hardware to non-real-time workstation based simulations.

b. Acceptance Guidelines for using Engineering Simulator Validation Data

(1) The current system of requiring flight test data as a reference for validating training simulators should continue.

(2) When a fully flight-test-validated simulation is modified as a result of changes to the simulated airplane configuration, a qualified airplane manufacturer, or other acceptable data supplier, may choose, with prior agreement of the NSPM, to supply validation data from an engineering simulator/simulation to selectively supplement flight test data.

(3) In cases where data from an engineering simulator are used, the engineering simulation process would have to be audited by the NSPM.

(4) In all cases a data package verified to current standards against flight test should be developed for the airplane "entry-into-service" configuration of the baseline airplane.

(5) Where engineering simulator data are used as part of a QTG, an essential match is expected (see paragraph 11of this attachment).

(6) In cases where the use of engineering simulator data is envisaged, a complete proposal should be presented to the NSPM. Such a proposal would contain evidence of the airplane manufacturer's, or other acceptable data supplier's, past achievements in high fidelity modeling.

(7) The process will be applicable to "one step" away from a fully flight validated simulation.

(8) A configuration management process should be maintained, including an audit trail which clearly defines the simulation model changes step by step away from a fully flight validated simulation, so that it would be possible to remove the changes and return to the baseline (flight validated) version.

(9) The NSPM (in conjunction with other regulatory authorities, when appropriate) will conduct technical reviews of the proposed plan and the subsequent validation data to establish acceptability of the proposal.

(10) The procedure will be considered complete when an acceptability statement is issued. This statement will identify acceptable validation data sources.

(11) To be admissible as an alternative source of validation data an engineering simulator would:

(a) Have to exist as a physical entity, complete with a flight deck representative of the affected class of airplane, with controls sufficient for manual flight.

(b) Have a visual system; and preferably also a motion system.

(c) Where appropriate, have actual avionics boxes interchangeable with the equivalent software simulations, to support validation of released software.

(d) Have a rigorous configuration control system covering hardware and software.

(e) Have been found to be a high fidelity representation of the airplane by the pilots of the manufacturer (or other acceptable data supplier), operators, and the NSPM.

(12) The precise procedure followed to gain acceptance of engineering simulator data will vary from case-to-case between airplane manufacturers (or other acceptable data suppliers) and type of change. Irrespective of the solution proposed, engineering simulations/simulators should conform to the following criteria:

(a) The original (baseline) simulation models should have been fully flight-test validated.

(b) The models as released by the airplane manufacturer (or other acceptable data supplier) to the industry for use in flight simulators should be essentially identical to those used by the airplane manufacturer (or other acceptable data supplier) in their engineering simulations/simulators.

(c) These engineering simulations/simulators will have been used as part of the airplane design, development and/or certification process.

(13) Flight simulator(s) utilizing these baseline simulation models should be currently qualified to at least internationally recognized standards such as contained in the ICAO Document 9625, the 'Manual of Criteria for the Qualification of Flight Simulators'.

(14) The type of modifications covered by this alternative procedure will be restricted to those with "well understood effects":

(a) Software (e.g., flight control computer, autopilot, etc.).

(b) Simple (in aerodynamic terms) geometric revisions (e.g., body length).

(c) Engines – limited to non-propeller-driven airplanes.

(d) Control system gearing/rigging/deflection limits

(e) Brake, tire and steering revisions.

(15) The manufacturer (or other acceptable data supplier) who wishes to take advantage of this alternative procedure, is expected to demonstrate a sound engineering basis for his proposed approach. Such analysis would show that the predicted effects of the change(s) were incremental in nature and both easily understood and well defined, confirming that additional flight test data were not required. In the event that the predicted effects were not deemed to be sufficiently accurate, it might be necessary to collect a limited set of flight test data to validate the predicted increments.

(16) Any applications for this procedure will be reviewed by the NSPM and, when appropriate, in conjunction with other regulatory authorities.

Table B1A

Minimum FTD Requirements					
<<< QPS Requirements >>>					<< Information >>
Number	General FTD Requirements	FTD Level 4	FTD Level 5	FTD Level 6	Notes
	of equipment must replicate the appropriate function in the airplane; however, fire axes, landing gear pins, and any similar purpose instruments need only be represented in silhouette. **An SOC is required.**				
2.	**Programming.**				
2.a.	The FTD must provide the proper effect of aerodynamic changes for the combinations of drag and thrust normally encountered in flight. This must include the effect of change in airplane attitude, thrust, drag, altitude, temperature, and configuration. Level 6 additionally requires the effects of change in gross weight and center of gravity. Level 5 requires only generic aerodynamic programming. **An SOC is required.**		X	X	
2.b.	The FTD must have the computer (analog or digital) capability (i.e., capacity, accuracy, resolution, and dynamic response) needed to meet the qualification level sought. **An SOC is required.**	X	X	X	
2.c.	Relative responses of the cockpit instruments must be measured by latency tests, or transport delay tests, and may not exceed 300 milliseconds. The instruments must respond to abrupt input at the pilot's position within the allotted time, but not before the time, when the airplane would respond under the same conditions. **An Objective Test is required.**		X	X	The intent is to verify that the FTD provides instrument cues that are, within the stated time delays, like the airplane responses. For airplane response, acceleration in the appropriate, corresponding rotational axis is preferred. Additional information regarding Latency and Transport Delay testing may be found in Appendix A, Attachment 2, paragraph 14.

Table B1A

Minimum FTD Requirements					
<<< QPS Requirements >>>					<< Information >>
Number	General FTD Requirements	FTD Level 4	FTD Level 5	FTD Level 6	Notes
3.	**Equipment Operation.**				
3.a.	All relevant instrument indications involved in the simulation of the airplane must automatically respond to control movement or external disturbances to the simulated airplane; e.g., turbulence or winds. **A Subjective Test is required.**		X	X	
3.b.	Navigation equipment must be installed and operate within the tolerances applicable for the airplane. Levels 6 must also include communication equipment (inter-phone and air/ground) like that in the airplane and, if appropriate to the operation being conducted, an oxygen mask microphone system. Level 5 need have only that navigation equipment necessary to fly an instrument approach. **A Subjective Test is required.**		X	X	
3.c.	Installed systems must simulate the applicable airplane system operation, both on the ground and in flight. Installed systems must be operative to the extent that applicable normal, abnormal, and emergency operating procedures included in the sponsor's training programs can be accomplished. Level 6 must simulate all applicable airplane flight, navigation, and systems operation. Level 5 must have at least functional flight and navigational controls, displays, and instrumentation. Level 4 must have at least one airplane system installed and functional. **A Subjective Test is required.**	X	X	X	
3.d.	The lighting environment for panels and instruments must be sufficient for the operation being conducted. **A Subjective Test is required.**	X	X	X	Back-lighted panels and instruments may be installed but are not required.
3.e.	The FTD must provide control forces and control travel that corresponds to the airplane being simulated. Control forces must react in the same manner as in the airplane under the same flight conditions.			X	

Table B1A

Minimum FTD Requirements					
<<< QPS Requirements >>>					<< Information >>
Number	General FTD Requirements	FTD Level			Notes
		4	5	6	
	An Objective Test is required.				
3.f.	The FTD must provide control forces and control travel of sufficient precision to manually fly an instrument approach. **A Subjective Test is required.**		X		
4.	**Instructor or Evaluator Facilities.**				
4.a.	In addition to the flight crewmember stations, suitable seating arrangements for an instructor/check airman and FAA Inspector must be available. These seats must provide adequate view of crewmember's panel(s). **A Subjective Test is required.**	X	X	X	These seats need not be a replica of an aircraft seat and may be as simple as an office chair placed in an appropriate position.
4.b.	The FTD must have instructor controls that permit activation of normal, abnormal, and emergency conditions, as may be appropriate. Once activated, proper system operation must result from system management by the crew and not require input from the instructor controls. **A Subjective Test is required.**	X	X	X	
5.	**Motion System (not required).**				
5.a.	The FTD may have a motion system, if desired, although it is not required. If installed, the motion system operation must not be distracting. The motions system must respond to abrupt input at the pilot's position. **A Subjective Test is required.**	X	X		The motion system standards set out in part 60, Appendix A for at least Level A simulators is acceptable.
5.b.	If a motion system is installed it must be measured by latency tests, or transport delay tests, and may not exceed 300 milliseconds. Instrument response must not occur prior to motion onset. **An Objective Test is required.**			X	The motion system standards set out in part 60, Appendix A for at least Level A simulators is acceptable.
6.	**Visual System (not required).**				
6.a.	The FTD may have a visual system, if desired, although it is not required. If a visual system is installed, it must meet at least the following criteria:				
6.a.1.	The visual system must respond to abrupt input at the pilot's position.	X	X	X	

Table B1A

Minimum FTD Requirements					
<<< QPS Requirements >>>					<< Information >>
Number	General FTD Requirements	FTD Level 4	5	6	Notes
	A Subjective Test is required.				
6.a.2.	The visual system must be at least a single channel, non-collimated display. **A Subjective Test is required.**	X	X	X	
6.a.3.	The visual system must provide at least a field of view of 18° vertical / 24° horizontal for the pilot flying. **An SOC is required.**	X	X	X	
6.a.4.	The visual system must provide for a maximum parallax error of 10° per pilot. **An SOC is required.**	X	X	X	
6.a.5.	The visual scene content may not be distracting. **A Subjective Test is required.**	X	X	X	
6.a.6.	The minimum distance from the pilot's eye position to the surface of a direct view display may not be less than the distance to any front panel instrument. **An SOC is required.**	X	X	X	
6.a.7.	The visual system must provide for a minimum resolution of 5 arc-minutes for both computed and displayed pixel size. **An SOC is required.**	X	X	X	
6.b.	If a visual system is installed and additional training, testing, or checking credits are being sought on the basis of having a visual system, a visual system meeting the standards set out for at least a Level A FFS (see Appendix A) will be required. A "direct-view," non-collimated visual system (with the other requirements for a Level A visual system met) may be considered satisfactory for those installations where the visual system design "eye point" is appropriately adjusted for each pilot's position such that the parallax error is at or less than 10 degrees, simultaneously for each pilot. **An SOC is required.**			X	Directly projected, non-collimated visual displays may prove to be unacceptable for dual pilot applications.

Table B1A

Minimum FTD Requirements					
<<< QPS Requirements >>>					<< Information >>
Number	General FTD Requirements	FTD Level			Notes
		4	5	6	
	An Objective Test is required.				
7.	**Sound System.**				
7.a.	The FTD must simulate significant cockpit sounds resulting from pilot actions that correspond to those heard in the airplane. **A Subjective Test is required.**			X	

Table B1B

Table of Tasks vs. FTD Level					
<<< QPS Requirements >>>					<< Information >>
Number	**Subjective Requirements** **In order to be qualified at the FTD qualification level indicated, the FTD must be able to perform at least the tasks associated with that level of qualification.** **See Notes 1 and 2 at the end of the Table.**	FTD Level			Notes
		4	5	6	
1.	**Preflight Procedures.**				
1.a.	Preflight Inspection (cockpit only).	A	A	X	
1.b.	Engine Start.	A	A	X	
1.c.	Pre-takeoff Checks.	A	A	X	
2.	**Takeoff and Departure Phase.**				
2.a.	Rejected Takeoff (requires visual system).			A	
2.b.	Departure Procedure.		X	X	
3.	**In-flight Maneuvers**				
3.a.	a. Steep Turns.		X	X	
3.b.	b. Approaches to Stalls.		A	X	
3.c.	c. Engine Failure (procedures only)—Multiengine Airplane.		A	X	
3.d.	d. Engine Failure (procedures only)—Single-Engine Airplane.		A	X	
3.e.	e. Specific Flight Characteristics.	>	>	>	Level of device as determined by the airplane Flight Standardization Board (FSB).
4.	**Instrument Procedures.**				
4.a.	Standard Terminal Arrival / Flight Management System Arrival.		A	X	
4.b.	Holding.		A	X	
4.c.	Precision Instrument, all engines operating.		A	X	e.g., Autopilot, Manual (Flt. Dir. Assisted), Manual (Raw Data)
4.d.	Non-precision Instrument, all engines operating.		A	X	e.g., NDB, VOR, VOR/DME, VOR/TAC, RNAV, LOC, LOC/BC, ADF, SDF, etc.
4.e.	Circling Approach (requires visual system).			A	
4.f.	Missed Approach.		A	X	
5	**Normal and Abnormal Procedures.**				
5.a.	Engine (including shutdown & restart – procedures only).	A	A	X	
5.b.	Fuel System.	A	A	X	
5.c.	Electrical System.	A	A	X	

Table B1B

Table of Tasks vs. FTD Level					
<<< QPS Requirements >>>					<< Information >>
Number	**Subjective Requirements** In order to be qualified at the FTD qualification level indicated, the FTD must be able to perform at least the tasks associated with that level of qualification. See Notes 1 and 2 at the end of the Table.	FTD Level 4	FTD Level 5	FTD Level 6	Notes
5.d.	Hydraulic System.	A	A	X	
5.e.	Environmental and Pressurization Systems.	A	A	X	
5.f.	Fire Detection and Extinguisher Systems.	A	A	X	
5.g.	Navigation and Avionics Systems.	A	A	X	
5.h.	Automatic Flight Control System, Electronic Flight Instrument System, and Related Subsystems.	A	A	X	
5.i.	Flight Control Systems.	A	A	X	
5.j.	Anti-ice and Deice Systems.	A	A	X	
5.k.	Aircraft and Personal Emergency Equipment.	A	A	X	
6.	**Emergency Procedures.**				
6.a.	Emergency Descent (maximum rate).		A	X	
6.b.	Inflight Fire and Smoke Removal.		A	X	
6.c.	Rapid Decompression.		A	X	
6.d.	Emergency Evacuation.	A	A	X	
7.	**Postflight Procedures.**				
7.a.	After-Landing Procedures.	A	A	X	
7.b.	Parking and Securing.	A	A	X	

Note 1: An "A" in the table indicates that the system, task, or procedure may be examined if the appropriate airplane system is simulated in the FTD and is working properly.

Note 2: Items not installed or not functional on the FTD and, therefore, not appearing on the SOQ Configuration List, are not required to be listed as exceptions on the SOQ.

Attachment 2 to Appendix B to Part 60--
FLIGHT TRAINING DEVICE (FTD) OBJECTIVE EVALUATION

Begin QPS Requirements

1. Test Requirements.

a. The ground and flight tests required for qualification are listed in Table B2A, Objective Evaluation. Computer generated FTD test results must be provided for each test except where specifically authorized an alternate means by the NSPM. If a flight condition or operating condition is required for the test but which does not apply to the airplane being simulated or to the qualification level sought, it may be disregarded (for example: an engine out missed approach for a single-engine airplane; a maneuver using reverse thrust for an airplane without reverse thrust capability; etc.). Each test result is compared against the validation data described in § 60.13, and Paragraph 9 in the main body of this appendix. (See paragraph 1.b. of this attachment for additional information.) The results must be produced on an appropriate recording device acceptable to the NSPM and must include FTD number, date, time, conditions, tolerances, and appropriate dependent variables portrayed in comparison to the validation data. Time histories are required unless otherwise indicated in Table B2A. All results must be labeled using the tolerances and units given.

b. For the purposes of this attachment, the flight conditions specified in the Flight Conditions Column of Table B2A, are defined as follows:

(1) Ground – on ground, independent of airplane configuration;
(2) Take-off – gear down with flaps/slats in any certified takeoff position;
(3) Second segment climb – gear up with flaps/slats in any certified takeoff position (normally between 50 ft and 400 ft AGL);
(4) Clean – flaps/slats retracted and gear up;
(5) Cruise – clean configuration at cruise altitude and airspeed;
(6) Approach – gear up or down with flaps/slats at any normal approach position as recommended by the airplane manufacturer; and
(7) Landing – gear down with flaps/slats in any certified landing position.

c. Table B2A in this attachment sets out the test results required, including the parameters, tolerances, and flight conditions for FTD validation. Tolerances are provided for the listed tests because mathematical modeling and acquisition/development of reference data are often inexact. All tolerances listed in the following tables are applied to FTD performance. When two tolerance values are given for a parameter, the less restrictive may be used unless otherwise indicated.

d. Certain tests included in this attachment must be supported with a Statement of Compliance and Capability (SOC). In B2A, requirements for SOC's are indicated in the "Test Details" column.

e. When operational or engineering judgment is used in making assessments for flight test data applications for FTD validity, such judgment must not be limited to a single parameter.

For example, data that exhibit rapid variations of the measured parameters may require interpolations or a "best fit" data section. All relevant parameters related to a given maneuver or flight condition must be provided to allow overall interpretation. When it is difficult or impossible to match FTD to airplane data throughout a time history, differences must be justified by providing a comparison of other related variables for the condition being assessed.

f. It is not sufficient, nor is it acceptable, to program the FTD so that the mathematical modeling is correct only at the validation test points. Unless noted otherwise, tests must represent airplane performance and handling qualities at normal operating weights and centers of gravity (CG). If a test is supported by aircraft data at one extreme weight or CG, another test supported by aircraft data at mid-conditions or as close as possible to the other extreme is necessary. Certain tests that are relevant only at one extreme CG or weight condition need not be repeated at the other extreme. The results of the tests for Level 6 are expected to be indicative of the device's performance and handling qualities throughout the following:

(1) the airplane weight and CG envelope;
(2) the operational envelope; and
(3) varying atmospheric ambient and environmental conditions – including the extremes authorized for the respective airplane or set of airplanes.

g. When comparing the parameters listed to those of the airplane, sufficient data must also be provided to verify the correct flight condition and airplane configuration changes. For example: to show that control force is within ±5 pounds (2.2 daN) in a static stability test, data to show the correct airspeed, power, thrust or torque, airplane configuration, altitude, and other appropriate datum identification parameters must also be given. If comparing short period dynamics, normal acceleration may be used to establish a match to the airplane, but airspeed, altitude, control input, airplane configuration, and other appropriate data must also be given. If comparing landing gear change dynamics, pitch, airspeed, and altitude may be used to establish a match to the airplane, but landing gear position must also be provided. All airspeed values must be clearly annotated as to indicated, calibrated, etc., and like values used for comparison.

h. The QTG provided by the sponsor must describe clearly and distinctly how the FTD will be set up and operated for each test. Overall integrated testing of the FTD must be accomplished to assure that the total FTD system meets the prescribed standards; i.e., it is not acceptable to test only each FTD subsystem independently. A manual test procedure with explicit and detailed steps for completion of each test must also be provided.

i. In those cases where the objective test results authorize a "snapshot test" or a "series of snapshot test" results in lieu of a time-history result, the sponsor or other data provider must ensure that a steady state condition exists from at least 5 seconds prior to, through at least 2 seconds after, the instant of time captured by the "snapshot." Alternative time intervals may be evaluated as acceptable by the NSPM on a case-by-case basis.

j. For previously qualified FTDs, the tests and tolerances of this appendix may be used in subsequent continuing qualification evaluations for any given test providing the sponsor has submitted a proposed MQTG revision to the NSPM and has received NSPM approval.

k. FTDs are evaluated and qualified with an engine model simulating the airplane data supplier's flight test engine. For qualification of alternative engine models (either variations of the flight test engines or other manufacturer's engines) additional tests with the alternative engine models may be required. Where thrust is more than 5% greater or more than 15% less than that of the flight test engine, flight test data from an airplane equipped with the alternative engine is required. However, if the validation data supplier shows that a thrust increase greater than 5% will not significantly change the airplane's flight characteristics, then flight validation data are not needed. Where the airplane data supplier certifies that the only impact on the FTD model is thrust, and that other variables related to the alternative engine (such as engine dynamic characteristics and thrust vector) are unchanged or are insignificantly changed, additional FTD tests may be run with the same initial conditions using the thrust from the flight test data as a driven parameter for the alternative engine model.

l. For testing Computer Controlled Airplane (CCA) FTDs, or other highly augmented airplane FTDs, flight test data may be required for the Normal (N) and/or Non-normal (NN) control states, as indicated in this attachment. Where test results are independent of control state, Normal or Non-normal control data may be used. All tests in Table B2A require test results in the Normal control state unless specifically noted otherwise in the Test Details section following the CCA designation. Tests for other levels of control state degradation may be required as detailed by the NSPM at the time of definition of a set of specific airplane tests for simulator data. Where Non-normal control states are required, test data must be provided for one or more Non-normal control states, and must include the least augmented state. Where applicable, flight test data must record Normal and Non-normal states for:

(1) Pilot controller deflections or electronically generated inputs, including location of input; and

(2) Flight control surface positions unless test results are not affected by, or are independent of, surface positions.

m. For airplanes using airplane hardware (e.g., "side stick controller") in the FTD cockpit, some tests will not be required as noted in Section 2 "Handling Qualities" in Table B2A of this attachment. However, in these cases the sponsor must supply a statement that the airplane hardware meets and will continue to meet the appropriate manufacturer's specifications and the sponsor must have supporting information to that fact available for NSPM review.

End QPS Requirements

Begin Information

2. Discussion.

a. If relevant winds are present in the objective data, the wind vector should be clearly noted as part of the data presentation, expressed in conventional terminology, and related to the runway being used for the test.

b. The format for numbering the objective tests in Appendix A, Attachment 2, Table A2A, and the objective tests in Appendix B, Attachment 2, Table B2A, is identical. However, each test required for FFS's is not necessarily required for FTD's. Also, each test required for FTD's is not necessarily required for FSS's. Therefore, when a test number (or series of numbers) is not required, the term "Reserved" is used in the table at that location. Following this numbering format provides a degree of commonality between the two tables and substantially reduces the potential for confusion when referring to objective test numbers for either FFS's or FTD's.

c. A Level 4 FTD does not require objective tests and therefore, Level 4 is not addressed in the following table. Additionally, and in accordance with the following three conditions, a Level 4 FTD is not required to have aerodynamic programming or a QTG, and both initial evaluations and continuing qualification evaluations will consist only of a subjective evaluation conducted by the NSPM or his designated representative.

(1) A Level 4 FTD may not be used to credit any training or practice if flown through manual manipulation of the primary flight controls. If this feature is desired, a Level 5 FTD will be required.

(2) A Level 4 FTD may have a generic aerodynamic program for use in systems training for auto-pilot, auto-flight guidance, and/or auto-flight management systems (FMS) systems operation provided:

(a) Any such training or practice is conducted in strict adherence to a training program lesson plan for the specific device;

(b) The TPAA has subjectively evaluated the functionality of the aerodynamic programming in relation to the lesson plan; and

(c) The lesson plan is approved by the TPAA.

(3) A Level 4 FTD that has aerodynamic programming available and use of the FTD is not restricted to flight under a specific lesson plan (i.e., the FTD may be used under a "free play" option for the student beyond a structured lesson plan), the sponsor must initially provide to the NSPM, or his designated representative, detailed information regarding how the aerodynamic programming was derived, and explain how this programming and the FTD systems that are simulated are integrated to insure proper operation.

3. The reader is encouraged to review the Airplane Flight Simulator Evaluation Handbook, Volumes I and II, published by the Royal Aeronautical Society, London, UK, and FAA Advisory Circulars (AC) 25-7, as may be amended, Flight Test Guide for Certification of Transport Category Airplanes, and (AC) 23-8, as may be amended, Flight Test Guide for Certification of Part 23 Airplanes, for references and examples regarding flight testing requirements and techniques.

End Information

Table B2A

Flight Training Device (FTD) Objective Tests							
<<< QPS Requirements >>>>							<< Information >>
Test		Tolerances	Flight Conditions	Test Details	FTD Level		Notes
Number	Title				5	6	
1. Performance.							
1.a.	**(Reserved)**						
1.b.	**Takeoff.**						
1.b.1.	Ground Acceleration Time.	±5% time or ±1 sec.	Takeoff.	Record acceleration time for a minimum of 80% of the segment from brake release to V_R. Preliminary aircraft certification data may be used.		X	This test is required only if RTO training credit is sought.
1.b.2. through 1.b.6.	**(Reserved)**						
1.b.7.	Rejected Takeoff.	±5% time or ±1.5 sec, ±7.5% distance or ±250 ft (±76 m).	Takeoff	Record time from brake application to full stop. Speed for reject must be at least 80% of V_1. The airplane must be at or near the maximum takeoff gross weight. Use maximum braking effort, auto or manual.		X	This test is required only if RTO training credit is sought.
1.b.8.	**(Reserved)**						
1.c.	**Climb.**						
1.c.1.	Normal Climb all engines operating.	±3 kt airspeed, ±5% or ±100 ft/min (0.5 m/sec) climb rate.	Clean.	Flight test data or airplane performance manual data may be used. Record at nominal climb speed and mid-initial climb altitude. Flight simulator performance must be recorded over an interval of at least 1,000 ft (300 m). May be a snapshot test.	X	X	
1.c.2. through 1.c.4.	**(Reserved)**						
1.d.	**(Reserved)**						
1.e.	**(Reserved)**						

Table B2A

Test Number	Test Title	Tolerances	Flight Conditions	Test Details	FTD Level 5	FTD Level 6	Notes
	Flight Training Device (FTD) Objective Tests						
	<<< QPS Requirements >>>>						**<< Information >>**
1.f.	**Engines.**						
1.f.1.	Acceleration.	±10% T_t or ±0.25 sec for Level 6. ±1 sec for Level 5.	Approach or Landing	Record engine power (N_1, N_2, EPR, Torque, Manifold Pressure, etc.) from idle to maximum takeoff power for a rapid (slam) throttle movement.	X	X	T_t is the total time from initial throttle movement to reaching 90% of go around power.
1.f.2.	Deceleration.	±10% T_t, or ±0.25 sec for Level 6. ±1 sec for Level 5.	Ground.	Record engine power (N_1, N_2, EPR, Torque, Manifold Pressure, etc.) from maximum takeoff power to idle for a rapid (slam) throttle movement.	X	X	T_t is the total time from initial throttle movement to reaching 90% decay of maximum takeoff power.
2. Handling Qualities.							
	For FTDs requiring Static tests at the controls (i.e., column, wheel, rudder pedal), special test fixtures will not be required during initial or upgrade evaluations if the sponsor's QTG/MQTG shows both test fixture results **and** the results of an alternative approach, such as computer plots produced concurrently, that show satisfactory agreement. Repeat of the alternative method during the initial or upgrade evaluation would then satisfy this test requirement.						
2.a.	**Static Control Tests.**						
2.a.1.a.	Pitch Controller Position vs. Force and Surface Position Calibration.	±2 lb (0.9 daN) breakout, ±10% or ±5 lb (2.2 daN) force, ±2° elevator.	Ground.	Record results for an uninterrupted control sweep to the stops.		X	
2.a.1.b.	Pitch Controller Position vs. Force.	±2 lb (0.9 daN) breakout, ±10% or ±5 lb (2.2 daN) force. Applicable only on continuing qualification evaluations.	As determined by Sponsor.	Record results during initial evaluation for an uninterrupted control sweep to the stops for subsequent comparison on continuing qualification evaluations, where tolerances will apply.	X		The intent is to design the control feel for Level 5 to be able to manually fly an instrument approach; and not to compare results to flight test or other such data.
2.a.2.a.	Roll Controller Position vs. Force	±2 lb (0.9 daN) breakout,	Ground.	Record results for an uninterrupted control sweep to		X	

Table B2A

Flight Training Device (FTD) Objective Tests							
<<< QPS Requirements >>>>							<< Information >>
Test		Tolerances	Flight Conditions	Test Details	FTD Level		Notes
Number	Title				5	6	
	and Surface Position Calibration.	±10% or ±3 lb (1.3 daN) force, ±2° aileron, ±3° spoiler angle.		the stops.			
2.a.2.b.	Roll Controller Position vs. Force.	±2 lb (0.9 daN) breakout, ±10% or ±3 lb (1.3 daN) force. Applicable only on continuing qualification evaluations.	As determined by Sponsor.	Record results during initial evaluation for an uninterrupted control sweep to the stops for subsequent comparison on continuing qualification evaluations, where tolerances will apply.	X		The intent is to design the control feel for Level 5 to be able to manually fly an instrument approach; and not to compare results to flight test or other such data.
2.a.3.a.	Rudder Pedal Position vs. Force and Surface Position Calibration.	±5 lb (2.2 daN) breakout, ±10% or ±5 lb (2.2 daN) force, ±2° rudder angle.	Ground.	Record results for an uninterrupted control sweep to the stops.		X	
2.a.3.b.	Rudder Pedal Position vs. Force.	±5 lb (2.2 daN) breakout, ±10% or ±5 lb (2.2 daN) force. Applicable only on continuing qualification evaluations.	As determined by Sponsor.	Record results during initial evaluation for an uninterrupted control sweep to the stops for subsequent comparison on continuing qualification evaluations, where tolerances will apply.	X		The intent is to design the control feel for Level 5 to be able to manually fly an instrument approach; and not to compare results to flight test or other such data.
2.a.4.	Nosewheel Steering Controller Force.	±2 lb (0.9 daN) breakout, ±10% or ±3 lb (1.3 daN) force.	Ground.	Record results of an uninterrupted control sweep to the stops.		X	
2.a.5.	Rudder Pedal Steering	±2° nosewheel angle.	Ground.	Record results of an uninterrupted control sweep to		X	

Table B2A

Flight Training Device (FTD) Objective Tests								
<<< QPS Requirements >>>>								<< Information >>
Test		Tolerances	Flight Conditions	Test Details	FTD Level		Notes
Number	Title				5	6	
	Calibration.			the stops.			
2.a.6.	Pitch Trim Indicator vs. Surface Position Calibration.	±0.5° of computed trim surface angle.	Ground.			X	The purpose of the test is to compare the FTD against design data or equivalent.
2.a.7.	**(Reserved)**						
2.a.8.	Alignment of Cockpit Throttle Lever vs. Selected Engine Parameter.	±5° of throttle lever angle, or ±3% N1, or ±.03 EPR, or ±3% maximum rated manifold pressure, or ±3% torque. Where control levers do not have angular travel, a tolerance of ±0.8 inch (±2 cm.) applies.	Ground.	Requires simultaneous recording for all engines. The tolerances apply against airplane data and between engines. In the case of propeller powered airplanes, if a propeller lever is present, it must also be checked. For airplanes with throttle "detents," all detents must be presented. May be a series of snapshot test results.		X	
2.a.9.	Brake Pedal Position vs. Force.	±5 lb (2.2 daN) or 10% force,	Ground.	Two data points are required: zero and maximum deflection. Computer output results may be used to show compliance..		X	Test not required unless RTO credit is sought.
2.b.	**(Reserved)**						
2.c.	**Longitudinal Control Tests.**						
	Power setting is that required for level flight unless otherwise specified.						
2.c.1.	Power Change Force.	±5 lb (2.2 daN) or, ±20% force.	Approach.	May be a series of snapshot test results. Power change dynamics test as described in test 2.c.1 of Table A2A of this part will be accepted. (CCA: Test in Normal and Non-normal control state.)	X	X	
2.c.2.	Flap/Slat Change	±5 lb (2.2 daN) or,	Takeoff	May be a series of snapshot test	X	X	

Table B2A

Flight Training Device (FTD) Objective Tests							
<<< QPS Requirements >>>>							<< Information >>
Test		Tolerances	Flight Conditions	Test Details	FTD Level		Notes
Number	Title				5	6	
	Force.	±20% force.	through initial flap retraction, and approach to landing.	results. Flap/Slat change dynamics test as described in test 2.c.2 of Table A2A of this part will be accepted. (CCA: Test in Normal and Non-normal control state.)			
2.c.3.	(Reserved)						
2.c.4.	Gear Change Force.	±5 lb (2.2 daN) or, ±20% force.	Takeoff (retraction), and Approach (extension).	May be a series of snapshot test results. Gear change dynamics test as described in test 2.c.4 of Table A2A of this part will be accepted. (CCA: Test in Normal and Non-normal control state.)	X	X	
2.c.5.	Longitudinal Trim.	±0.5° trim surface angle ±1°elevator ±1° pitch angle ±5% net thrust or equivalent.	Cruise, Approach, and Landing.	Record steady-state condition with wings level and thrust set for level flight. May be a series of snapshot tests. Level 5 may use equivalent stick and trim controllers in lieu of elevator and trim surface. (CCA: Test in Normal and Non-normal control state.)	X	X	
2.c.6.	Longitudinal Maneuvering Stability (Stick Force/g).	±5 lb (±2.2 daN) or ±10% pitch controller force. Alternative method: ±1° or ±10% change of elevator.	Cruise, Approach, and Landing.	Continuous time history data or a series of snapshot tests may be used. Record results up to approximately 30° of bank for approach and landing configurations. Record results for up to approximately 45° of bank for the cruise configuration. The force tolerance is not applicable if forces are generated solely by the use of airplane hardware in the		X	

Table B2A

Flight Training Device (FTD) Objective Tests							
<<< QPS Requirements >>>>							<< Information >>
Test		Tolerances	Flight Conditions	Test Details	FTD Level		Notes
Number	Title				5	6	
				FTDr. The alternative method applies to airplanes that do not exhibit "stick-force-per-g" characteristics. (CCA: Test in Normal and Non-normal control state as applicable.)			
2.c.7.	Longitudinal Static Stability.	±5 lb (±2.2 daN) or ±10% pitch controller force. Alternative method: ±1° or ±10% change of elevator.	Approach.	Record results for at least 2 speeds above and 2 speeds below trim speed. May be a series of snapshot test results. The force tolerance is not applicable if forces are generated solely by the use of airplane hardware in the FTD. The alternative method applies to airplanes that do not exhibit speed stability characteristics. Level 5 must exhibit positive static stability, but need not comply with the numerical tolerance. (CCA: Test in Normal or Non-normal control state, as applicable.)	X	X	
2.c.8.	Stall Warning (actuation of stall warning device.)	±3 kt airspeed, ±2° bank for speeds greater than actuation of stall warning device or initial buffet.	Second Segment Climb, and Approach or Landing.	The stall maneuver must be entered with thrust at or near idle power and wings level (1g). Record the stall warning signal and initial buffet, if applicable. (CCA: Test in Normal and Non-normal control state.)	X	X	
2.c.9.a.	Phugoid Dynamics.	±10% period,	Cruise.	The test must include whichever is less of the following: Three		X	

Table B2A

Flight Training Device (FTD) Objective Tests							
<<< QPS Requirements >>>>							<< Information >>
Test		Tolerances	Flight Conditions	Test Details	FTD Level		Notes
Number	Title				5	6	
		±10% of time to ½ or double amplitude or ±.02 of damping ratio.		full cycles (six overshoots after the input is completed), or the number of cycles sufficient to determine time to ½ or double amplitude. **(CCA:** Test in Non-normal control state.)			
2.c.9.b.	Phugoid Dynamics.	±10% period, Representative damping.	Cruise.	The test must include whichever is less of the following: Three full cycles (six overshoots after the input is completed), or the number of cycles sufficient to determine representative damping. **(CCA:** Test in Non-normal control state.)	X		
2.c.10.	Short Period Dynamics.	±1.5° pitch angle or ±2°/sec pitch rate, ±0.10g acceleration.	Cruise.	**(CCA:** Test in Normal and Non-normal control state.)		X	
2.c.11.	Gear and flap/slat operating times.	±1 sec, or ±10% of time.	Takeoff, Approach	Normal and alternate flap/slat extension and retraction. Normal gear extension and retraction. Alternate gear, extension only.		X	
2.d.	**Lateral Directional Tests.**						
	Power setting is that required for level flight unless otherwise specified.						
2.d.1.	**(Reserved)**						
2.d.2.	Roll Response (Rate).	±10% or ±2°/sec roll rate.	Cruise, and Approach or Landing.	Record results for normal roll controller deflection (about one-third of maximum roll controller travel). May be combined with step input of flight deck roll controller test (2.d.2.).	X	X	
2.d.3.	Roll Response to	±10% or ±2° bank	Approach or	Record from initiation of roll		X	

Table B2A

Flight Training Device (FTD) Objective Tests							
<<< QPS Requirements >>>>							<< Information >>
Test		Tolerances	Flight Conditions	Test Details	FTD Level		Notes
Number	Title				5	6	
	Cockpit Roll Controller Step Input.	angle.	Landing.	through 10 seconds after control is returned to neutral and released. May be combined with roll response (rate) test (2.d.1.). **(CCA:** Test in Normal and Non-normal control state.)			
2.d.4.a.	Spiral Stability.	Correct trend and ±3° or ±10% bank angle in 30 seconds.. Alternate test requires correct trend and ±2° aileron.	Cruise	Record results for both directions. Airplane data averaged from multiple tests may be used. As an alternate test, demonstrate the lateral control required to maintain a steady turn with a bank angle of approximately 30°. **(CCA:** Test in Non-normal control state.)		X	
2.d.4.b.	Spiral Stability.	Correct trend.	Cruise	Airplane data averaged from multiple tests in same direction may be used. **(CCA:** Test in Non-normal control state.)	X		
2.d.5.	**(Reserved)**						
2.d.6.a.	Rudder Response.	±2°/sec or ±10% yaw rate.	Approach or Landing.	A rudder step input of 20%-30% rudder pedal throw is used. Not required if rudder input and response is shown in Dutch Roll test (test 2.d.5). **(CCA:** Test in Normal and Non-normal control state.)		X	
2.d.6.b.	Rudder Response.	Roll rate ±2°/sec, bank angle ±3°.	Approach or Landing	May be roll response to a given rudder deflection. **(CCA:** Test in Normal and Non-normal control state.)	X		
2.d.7.	Dutch Roll, (Yaw	±0.5 sec or ±10% of	Cruise, and	Record results for at least 6		X	

Table B2A

Flight Training Device (FTD) Objective Tests							
<<< QPS Requirements >>>>							<< Information >>
Test		Tolerances	Flight Conditions	Test Details	FTD Level		Notes
Number	Title				5	6	
	Damper OFF).	period. ±10% of time to ½ or double amplitude or ±.02 of damping ratio.	Approach or Landing.	complete cycles with stability augmentation OFF, or the number of cycles sufficient to determine time to ½ or double amplitude. (CCA: Test in Non-normal control state.)			
2.d.8.	Steady State Sideslip.	For given rudder position ±2° bank angle, ±1° sideslip angle, ±10% or ±2° aileron, ±10% or ±5° spoiler or equivalent roll, controller position or force.	Approach or Landing.	May be a series of snapshot test results. Propeller driven airplanes must test in each direction. Sideslip angle is matched only for repeatability and only on continuing qualification evaluations.	X	X	
2.e. through 2.h.	**(Reserved)**						
3.	**(Reserved)**						
4.	**(Reserved)**						
5.	**(Reserved)**						
6.	**FTD System Response Time.**						
6.a.	Latency.						
		300 ms (or less) after airplane response.	Take-off, cruise, and approach or landing.	One test is required in each axis (pitch, roll and yaw) for each of the three conditions (take-off, cruise, and approach or landing).	X	X	

Table B2A

Flight Training Device (FTD) Objective Tests							
<<< QPS Requirements >>>>							<< Information >>
Test		Tolerances	Flight Conditions	Test Details	FTD Level		Notes
Number	Title				5	6	
	Transport Delay. If Transport Delay is chosen to demonstrate response time rather than Latency, it is expected that, when reviewing those existing tests where latency can be identified (e.g., short period, roll response, rudder response, etc.) the sponsor and the NSPM will apply additional scrutiny to ensure proper FTD response.						
		300 ms (or less) after controller movement.	N/A	A separate test is required in each axis (pitch, roll, and yaw).	X	X	

4. Alternative Objective Data for FTD Level 5.

Begin QPS Requirements

a. This paragraph (including the following tables) is relevant only to FTD Level 5 and is provided due to the fact that this level is required to perform and handle similarly to a set of airplanes having similar performance (normal airspeed/altitude operating envelope), that have similar handling characteristics, and have the same number and type of propulsion systems (engines).

b. The following tables reflect the performance range typical for the stated set of airplanes and may be used without having to acquire flight test data or gather validation data from any other source. However, if the performance of the device does not fall within the established range (according to the following tables) for a specific table entry, and the sponsor has airplane flight test data, acceptable to the NSPM, that matches the performance of the device within the tolerances established in the Table of Objective Tests, this flight test data may be used for that specific table entry requirement.

c. The following applies to those wishing to pursue this alternative approach:
(1) The sponsor will submit a complete QTG including the following:
  (a) If this alternate source of data method is used, recordings that demonstrate that the performance of the FTD is within the allowable performance range.
  (b) Results from the objective tests appropriate to the level of qualification sought.
(2) The QTG test results must include all appropriate parameters for which tolerances are established in the Table of Objective Tests, and must include all relevant information concerning the conditions under which the test was conducted; e.g., gross weight, center of gravity, airspeed, power setting, altitude (climbing, descending, or level), temperature, configuration, and any other parameter that would have an impact on the conduct of the test.
(3) One reviewed and accepted by the NSPM, these test results are the validation data against which the initial and all subsequent recurrent evaluations will be compared. These subsequent evaluations will use the tolerances listed in the Table of Objective Tests.
(4) Subjective testing of the device must be performed to determine that the device performs and handles acceptably like an airplane within the appropriate set of airplanes.

End QPS Requirements

Begin Information

d. The alternative source data contained in the following tables have been derived from a consensus of aviation professionals, including simulator and flight training device manufacturers; pilots and instructors familiar with the various sets of airplanes, and airplane manufacturer's representatives for airplanes fitting the appropriate set of airplanes.

e. The reader is encouraged to consult the Airplane Flight Simulator Evaluation Handbook, Volumes I and II, published by the Royal Aeronautical Society, London, UK, in February 1995 and July 1996, respectively, and FAA Advisory Circulars (AC) 25-7, Flight Test Guide for Certification of Transport Category Airplanes, and (AC) 23-8A, Flight Test Guide for Certification of Part 23 Airplanes, for references and examples regarding flight testing requirements and techniques.

End Information

Table B2B

Alternative Data Source for FTD Level 5		
Small, Single Engine (Reciprocating) Airplane		
<<< QPS Requirement >>>		
Applicable Test		**Authorized Performance Range**
Number	**Title and Procedure**	
1.	**Performance.**	
1.c	**Climb.**	
1.c.1.	Normal climb with nominal gross weight, at best rate-of-climb airspeed.	Climb rate = 500 - 1200 fpm (2.5 - 6 m/sec).
1.f.	**Engines.**	
1.f.1.	Acceleration; idle to takeoff power.	2 - 4 Seconds.
1.f.2.	Deceleration; takeoff power to idle.	2 - 4 Seconds.
2.	**Handling Qualities.**	
2.c.	**Longitudinal Tests.**	
2.c.1.	Power change force.	
	a) Trim for straight and level flight at 80% of normal cruise airspeed with necessary power. Reduce power to flight idle. Do not change trim or configuration. After stabilized, record column force necessary to maintain original airspeed.	5 - 15 lbs (2.2 - 6.6 daN) of force (Pull).
	OR	
	b) Trim for straight and level flight at 80% of normal cruise airspeed with necessary power. Add power to maximum setting. Do not change trim or configuration. After stabilized, record column force necessary to maintain original airspeed.	5 - 15 lbs (2.2 - 6.6 daN) of force (Push).
2.c.2.	Flap/slat change force.	
	a) Trim for straight and level flight with flaps fully retracted at a constant airspeed within the flaps-extended airspeed range. Do not adjust trim or power. Extend the flaps to 50% of full flap travel. After stabilized, record stick force necessary to maintain original airspeed.	5 - 15 lbs (2.2 - 6.6 daN) of force (Pull).
	OR	
	b) Trim for straight and level flight with flaps extended to 50% of full flap travel, at a constant airspeed within the flaps-extended airspeed range. Do not adjust trim or power. Retract the flaps to zero. After stabilized, record stick force necessary to maintain original airspeed.	5 - 15 lbs (2.2 - 6.6 daN) of force (Push).
2.c.4.	Gear change force.	

Table B2B

Alternative Data Source for FTD Level 5		
Small, Single Engine (Reciprocating) Airplane		
<<< QPS Requirement >>>		
Applicable Test		**Authorized Performance Range**
Number	**Title and Procedure**	
	a) Trim for straight and level flight with landing gear retracted at a constant airspeed within the landing gear-extended airspeed range. Do not adjust trim or power. Extend the landing gear. After stabilized, record stick force necessary to maintain original airspeed.	2 - 12 lbs (0.88 - 5.3 daN) of force (Pull).
	OR	
	b) Trim for straight and level flight with landing gear extended, at a constant airspeed within the landing gear-extended airspeed range. Do not adjust trim or power. Retract the landing gear. After stabilized, record stick force necessary to maintain original airspeed.	2 - 12 lbs (0.88 - 5.3 daN) of force (Push).
2.c.5.	Longitudinal trim.	Must be able to trim longitudinal stick force to "zero" in each of the following configurations: cruise; approach; and landing.
2.c.7.	Longitudinal static stability.	Must exhibit positive static stability.
2.c.8.	Stall warning (actuation of stall warning device) with nominal gross weight; wings level; and a deceleration rate of approximately one (1) knot per second.	If installed and working correctly.
	a) Landing configuration:	40 - 60 knots; ± 5° of bank.
	b) Clean configuration:	Landing configuration speed + 10 - 20 percent.
2.c.9.b.	Phugoid dynamics.	Must have a phugoid with a period of 30 - 60 seconds. May not reach ½ or double amplitude in less than 2 cycles.
2.d.	**Lateral Directional Tests.**	
2.d.2.	Roll response. Roll rate must be measured through at least 30 degrees of roll. Aileron control must be deflected approximately 1/3 (33.3 percent) of maximum travel.	Must have a roll rate of 4 - 25 degrees/second.
2.d.4.b.	Spiral stability. Cruise configuration and normal cruise airspeed. Establish a 20 - 30 degree bank. When stabilized, neutralize the aileron control and release. Must be completed in both directions of turn.	Initial bank angle (± 5 degrees) after 20 seconds.
2.d.6.b.	Rudder response. Use approximately 25 percent of maximum rudder deflection.	3 - 6 degrees/second yaw rate.

Table B2B

Alternative Data Source for FTD Level 5		
Small, Single Engine (Reciprocating) Airplane		
<<< QPS Requirement >>>		
Applicable Test		Authorized Performance Range
Number	Title and Procedure	
	(Applicable to approach or landing configuration.)	
2.d.7.	Dutch roll, yaw damper off. (Applicable to cruise and approach configurations.)	A period of 2 - 5 seconds; and ½ - 2 cycles.
2.d.8.	Steady state sideslip. Use 50 percent rudder deflection. (Applicable to approach and landing configurations.)	2 - 10 degrees of bank; 4 - 10 degrees of sideslip; and 2 -10 degrees of aileron.
6.	FTD System Response Time.	
6.a.	Cockpit instrument systems response to an abrupt pilot controller input. One test is required in each axis (pitch, roll, yaw).	300 milliseconds or less.

Table B2C

Alternative Data Source for FTD Level 5		
Small, Multi-Engine (Reciprocating) Airplane		
<<< QPS Requirement >>>		
Applicable Test		Authorized Performance Range
Number	Title and Procedure	
1.	**Performance.**	
1.c	**Climb.**	
1.c.1.	Normal climb with nominal gross weight, at best rate-of-climb airspeed.	Climb airspeed = 95 – 115 knots. Climb rate = 500 – 1500 fpm (2.5 – 7.5 m/sec)
1.f.	**Engines.**	
1.f.1.	Acceleration; idle to takeoff power.	2 - 5 Seconds.
1.f.2.	Deceleration; takeoff power to idle.	2 - 5 Seconds.
2.	**Handling Qualities.**	
2.c.	**Longitudinal Tests.**	
2.c.1.	Power change force.	
	a) Trim for straight and level flight at 80% of normal cruise airspeed with necessary power. Reduce power to flight idle. Do not change trim or configuration. After stabilized, record column force necessary to maintain original airspeed.	10 - 25 lbs (2.2 - 6.6 daN) of force (Pull).
	OR	
	b) Trim for straight and level flight at 80% of normal cruise airspeed with necessary power. Add power to maximum setting. Do not change trim or configuration. After stabilized, record column force necessary to maintain original airspeed.	5 - 15 lbs (2.2 - 6.6 daN) of force (Push).
2.c.2.	Flap/slat change force.	
	a) Trim for straight and level flight with flaps fully retracted at a constant airspeed within the flaps-extended airspeed range. Do not adjust trim or power. Extend the flaps to 50% of full flap travel. After stabilized, record stick force necessary to maintain original airspeed.	5 - 15 lbs (2.2 - 6.6 daN) of force (Pull).
	OR	
	b) Trim for straight and level flight with flaps extended to 50% of full flap travel, at a constant airspeed within the flaps-extended airspeed range. Do not adjust trim or power. Retract the flaps to zero. After stabilized, record stick force necessary to maintain original airspeed.	5 - 15 lbs (2.2 - 6.6 daN) of force (Push).
2.c.4.	Gear change force.	

Table B2C

Alternative Data Source for FTD Level 5		
Small, Multi-Engine (Reciprocating) Airplane		
<<< QPS Requirement >>>		
Applicable Test		Authorized Performance Range
Number	Title and Procedure	
	a) Trim for straight and level flight with landing gear retracted at a constant airspeed within the landing gear-extended airspeed range. Do not adjust trim or power. Extend the landing gear. After stabilized, record stick force necessary to maintain original airspeed.	2 - 12 lbs (0.88 - 5.3 daN) of force (Pull).
	OR	
	b) Trim for straight and level flight with landing gear extended, at a constant airspeed within the landing gear-extended airspeed range. Do not adjust trim or power. Retract the landing gear. After stabilized, record stick force necessary to maintain original airspeed.	2 - 12 lbs (0.88 - 5.3 daN) of force (Push).
2.c.4.	Longitudinal trim.	Must be able to trim longitudinal stick force to "zero" in each of the following configurations: cruise; approach; and landing.
2.c.7.	Longitudinal static stability.	Must exhibit positive static stability.
2.c.8.	Stall warning (actuation of stall warning device) with nominal gross weight; wings level; and a deceleration rate of approximately one (1) knot per second.	If installed and working correctly.
	a) Landing configuration:	60 - 90 knots; ± 5° of bank.
	b) Clean configuration:	Landing configuration speed + 10 - 20 percent.
2.c.9.b.	Phugoid dynamics.	Must have a phugoid with a period of 30 - 60 seconds. May not reach ½ or double amplitude in less than 2 cycles.
2.d.	**Lateral Directional Tests.**	
2.d.2.	Roll response. Roll rate must be measured through at least 30 degrees of roll. Aileron control must be deflected approximately 1/3 (33.3 percent) of maximum travel.	Must have a roll rate of 4 - 25 degrees/second.
2.d.4.b.	Spiral stability. Cruise configuration and normal cruise airspeed. Establish a 20 - 30 degree bank. When stabilized, neutralize the aileron control and release. Must be completed in both directions of turn.	Initial bank angle (± 5 degrees) after 20 seconds.
2.d.6.b.	Rudder response. Use approximately 25 percent of maximum rudder deflection. (Applicable to approach or landing configuration.)	3 - 6 degrees/second yaw rate.
2.d.7.	Dutch roll, yaw damper off.	A period of 2 - 5 seconds; and ½ - 2 cycles.

Table B2C

Alternative Data Source for FTD Level 5		
Small, Multi-Engine (Reciprocating) Airplane		
<<< QPS Requirement >>>		
Applicable Test		**Authorized**
Number	**Title and Procedure**	**Performance Range**
	(Applicable to cruise and approach configurations.)	
2.d.8.	Steady state sideslip. Use 50 percent rudder deflection. (Applicable to approach and landing configurations.)	2 - 10 degrees of bank; 4 - 10 degrees of sideslip; and 2 -10 degrees of aileron.
6.	**FTD System Response Time.**	
6.a.	Cockpit instrument systems response to an abrupt pilot controller input. One test is required in each axis (pitch, roll, yaw).	300 milliseconds or less.

Table B2D

Alternative Data Source for FTD Level 5		
Small, Single Engine (Turbo-Propeller) Airplane		
<<< QPS Requirement >>>		
Applicable Test		**Authorized Performance Range**
Number	**Title and Procedure**	
1.	**Performance.**	
1.c	**Climb.**	
1.c.1.	Normal climb with nominal gross weight, at best rate-of-climb airspeed.	Climb airspeed = 95 – 115 knots. Climb rate = 800 - 1800 fpm (4 - 9 m/sec)
1.f.	**Engines.**	
1.f.1.	Acceleration; idle to takeoff power.	4 - 8 Seconds.
1.f.2.	Deceleration; takeoff power to idle.	3 - 7 Seconds.
2.	**Handling Qualities.**	
2.c.	**Longitudinal Tests.**	
2.c.1.	Power change force.	
	a) Trim for straight and level flight at 80% of normal cruise airspeed with necessary power. Reduce power to flight idle. Do not change trim or configuration. After stabilized, record column force necessary to maintain original airspeed.	8 lbs (3.5 daN) of Push force – 8 lbs (3.5 daN) of Pull force.
	OR	
	b) Trim for straight and level flight at 80% of normal cruise airspeed with necessary power. Add power to maximum setting. Do not change trim or configuration. After stabilized, record column force necessary to maintain original airspeed.	12 - 22 lbs (5.3 – 9.7 daN) of force (Push).
2.c.2.	Flap/slat change force.	
	a) Trim for straight and level flight with flaps fully retracted at a constant airspeed within the flaps-extended airspeed range. Do not adjust trim or power. Extend the flaps to 50% of full flap travel. After stabilized, record stick force necessary to maintain original airspeed.	5 - 15 lbs (2.2 - 6.6 daN) of force (Pull).
	OR	
	b) Trim for straight and level flight with flaps extended to 50% of full flap travel, at a constant airspeed within the flaps-extended airspeed range. Do not adjust trim or power. Retract the flaps to zero. After stabilized, record stick force necessary to maintain original airspeed.	5 - 15 lbs (2.2 - 6.6 daN) of force (Push).
2.c.4.	Gear change force.	

Table B2D

Alternative Data Source for FTD Level 5		
Small, Single Engine (Turbo-Propeller) Airplane		
<<< QPS Requirement >>>		
Applicable Test		Authorized Performance Range
Number	Title and Procedure	
	a) Trim for straight and level flight with landing gear retracted at a constant airspeed within the landing gear-extended airspeed range. Do not adjust trim or power. Extend the landing gear. After stabilized, record stick force necessary to maintain original airspeed.	2 - 12 lbs (0.88 - 5.3 daN) of force (Pull).
	OR	
	b) Trim for straight and level flight with landing gear extended, at a constant airspeed within the landing gear-extended airspeed range. Do not adjust trim or power. Retract the landing gear. After stabilized, record stick force necessary to maintain original airspeed.	2 - 12 lbs (0.88 - 5.3 daN) of force (Push).
2.b.5.	Longitudinal trim.	Must be able to trim longitudinal stick force to "zero" in each of the following configurations: cruise; approach; and landing.
2.c.7.	Longitudinal static stability.	Must exhibit positive static stability.
2.c.8.	Stall warning (actuation of stall warning device) with nominal gross weight; wings level; and a deceleration rate of approximately one (1) knot per second.	If installed and working correctly.
	a) Landing configuration:	60 - 90 knots; ± 5° of bank.
	b) Clean configuration:	Landing configuration speed + 10 - 20 percent.
2.c.8.b.	Phugoid dynamics.	Must have a phugoid with a period of 30 - 60 seconds. May not reach ½ or double amplitude in less than 2 cycles.
2.d.	**Lateral Directional Tests.**	
2.d.2.	Roll response. Roll rate must be measured through at least 30 degrees of roll. Aileron control must be deflected approximately 1/3 (33.3 percent) of maximum travel.	Must have a roll rate of 4 - 25 degrees/second.
2.d.4.b.	Spiral stability. Cruise configuration and normal cruise airspeed. Establish a 20 - 30 degree bank. When stabilized, neutralize the aileron control and release. Must be completed in both directions of turn.	Initial bank angle (± 5 degrees) after 20 seconds.
2.d.6.b.	Rudder response. Use approximately 25 percent of maximum rudder deflection. (Applicable to approach or landing configuration.)	3 - 6 degrees/second yaw rate.
2.d.7.	Dutch roll, yaw damper off. (Applicable to cruise and approach configurations.)	A period of 2 - 5 seconds; and ½ - 2 cycles.

Table B2D

Alternative Data Source for FTD Level 5		
Small, Single Engine (Turbo-Propeller) Airplane		
<<< QPS Requirement >>>		
Applicable Test		Authorized Performance Range
Number	Title and Procedure	
2.d.8.	Steady state sideslip. Use 50 percent rudder deflection. (Applicable to approach and landing configurations.)	2 - 10 degrees of bank; 4 - 10 degrees of sideslip; and 2 -10 degrees of aileron.
6.	**FTD System Response Time.**	
6.a.	Cockpit instrument systems response to an abrupt pilot controller input. One test is required in each axis (pitch, roll, yaw).	300 milliseconds or less.

Table B2E

Alternative Data Source for FTD Level 5		
Multi-Engine (Turbo-Propeller) Airplane		
<<< QPS Requirement >>>		
Applicable Test		Authorized
Number	Title and Procedure	Performance Range
1.	**Performance.**	
1.c	**Climb.**	
1.b.1.	Normal climb with nominal gross weight, at best rate-of-climb airspeed.	Climb airspeed = 120 – 140 knots. Climb rate = 1000 – 3000 fpm (4 - 9 m/sec)
1.f.	**Engines.**	
1.f.1.	Acceleration; idle to takeoff power.	2 - 6 Seconds.
1.f.2.	Deceleration; takeoff power to idle.	1 - 5 Seconds.
2.	**Handling Qualities.**	
2.c.	**Longitudinal Tests.**	
2.c.1.	Power change force.	
	a) Trim for straight and level flight at 80% of normal cruise airspeed with necessary power. Reduce power to flight idle. Do not change trim or configuration. After stabilized, record column force necessary to maintain original airspeed.	8 lbs (3.5 daN) of Push force to 8 lbs (3.5 daN) of Pull force.
	OR	
	b) Trim for straight and level flight at 80% of normal cruise airspeed with necessary power. Add power to maximum setting. Do not change trim or configuration. After stabilized, record column force necessary to maintain original airspeed.	12 - 22 lbs (5.3 – 9.7 daN) of force (Push).
2.c.2.	Flap/slat change force.	
	a) Trim for straight and level flight with flaps fully retracted at a constant airspeed within the flaps-extended airspeed range. Do not adjust trim or power. Extend the flaps to 50% of full flap travel. After stabilized, record stick force necessary to maintain original airspeed.	5 - 15 lbs (2.2 - 6.6 daN) of force (Pull).
	OR	
	b) Trim for straight and level flight with flaps extended to 50% of full flap travel, at a constant airspeed within the flaps-extended airspeed range. Do not adjust trim or power. Retract the flaps to zero. After stabilized, record stick force necessary to maintain original airspeed.	5 - 15 lbs (2.2 - 6.6 daN) of force (Push).
2.c.4.	Gear change force.	

Table B2E

Alternative Data Source for FTD Level 5		
Multi-Engine (Turbo-Propeller) Airplane		
<<< QPS Requirement >>>		
Applicable Test		Authorized Performance Range
Number	Title and Procedure	
	a) Trim for straight and level flight with landing gear retracted at a constant airspeed within the landing gear-extended airspeed range. Do not adjust trim or power. Extend the landing gear. After stabilized, record stick force necessary to maintain original airspeed.	2 - 12 lbs (0.88 - 5.3 daN) of force (Pull).
	OR	
	b) Trim for straight and level flight with landing gear extended, at a constant airspeed within the landing gear-extended airspeed range. Do not adjust trim or power. Retract the landing gear. After stabilized, record stick force necessary to maintain original airspeed.	2 - 12 lbs (0.88 - 5.3 daN) of force (Push).
2.b.5.	Longitudinal trim.	Must be able to trim longitudinal stick force to "zero" in each of the following configurations: cruise; approach; and landing.
2.c.7.	Longitudinal static stability.	Must exhibit positive static stability.
2.c.8.	Stall warning (actuation of stall warning device) with nominal gross weight; wings level; and a deceleration rate of approximately one (1) knot per second.	If installed and working correctly.
	a) Landing configuration:	80 - 100 knots; ± 5° of bank.
	b) Clean configuration:	Landing configuration speed + 10 - 20 percent.
2.c.8.b.	Phugoid dynamics.	Must have a phugoid with a period of 30 - 60 seconds. May not reach ½ or double amplitude in less than 2 cycles.
2.d.	**Lateral Directional Tests.**	
2.d.2.	Roll response. Roll rate must be measured through at least 30 degrees of roll. Aileron control must be deflected approximately 1/3 (33.3 percent) of maximum travel.	Must have a roll rate of 4 - 25 degrees/second.
2.d.4.b.	Spiral stability. Cruise configuration and normal cruise airspeed. Establish a 20 - 30 degree bank. When stabilized, neutralize the aileron control and release. Must be completed in both directions of turn.	Initial bank angle (± 5 degrees) after 20 seconds.
2.d.6.b.	Rudder response. Use approximately 25 percent of maximum rudder deflection. (Applicable to approach or landing configuration.)	3 - 6 degrees/second yaw rate.
2.d.7.	Dutch roll, yaw damper off.	A period of 2 - 5 seconds; and ½ - 2 cycles.

Table B2E

Alternative Data Source for FTD Level 5		
Multi-Engine (Turbo-Propeller) Airplane		
<<< QPS Requirement >>>		
Applicable Test		Authorized Performance Range
Number	**Title and Procedure**	
	(Applicable to cruise and approach configurations.)	
2.d.8.	Steady state sideslip. Use 50 percent rudder deflection. (Applicable to approach and landing configurations.)	2 - 10 degrees of bank; 4 - 10 degrees of sideslip; and 2 -10 degrees of aileron.
6.	**FTD System Response Time.**	
6.a.	Cockpit instrument systems response to an abrupt pilot controller input. One test is required in each axis (pitch, roll, yaw).	300 milliseconds or less.

6. Alternative Data Sources, Procedures, and Instrumentation: Level 6 FTD Only

Begin Information

a. In recent years, considerable progress has been made by highly experienced aircraft and FTD manufacturers in improvement of aerodynamic modeling techniques. In conjunction with increased accessibility to very high powered computer technology, these techniques have become quite sophisticated. Additionally, those who have demonstrated success in combining these modeling techniques with minimal flight testing have incorporated the use of highly mature flight controls models and have had extensive experience in comparing the output of their effort with actual flight test data - and they have been able to do so on an iterative basis over a period of years.

b. It has become standard practice for experienced FTD manufacturers to use such techniques as a means of establishing data bases for new FTD configurations while awaiting the availability of actual flight test data; and then comparing this new data with the newly available flight test data. The results of such comparisons have, as reported by some recognized and experienced simulation experts, become increasingly consistent and indicate that these techniques, applied with appropriate experience, are becoming dependably accurate for the development of aerodynamic models for use in Level 6 FTDs.

c. In reviewing this history, the NSPM has concluded that, with proper care, those who are experienced in the development of aerodynamic models for FTD application can successfully use these modeling techniques to acceptably alter the method by which flight test data may be acquired and, when applied to Level 6 FTDs, does not compromise the quality of that simulation.

d. The information in the table that follows (Table of Alternative Data Sources, Procedures, and Information: Level 6 FTD Only) is presented to describe an acceptable alternative to data sources for Level 6 FTD modeling and validation and as an acceptable alternative to the procedures and instrumentation found in the traditionally accepted flight test methods used to gather such modeling and validation data.
(1) Alternative data sources which may be used for part or all of a data requirement are the Airplane Maintenance Manual, the Airplane Flight Manual (AFM), Airplane Design Data, the Type Inspection Report (TIR), Certification Data or acceptable supplemental flight test data.
(2) The NSPM recommends that use of the alternative instrumentation noted in the following Table be coordinated with the NSPM prior to employment in a flight test or data gathering effort.

e. The NSPM position regarding the use of these alternative data sources, procedures, and instrumentation is based on two primary preconditions and presumptions regarding the objective data and FTD aerodynamic program modeling.

(1) Data gathered through the alternative means does not require angle of attack (AOA) measurements or control surface position measurements for any flight test:

(a) AOA can be sufficiently derived if the flight test program insures the collection of acceptable level, unaccelerated, trimmed flight data. Any of the FTD time history tests that begin in level, unaccelerated, and trimmed flight, including the three basic trim tests and "fly-by" trims, can be a successful validation of angle of attack by comparison with flight test pitch angle; and

(b) Surface position measurements do not have to be gathered during flight test when a rigorously defined and fully mature simulation controls system model, that includes accurate gearing and cable stretch characteristics (where applicable), is developed from actual aircraft measurements and used in the simulation.

(2) The authorized uses of Level 6 FTDs (as listed in the appropriate Commercial, Instrument, or Airline Transport Pilot and/or Type Rating Practical Test Standards) for "initial," "transition," or "upgrade" training, still requires additional flight training and/or flight testing/checking in the airplane or in a Level C or Level D simulator.

f. This table is not applicable to Computer Controlled Aircraft FTDs.

g. Utilization of these alternate data sources, procedures, and instrumentation does not relieve the sponsor from compliance with the balance of the information contained in this document relative to Level 6 FTDs.

h. When the term, "inertial measurement system" is used in the following table, this is meant to include the use of a functional global positioning system (GPS).

End Information

Table B2F

Alternative Data Sources, Procedures, and Instrumentation Level 6 FTD		
Information		
Objective Test Reference Number and Title	**Alternative Data Sources, Procedures, and Instrumentation**	**Notes and Reminders**
1.b.1. Performance. Takeoff. Ground acceleration time.	Data may be acquired through a synchronized video recording of a stop watch and the calibrated airplane airspeed indicator. Hand-record the flight conditions and airplane configuration.	This test is required only if RTO is sought.
1.b.7. Performance. Takeoff. Rejected takeoff.	Data may be acquired through a synchronized video recording of a stop watch and the calibrated airplane airspeed indicator. Hand-record the flight conditions and airplane configuration.	This test is required only if RTO is sought.
1.c.1. Performance. Climb. Normal climb all engines operating..	Data may be acquired with a synchronized video of: calibrated airplane instruments and engine power throughout the climb range.	
1.f.1. Performance. Engines. Acceleration	Data may be acquired with a synchronized video recording of engine instruments and throttle position.	
1.f.2. Performance. Engines. Deceleration	Data may be acquired with a synchronized video recording of engine instruments and throttle position.	
2.a.1.a. Handling qualities. Static control tests. Pitch controller position vs. force and surface position calibration	Surface position data may be acquired from flight data recorder (FDR) sensor or, if no FDR sensor, at selected, significant column positions (encompassing significant column position data points), acceptable to the NSPM, using a control surface protractor on the ground (for airplanes with reversible control systems, this function should be accomplished with winds less than 5 kt). Force data may be acquired by using a hand held force gauge at the same column position data points.	
2.a.2.a. Handling qualities. Static control tests. Wheel position vs. force and surface position calibration.	Surface position data may be acquired from flight data recorder (FDR) sensor or, if no FDR sensor, at selected, significant column positions (encompassing significant column position data points), acceptable to the	

Table B2F

Alternative Data Sources, Procedures, and Instrumentation Level 6 FTD		
Information		
Objective Test Reference Number and Title	**Alternative Data Sources, Procedures, and Instrumentation**	**Notes and Reminders**
	NSPM, using a control surface protractor on the ground (for airplanes with reversible control systems, this function should be accomplished with winds less than 5 kt). Force data may be acquired by using a hand held force gauge at the same column position data points.	
2.a.3.a. Handling qualities. Static control tests. Rudder pedal position vs. force and surface position calibration.	Surface position data may be acquired from flight data recorder (FDR) sensor or, if no FDR sensor, at selected, significant column positions (encompassing significant column position data points), acceptable to the NSPM, using a control surface protractor on the ground (for airplanes with reversible control systems, this function should be accomplished with winds less than 5 kt). Force data may be acquired by using a hand held force gauge at the same column position data points.	
2.a.4. Handling qualities. Static control tests. Nosewheel steering force.	Breakout data may be acquired with a hand held force gauge. The remainder of the force to the stops may be calculated if the force gauge and a protractor are used to measure force after breakout for at least 25% of the total displacement capability.	
2.a.5. Handling qualities. Static control tests. Rudder pedal steering calibration.	Data may be acquired through the use of force pads on the rudder pedals and a pedal position measurement device, together with design data for nose wheel position.	
2.a.6. Handling qualities. Static control tests. Pitch trim indicator vs. surface position calibration.	Data may be acquired through calculations.	
2.a.8. Handling qualities. Static control tests. Alignment of power lever angle vs. selected engine parameter (e.g., EPR, N_1,	Data may be acquired through the use of a temporary throttle quadrant scale to document throttle position. Use a synchronized video to record steady state instrument readings or hand-record steady state engine performance	

Table B2F

Alternative Data Sources, Procedures, and Instrumentation **Level 6 FTD**		
Information		
Objective Test Reference Number and Title	**Alternative Data Sources, Procedures, and Instrumentation**	**Notes and Reminders**
Torque, etc.).	readings.	
2.a.9. Handling qualities. Static control tests. Brake pedal position vs. force.	Use of design or predicted data is acceptable. Data may be acquired by measuring deflection at "zero" and at "maximum."	
2.c.1. Handling qualities. Longitudinal control tests. Power change force.	Data may be acquired by using an inertial measurement system and a synchronized video of the calibrated airplane instruments, throttle position, and the force/position measurements of cockpit controls.	Power change dynamics test is acceptable using the same data acquisition methodology.
2.c.2. Handling qualities. Longitudinal control tests. Flap/slat change force.	Data may be acquired by using an inertial measurement system and a synchronized video of calibrated airplane instruments, flap/slat position, and the force/position measurements of cockpit controls.	Flap/slat change dynamics test is acceptable using the same data acquisition methodology.
2.c.4. Handling qualities. Longitudinal control tests. Gear change force.	Data may be acquired by using an inertial measurement system and a synchronized video of the calibrated airplane instruments, gear position, and the force/position measurements of cockpit controls.	Gear change dynamics test is acceptable using the same data acquisition methodology.
Handling qualities. Longitudinal control tests. Landing gear and flap/slat operating times.	May use design data, production flight test schedule, or maintenance specification, together with an SOC.	
2.c.5. Handling qualities. Longitudinal control tests. Longitudinal trim	Data may be acquired through use of an inertial measurement system and a synchronized video of: the cockpit controls position (previously calibrated to show related surface position) and the engine instrument readings.	
2.c.6. Handling qualities. Longitudinal control tests. Longitudinal maneuvering stability (stick force/g)	Data may be acquired through the use of an inertial measurement system and a synchronized video of the calibrated airplane instruments; a temporary, high resolution bank angle scale affixed to the attitude indicator; and a wheel and column force measurement indication.	
2.c.7. Handling qualities. Longitudinal control tests. Longitudinal static stability	Data may be acquired through the use of a synchronized video of the airplane flight instruments and a hand held force gauge.	

Table B2F

Alternative Data Sources, Procedures, and Instrumentation Level 6 FTD Information		
Objective Test Reference Number and Title	**Alternative Data Sources, Procedures, and Instrumentation**	**Notes and Reminders**
2.c.8. Handling qualities. Longitudinal control tests. Stall Warning (activation of stall warning device)	Data may be acquired through a synchronized video recording of a stop watch and the calibrated airplane airspeed indicator. Hand-record the flight conditions and airplane configuration.	Airspeeds may be cross checked with those in the TIR and AFM.
2.c.9.a. Handling qualities. Longitudinal control tests. Phugoid dynamics	Data may be acquired by using an inertial measurement system and a synchronized video of the calibrated airplane instruments and the force/position measurements of cockpit controls.	
2.c.10. Handling qualities. Longitudinal control tests. Short period dynamics.	Data may be acquired by using an inertial measurement system and a synchronized video of the calibrated airplane instruments and the force/position measurements of cockpit controls.	
2.c.11. Handling qualities. Longitudinal control tests. Gear and flap/slat operating times.	May use design data, production flight test schedule, or maintenance specification, together with an SOC.	
2.d.2. Handling qualities. Lateral directional tests. Roll response (rate)	Data may be acquired by using an inertial measurement system and a synchronized video of the calibrated airplane instruments and the force/position measurements of cockpit lateral controls.	
2.d.3. Handling qualities. Lateral directional tests. **(a)** Roll overshoot OR **(b)** Roll response to cockpit roll controller step input	Data may be acquired by using an inertial measurement system and a synchronized video of the calibrated airplane instruments and the force/position measurements of cockpit lateral controls.	
2.d.4. Handling qualities. Lateral directional tests. Spiral stability	Data may be acquired by using an inertial measurement system and a synchronized video of the calibrated airplane instruments; the force/position measurements of cockpit controls; and a stop watch.	
2.d.6.a. Handling qualities. Lateral directional tests.	Data may be acquired by using an inertial measurement system and a synchronized video of the calibrated	

Table B2F

Alternative Data Sources, Procedures, and Instrumentation Level 6 FTD		
Information		
Objective Test Reference Number and Title	**Alternative Data Sources, Procedures, and Instrumentation**	**Notes and Reminders**
Rudder response	airplane instruments; the force/position measurements of rudder pedals.	
2.d.7. Handling qualities. Lateral directional tests. Dutch roll, (yaw damper OFF)	Data may be acquired by using an inertial measurement system and a synchronized video of the calibrated airplane instruments and the force/position measurements of cockpit controls.	
2.d.8. Handling qualities. Lateral directional tests. Steady state sideslip	Data may be acquired by using an inertial measurement system and a synchronized video of the calibrated airplane instruments and the force/position measurements of cockpit controls.	

Attachment 3 to Appendix B to Part 60--
FLIGHT TRAINING DEVICE (FTD) SUBJECTIVE EVALUATION

1. DISCUSSION.

Begin Information

a. The subjective tests provide a basis for evaluating the capability of the FTD to perform over a typical utilization period; determining that the FTD competently simulates each required maneuver, procedure, or task; and verifying correct operation of the FTD controls, instruments, and systems. The items listed in the Table of Functions and Subjective Tests are for FTD evaluation purposes only. They must not be used to limit or exceed the authorizations for use of a given level of FTD as described on the Statement of Qualification or as may be approved by the TPAA. All items in the following paragraphs are subject to an examination.

b. The Table of Functions and Subjective Tests in this attachment addresses pilot functions, including maneuvers and procedures (called flight tasks), and is divided by flight phases. The performance of these tasks by the NSPM includes an operational examination of special effects and any installed visual system. There are flight tasks included to address some features of advanced technology airplanes and innovative training programs. For example, "high angle-of-attack maneuvering" is included to provide a required alternative to "approach to stalls" for airplanes employing flight envelope protection functions.

c. The Table of Functions and Subjective Tests in this attachment addresses the overall function and control of the FTD including the various simulated environmental conditions; simulated airplane system operation (normal, abnormal, and emergency); and visual system displays and special effects (if either are applicable) that are used to meet flightcrew training, evaluation, or flight experience requirements.

d. All simulated airplane systems functions will be assessed for normal and, where appropriate, alternate operations. Normal, abnormal, and emergency operations associated with a flight phase will be assessed during the evaluation of flight tasks or events within that flight phase. Simulated airplane systems are listed separately under "Any Flight Phase" to ensure appropriate attention to systems checks. Operational navigation systems (including inertial navigation systems, global positioning systems, or other long-range systems) and the associated electronic display systems will be evaluated if installed. The NSP pilot will include in his report to the TPAA, the effect of the system operation and any system limitation.

e. At the request of the TPAA, the NSP Pilot may assess the FTD for a special aspect of a sponsor's training program during the functions and subjective portion of an evaluation. Such an assessment may include a portion of a Line Oriented Flight Training (LOFT) scenario or special emphasis items in the sponsor's training program. Unless directly related to a requirement for the qualification level, the results of such an evaluation would not affect the qualification of the FTD.

End Information

Table B3A

Table of Functions and Subjective Tests Level 6 FTD	
<<< QPS Requirements >>>	
Number	Operations Tasks

Tasks in this table are subject to evaluation if appropriate for the airplane system or systems simulated as indicated in the SOQ Configuration List as defined in App B, Att 2 of this part.	
1.	**Preflight.** Accomplish a functions check of all installed switches, indicators, systems, and equipment at all crewmembers' and instructors' stations, and determine that the cockpit (or flight deck area) design and functions replicate the appropriate airplane.
2.	**Surface Operations (pre-takeoff).**
2.a.	Engine start:
2.a.1.	Normal start.
2.a.2.	Alternative procedures start.
2.a.3.	Abnormal procedures start / shut down.
2.b.	Pushback / Powerback (powerback requires visual system).
3.	**Takeoff** (requires appropriate visual system as set out in Appendix B, Attachment 1, Table B1A, item 6.b.).
3.a.	Instrument takeoff:
3.a.1	Engine checks (e.g., engine parameter relationships, propeller/mixture controls, etc.).
3.a.2.	Acceleration characteristics.
3.a.3.	Nosewheel / rudder steering.
3.a.4.	Landing gear, wing flap, leading edge device operation.
3.b.	Rejected takeoff
3.b.1.	Deceleration characteristics.
3.b.2.	Brakes / engine reverser / ground spoiler operation.
3.b.3.	Nosewheel / rudder steering.
4.	**In-Flight Operations.**
4.a.	Normal climb.
4.b.	Cruise:
4.b.1.	Demonstration of performance characteristics (speed vs. power).
4.b.2.	Normal turns
4.b.3.	Demonstration of high altitude handling.
4.b.4.	Demonstration of high airspeed handling / overspeed warning.
4.b.5.	Demonstration of Mach effects on control and trim.
4.b.6.	Steep turns.

Table B3A

Table of Functions and Subjective Tests Level 6 FTD	
<<< QPS Requirements >>>	
Number	Operations Tasks
4.b.10.	In-Flight engine shutdown (procedures only).
4.b.11.	In-Flight engine restart (procedures only).
4.b.13.	Specific flight characteristics (as described by the airplane Flight Standardization Board).
4.b.14.	Response to loss of flight control power.
4.b.15.	Response to other flight control system failure modes.
4.b.19.	Operations during icing conditions.
4.b.20.	Effects of airframe / engine icing.
4.c	Other flight phase
4.c.1	Approach to stalls in the following configurations:
4.c.1.a.	Cruise.
4.c.1.b.	Takeoff or approach.
4.c.1.c.	Landing.
4.c.2.	High angle of attack maneuvers in the following configurations:
4.c.2.a.	Cruise.
4.c.2.b.	Takeoff or approach.
4.c.2.c.	Landing.
4.c.3	Slow flight.
4.c.4	Holding.
5.a.1.	Non-precision Instrument Approaches:
5.a.1.a.1.	With use of autopilot and autothrottle, as applicable.
5.a.1.a.2.	Without use of autopilot and autothrottle, as applicable.
5.a.1.b.1.	With 10 knot tail wind.
5.a.1.b.2.	With 10 knot crosswind.
5.a.2.	Precision Instrument Approaches:
5.a.2.a.1.	With use of autopilot, autothrottle, and autoland, as applicable.
5.a.2.a.2.	Without use of autopilot, autothrottle, and autoland, as applicable.
5.a.2.b.1	With 10 knot tail wind.
5.a.2.b.2	With 10 knot crosswind.
6.	**Missed Approach.**
6.a.	Manually controlled.

Table B3A

Table of Functions and Subjective Tests Level 6 FTD	
<<< QPS Requirements >>>	
Number	Operations Tasks
6.b.	Automatically controlled (if applicable).
7.	**Any Flight Phase, as appropriate**
7.a.	Normal system operation (installed systems)
7.b.	Abnormal/Emergency system operation (installed systems)
7.c.	Flap operation.
7.d.	Landing gear operation.
8.	**Instructor Operating Station (IOS), as appropriate.** *Functions in this section are subject to evaluation only if appropriate for the airplane and/or installed on the specific FTD involved.*
8.a.	Power Switch(es).
8.b.	Airplane conditions.
8.b.1.	Gross weight, center of gravity, fuel loading and allocation, etc
8.b.2.	Airplane systems status.
8.b.3.	Ground crew functions (e.g., ext. power, push back, etc.)
8.c.	Airports.
8.c.1.	Selection.
8.c.2.	Runway selection.
8.c.3.	Preset positions (e.g. ramp, over FAF, etc.)
8.d.	Environmental controls.
8.d.1.	Temperature.
8.d.2.	Climate conditions (e.g., ice, rain, etc.).
8.d.3.	Wind speed and direction.
8.e.	Airplane system malfunctions.
8.e.1.	Insertion / deletion.
8.e.2.	Problem clear.
8.f.	Locks, Freezes, and Repositioning.
8.f.1.	Problem (all) freeze / release.
8.f.2.	Position (geographic) freeze / release.
8.f.3.	Repositioning (locations, freezes, and releases).
8.f.4.	Ground speed control.
9	**Sound Controls. On / off / adjustment**

Table B3A

Table of Functions and Subjective Tests Level 6 FTD	
<<< QPS Requirements >>>	
Number	Operations Tasks
10.	**Control Loading System (as applicable)** On / off / emergency stop.
11.	**Observer Stations.**
11.a	Position.
11.b.	Adjustments.

Table B3B

Table of Functions and Subjective Tests Level 5 FTD	
<<< QPS Requirements >>>	
Number	Operations Tasks

Tasks in this table are subject to evaluation if appropriate for the airplane system or systems simulated as indicated in the SOQ Configuration List as defined in App B, Att 2 of this part.	
1.	**Preflight.** Accomplish a functions check of all installed switches, indicators, systems, and equipment at all crewmembers' and instructors' stations, and determine that the cockpit (or flight deck area) design and functions replicate the appropriate airplane.
2.	**Surface Operations (pre-takeoff).**
2.a.	Engine start:
2.a.1.	Normal start.
2.a.2.	Alternative procedures start.
2.a.3.	Abnormal/Emergency procedures start / shut down.
3.	**In-Flight Operations.**
3.a.	Normal climb.
3.b.	Cruise:
3.b.1.	Performance characteristics (speed vs. power).
3.b.2.	Normal turns.
3.c.	Normal descent.
4.	**Approaches.**
4.a.	Coupled instrument approach maneuvers (as applicable for the systems installed).
5.	**Any Flight Phase.**
5.a.	Normal system operation (Installed systems).
5.b.	Abnormal/Emergency system operation (installed systems).
5.c.	Flap operation
5.d.	Landing gear operation
6.	**Instructor Operating Station (IOS).**
6.a.	Power Switch(es).
6.b.	Preset positions – ground, air.
6.c.	Airplane system malfunctions (Installed systems).
6.c.1.	Insertion / deletion.
6.c.2.	Problem clear.

Table B3C

Table of Functions and Subjective Tests Level 4 FTD	
<<< QPS Requirements >>>	
Number	Operations Tasks

Tasks in this table are subject to evaluation if appropriate for the airplane system or systems simulated as indicated in the SOQ Configuration List as defined in App B, Att 2 of this part.	
1.	**Preflight.** Accomplish a functions check of all installed switches, indicators, systems, and equipment at all crewmembers' and instructors' stations, and determine that the cockpit (or flight deck area) design and functions replicate the appropriate airplane.
2.	**Surface Operations (pre-takeoff).**
2.a.	Engine start (if training credit sought):
2.a.1.	Normal start.
2.a.2.	Alternative procedures start.
2.a.3.	Abnormal/Emergency procedures start / shut down
3.	**Any Flight Phase.**
3.a.	Normal system operation (installed systems).
3.b.	Abnormal/Emergency system operation (installed systems).
4.	**Instructor Operating Station (IOS).**
4.a.	Power Switch(es).
4.b.	Preset positions – ground, air (logic switching only, if required by the installed system[s])
4.c.	Airplane system malfunctions (installed systems).
4.c.1.	Insertion / deletion.
4.c.2.	Problem clear.

Attachment 4 to Appendix B to Part 60--

SAMPLE DOCUMENTS
Begin Information

Table of Contents

Title of Sample

Attachment 4 to Appendix B to Part 60—
Figure B4A – Sample Letter , Request for Initial, Upgrade, or Reinstatement Evaluation..
INFORMATION

Edward Cook, PhD.
Manager, National Simulator Program
Federal Aviation Administration
P.O. Box 20636 (AFS-205)
Atlanta, GA 30320

Dear Dr. Cook:

RE: Request for Initial [Upgrade / Reinstatement] Evaluation

(Sponsor's name) ___________________ requests your evaluation of our (make, model, series) ________ airplane FTD for Level ______ qualification, located in (City/State) at the (Facility) on (proposed evaluation date). [The proposed evaluation date must not be more than 180 days following the date of this letter.] This FTD [has / has not] been previously qualified by the FAA [and had been issued FAA identification number XXX]. Under separate cover, we have asked our Principal Operations Inspector (POI) (Training Center Program Manager, TCPM), Mr./Ms.__________________(Name), to forward to you a letter concurring with this request.

[The history of this FTD is as follows: ____.]

We agree to provide a Qualification Test Guide (QTG) to your staff not later than 45 days prior to the proposed evaluation date [if tests not run at training site, an additional "1/3 on-site" tests must be provided not later than 14 days prior the proposed evaluation date]. If we are unable to meet the above date for the evaluation, this may result in a significant delay, perhaps 45 days or more, in rescheduling and completing the evaluation. With our forwarding the QTG, we acknowledge that the FTD meets all applicable requirements of Title 14 of the Code of Federal Regulation (14 CFR) Part 60; that it meets the requirements of the Airplane Flight Training Device Qualification Performance Standards (QPS); and that appropriate hardware and software configuration control procedures have been established.

We also agree to forward to you, not later than five (5) business days prior to the scheduled evaluation of this FTD, a confirmation statement that will include the following information:

1. That (a) pilot(s) we have designated, who is(are) qualified on the (make, model, series) _______ airplane, has(have) assessed the FTD and found that the performance and flying qualities of the FTD represent the (make, model, series) _______ airplane. This determination will be made after flying all the maneuvers and procedures and exercising the tasks listed in the Table of Functions and Subjective Tests in Attachment 3 to the Airplane FTD QPS (except for those listed in the attachment to this letter).

2. That (a) pilot(s), or (an)other person(s) we have designated, has(have) found the FTD systems and sub-systems (including simulated aircraft systems) functionally represent the (make, model, series) ________ airplane. This determination will be made after having exercised the operation of the FTD and the functions available through the Instructor Operating Station.

3. That, for type specific airplanes, (a) pilot(s), or (an)other person(s) we have designated, has(have) found the cockpit configuration represents the configuration of the (make, model, and series) ________ aircraft.

The names of the person(s) providing this information will be available to you upon your request.

[Added comments from Operator/Sponsor, if any]

Please contact (Name and Telephone Number of Sponsor's Contact) to confirm the date for this initial (upgrade / re-instatement) evaluation. We understand a member of your National Simulator Program staff will respond to this request within 14 days.

Sincerely,

(Signature –Management Representative)

Attachment 4 to Appendix B to Part 60—
Figure B4B – Sample Qualification Test Guide Cover Page
INFORMATION

SPONSOR NAME

SPONSOR ADDRESS

FAA QUALIFICATION TEST GUIDE

(SPECIFIC AIRPLANE MODEL)
for example
Stratos BA797-320A

(Type of FTD)

(FTD Identification Including Manufacturer, Serial Number, Visual System Used)

(FTD Level)

(Qualification Performanee Standard Used)

(FTD Location)

FAA Initial Evaluation

Date: ____________

______________________ Date: __________
(Sponsor)

______________________ Date: __________
Manager, National
Simulator Program, FAA

Attachment 4 to Appendix B to Part 60—
Figure B4C – Sample Simulator Information Page
INFORMATION

SPONSOR NAME	
SPONSOR SIMULATOR CODE:	BA-797 #1
AIRPLANE MODEL:	Stratos BA797-320A
AERODYNAMIC DATA REVISION:	BA797-320, CPX-8D, January 1988
ENGINE MODEL(S) AND REVISION:	CPX-8D; RPT-6, January 1988 DRQ-4002, RPT-3, April 1991
FLIGHT CONTROLS DATA REVISION:	BA707-320; May 1988
FLIGHT MANAGEMENT SYSTEM:	Berry XP
FTD MODEL AND MANUFACTURER:	MTD-797, Tinker Simulators, Inc.
DATE OF FTD MANUFACTURE:	1988
FTD COMPUTER:	CIA
VISUAL SYSTEM MODEL, MANUFACTURER, and DISPLAY TYPE:	ClearView, Inc. "Real World T2;" 5 Channel, 6-window CRT display
VISUAL SYSTEM COMPUTER:	N/A
MOTION SYSTEM:	N/A

Information on this page must be updated and kept current with any modifications or changes made to the simulator and reflected on the log of revisions and the list of effective pages.

ATTACHMENT 4 TO APPENDIX A TO PART 60—
Figure B4D – Sample Statement of Qualification
INFORMATION

Federal Aviation Administration
National Simulator Program

Statement of Qualification

This is to certify that representatives of the National Simulator Program Completed an evaluation of the

Go-Fast Airlines
Farnsworth Z-100 Flight Training Device
FAA Identification Number 998

And found it to meet the standards set forth in
AC 120-45A

The Master Qualification Test Guide and the attached Configuration List and Restrictions List Provide the Qualification Basis for this device to operate at

Level 6
Until March 1, 2003

Unless sooner rescinded or extended by the National Simulator Program Manager

February 15, 2002	I. B. Checkin, Jr.
(date)	(for the NSPM)

ATTACHMENT 4 TO APPENDIX A TO PART 60—

Figure B4D1 – Sample Statement of Qualification; Configuration List

INFORMATION

STATEMENT of QUALIFICATION
CONFIGURATION LIST

Go Fast Airline Training -- Farnsworth Z-100 -- Level D -- FAA ID# 999

AIRPLANE CONFIGURATION		DATE QUALIFIED
Airplane(s):		
☐ Model	Z320-232	November, 1999
Engine(s)		
☐ Make/Model	Israeli Motors / SH001 Capitol Engines / WZ33B	November, 1999 November, 1999
Flight Management System:		
☐ Make/Model	Israeli Flight-Right CEC-123	November, 1999 November, 1999
Flight Instruments:		
☐ Electro-Mechanical	Standby Instruments	November, 1999
☐ Display (CRT, LCD, etc.)	CRT Flight Instruments	November, 1999
☐ Combination	No	
☐ Heads-Up Display	No	
Autopilot/Autoflight:		
☐ Make/Model	Precision Electronics / AB-123	November, 1999
Flight Director:		
☐ Single Cue	No	
☐ Dual Cue	King	November, 1999
Engine Instruments:		
☐ Electro-Mechanical	No	
☐ Display (CRT, LCD, etc.)	CRT	November, 1999
☐ Combination	No	
Navigation Type(s):		
☐ ADF	Yes	November, 1999
☐ VOR/ILS	Yes	November, 1999
☐ GPS	No	
☐ INS	No	
☐ IRS/ADIRU	Yes	November, 1999
☐ FANS	No	
Weather Radar:		
☐ Make/Type	Eastinghouse / X-band	November, 1999
Windshear Equipment:		
☐ Reactive	Eastinghouse	November, 1999
☐ Predictive	No	November, 1999
Other Equipment:		
☐ TCAS	Lookout, Inc.	October, 2000
☐ ACARS	Merryweather	November, 1999
☐ EGPWS	No	November, 1999
☐ SATCOM	No	
☐ CRM Video/Voice Recording	Yes	November, 1999

ATTACHMENT 4 TO APPENDIX B TO PART 60—

Figure B4D2 – Sample Statement of Qualification; Restrictions List

INFORMATION

STATEMENT of QUALIFICATION
RESTRICTIONS LIST

Go Fast Airline Training -- Farnsworth Z-100 -- Level D -- FAA ID# 999

The FSTD is qualified to perform all of the tasks listed in AC 120-45A, Appendix 3, for its assigned level of qualification *except* for the following listed tasks.

Non-Qualified Tasks*:

3.e(1)(i)	NDB approach
3.h(1)(v)	Electrical system, generator failure

*Numbers refer to AC120-45A, App 3 table of required tasks.

Attachment 4 to Appendix B to Part 60—
Figure B4E – Sample Continuing Qualification Evaluation Requirements Page Information

Recurrent Evaluation Requirements ***Completed at conclusion of Initial Evaluation***	
Recurrent Evaluations to be conducted each _(fill in)__ months Allotting ______ hours of FTD time. Signed: ______________________________ NSPM / Evaluation Team Leader	Recurrent evaluations are due as follows: _(month)__ and __(month)_ and __(month)_ (enter or strike out, as appropriate) ______________________ Date

Revision: Based on (enter reasoning):	
Recurrent Evaluations are to be conducted each _(fill in)__ months. Allotting ______ hours. Signed: ______________________________ NSPM Evaluation Team Leader	Recurrent evaluations are due as follows: _(month)__ and __(month)_ and __(month)_ (enter or strike out, as appropriate) ______________________ Date

Revision: Based on (enter reasoning):	
Recurrent Evaluations are to be conducted each _(fill in)__ months. Allotting ______ hours. Signed: ______________________________ NSPM Evaluation Team Leader	Recurrent evaluations are due as follows: _(month)__ and __(month)_ and __(month)_ (enter or strike out, as appropriate) ______________________ Date

(Repeat as Necessary)

Attachment 4 to Appendix B to Part 60—
Figure B4F – Sample MQTG Index of Effective FSTD Directives.

INFORMATION

Index of Effective FSTD Directives
Filed in this Section

Notification Number	Received From: (TPAA/NSPM)	Date of Notification	Date of Modification Completion

Continue as Necessary....

Appendix E to Part 60—Qualification Performance Standards for Quality Management Systems for Flight Simulation Training Devices

Begin QPS Requirements

a. Not later than [insert date 12 months after the effective date of the final rule] all current sponsors of FSTD's must submit to the NSPM a proposed Quality Management System (QMS) program as described in this QPS appendix. The NSPM will review the program in order of receipt and notify the sponsor within 90 days of beginning the review regarding the acceptability of the program including any required adjustments. Within 6 months of the notification of acceptability, the sponsor must implement the program, conduct internal assessment(s), make any required program adjustments as a result of any internal assessment, and have the NSPM initial assessment scheduled.

b. For first-time FSTD sponsors, not later than 120 days prior to the date scheduled for the initial FSTD evaluation, the sponsor must submit to the NSPM the proposed QMS program as described in this QPS appendix. The NSPM will review the program and notify the sponsor within 90 days of beginning the review regarding the acceptability of the program including any required adjustments. Within 6 months of the notification of acceptability, the sponsor must implement the program, conduct internal assessment(s), make any required program adjustments as a result of any internal assessment, and have the NSPM initial assessment scheduled.

c. When a person sponsors an FSTD maintained by a person other than a US certificate holder, the sponsor remains responsible for the QMS program for that FSTD; however –

(1) If that FSTD is maintained under a qualification by a non-FAA regulatory authority and that authority and the NSPM have agreed to accept each other's simulator evaluations (e.g., under a Bilateral Aviation Safety Agreement, BASA, and associated Simulator Implementation Procedures, SIP, such as the Joint Aviation Authorities, JAA, of Europe), no additional requirements must be met for QMS programs; or

(2) If that FSTD is maintained under qualification of a regulatory authority where there is no BASA/SIP as described in c(1), or that authority and the NSPM have not agreed to accept each other'squalification programs, the sponsor will be required to reach an agreement with the NSPM regarding those aspects of the sponsor's QMS program that may be met in this specific FSTD.

d. The Director of Operations for a Part 119 certificate holder, the Chief Instructor for a Part 141 certificate holder, or the equivalent for a Part 142 or Flight Engineer School sponsor, must designate a management representative who has the responsibility and authority to establish and modify the sponsor's policies, practices, and procedures regarding the QMS program for the recurring qualification of, and the day-to-day use of, each FSTD.

e. The minimum content required for an acceptable QMS is found in Table E1. The policies, processes, and/or procedures described in this table must be maintained in a QMS Manual and will serve as the basis for the following:

(1) The sponsor-conducted initial and on-going periodic assessments;

(2) The NSPM-conducted initial and on-going periodic assessments; and

(3) The continuing surveillance and analysis by the NSPM of the sponsor's performance and effectiveness in providing a satisfactory FSTD for use on a regular basis.

End QPS Requirements

Table E1.
Minimum Requirements for Satisfactory FSTD Quality Management System

Number	QPS Requirement	Information (Reference)
E.1.	A QMS manual that sets out the policies, processes, and/or procedures outlined in this table.	§ 60.5(a)
E.2.	A policy, process, and/or procedure specifying how the sponsor will identify deficiencies in the QMS.	§ 60.5(b)
E.3.	A policy, process, and/or procedure specifying how the sponsor will document how the QMS program will be changed to address deficiencies when found.	§ 60.5(b)
E.4.	A policy, process, and/or procedure specifying how the sponsor will address proposed program changes (for programs that do not meet the minimum requirements as notified by the NSPM) to the NSPM and receive approval prior to their implementation.	§ 60.5(c)
E.5.	A policy, process, and/or procedure specifying how the sponsor will document that at least one FSTD is used within the sponsor's FAA-approved flight training program for the aircraft or set of aircraft at least once within the 12-month period following the initial/upgrade evaluation conducted by the NSP and at least once within each subsequent 12-month period thereafter.	§ 60. 7(b)(5)
E.6.	A policy, process, and/or procedure specifying how the sponsor will document that at least one FSTD is used within the sponsor's FAA-approved flight training program for the aircraft or set of aircraft at least once within the 12-month period following the first continuing qualification evaluation conducted by the NSP and at least once within each subsequent 12-month period thereafter.	§ 60.7(b)(6)
E.7.	A policy, process, and/or procedure specifying how the sponsor will obtain an annual written statement from a qualified pilot (after having flown the subject aircraft or set of aircrafl during the preceding 12-month period) that the performance and handling qualities of the subject FSTD represents the subject aircraft or set of aircraft (within the normal operating envelope). Required only if the subject FSTD is not used in the sponsor's FAA-approved flight training program for the aircraft or set of aircraft at least once within the preceding 12-month period.	§ 60.5(b)(7) and § 60.7(d)(2)
E.8.	A policy, process, and/or procedure specifying how independent feedback (from persons recently completing training, evaluation, or obtaining flight experience; instructors and check airmen using the FSTD for training, evaluation or flight experience sessions; and FSTD technicians and maintenance personnel) will be received and addressed by the sponsor regarding the FSTD and its operation.	§ 60.9(b)(1)
E.9.	A policy, process, and/or procedure specifying how and where the FSTD Statement of Qualification will be posted, or accessed by an appropriate terminal or display, in or adjacent to the FSTD.	§ 60.9(b)(2)
E.10.	A policy, process, and/or procedure specifying how the sponsor's management representative (MR) is selected and identified by name to the NSPM.	§ 60.9(c) and Appendix E, paragraph(d)
E.11.	A policy, process, and/or procedure specifying the MR authority and responsibility for the following:	
E.11.a.	Monitoring the on-going qualification of assigned FSTD's to ensure all matters regarding FSTD qualification are being carried out as provided for in 14CFR part 60	

Table E1.
Minimum Requirements for Satisfactory FSTD Quality Management System

Number	QPS Requirement	Information (Reference)
E.11.b.	Ensuring that the QMS is properly established, implemented, and maintained by overseeing the QMS policies, practices, and/or procedures and by and modifying when and where necessary.	§ 60.9(c)(2), (3), and (4).
E.11.c.	Regularly briefing sponsor's management on the status of the on-going FSTD qualification program and the effectiveness and efficiency of the QMS.	
E.11.d.	Serving as the primary contact point for all matters between the sponsor and the NSPM regarding the qualification of assigned FSTD's.	
E.11.e.	Delegating the MR assigned duties to an individual at each of the sponsor's locations, when/if/where appropriate.	
E.12.	A policy, process, and/or procedure specifying how the sponsor will:	
E.12.a.	Ensure that the data made available to the NSPM (the validation data package) includes the aircraft manufacturer's flight test data (or other data approved by the NSPM) and all relevant data developed after the type certificate was issued (e.g., data developed in response to an airworthiness directive) if such data results from a change in performance, handling qualities, functions, or other characteristics of the aircraft that must be considered for flightcrew member training, evaluation, or for meeting experience requirements of this chapter;	§ 60.13(a), (b), and (c). QPS Appendices A, B, C, and D.
E.12.b.	Immediately notify the NSPM when an addition to or a revision of the flight related data or airplane systems related data is available if this data is used to program and/or operate a qualified FFS, including technical information about this data to the NSPM relative to the data's significance for training, evaluation, or flight experience activities in the FFS; and	
E.12.c.	Maintain a liaison with the manufacturer of the aircraft being simulated (or with the holder of the aircraft type certificate for the aircraft being simulated if the manufacturer is no longer in business), and/or, if appropriate, with the person having supplied the aircraft data package for the FFS for the purposes of receiving notification of data package changes.	
E.13.	A policy, process, and/or procedure specifying how the sponsor will make available all special equipment and qualified personnel needed to accomplish or assist in the accomplishment of tests during initial, continuing qualification, or special evaluations.	§ 60.14
E.14.	A policy, process, and/or procedure specifying how the sponsor will submit to the NSPM a request to evaluate the FSTD for initial qualification at a specific level and simultaneously request the TPAA forward a concurring letter to the NSPM; including how the MR will use qualified personnel to confirm the following:	
E.14.a.	That the performance and handling qualities of the FSTD represents those of the aircraft or set of aircraft within the normal operating envelope;	§ 60.15(a)-(d); § 60.15(b);
E.14.b.	The FSTD systems and sub-systems (including the simulated aircraft systems) functionally represent those in the aircraft or set of aircraft; and	§ 60.15(b)(i); § 60.15(b)(ii);

Table E1.
Minimum Requirements for Satisfactory FSTD Quality Management System

Number	QPS Requirement	Information (Reference)
E.14.c.	The cockpit represents the configuration of the specific type; or aircraft make, model, and series aircraft being simulated, as appropriate.	§ 60.15(b)(iii).
E.15.	A policy, process, and/or procedure specifying how, for an initial evaluation, all of the subjective tests and all of the objective tests are accomplished at the sponsor's training facility, except as provided for in the appropriate QPS.	§ 60.15(e).
E.16.	A policy, process, and/or procedure specifying how, after the NSPM completes the evaluation for initial qualification, the sponsor will update the QTG with the results of the FAA-witnessed tests and demonstrations together with the results of all the objective tests and demonstrations described in the appropriate QPS.	§ 60.15(h).
E.17.	A policy, process, and/or procedure specifying how the sponsor will make the MQTG available to the NSPM upon request.	§ 60.15(i).
E.18.	A policy, process, and/or procedure specifying how the sponsor will apply to the NSPM to add (an) additional qualification(s) to the Statement of Qualification.	§ 60.16(a); § 60.16(a)(1)(i); and § 60.16(a)(1)(ii).
E.19.	A policy, process, and/or procedure specifying how the sponsor accomplishes all appropriate QPS Attachment 2 objective tests each year in a minimum of four evenly spaced inspections as specified in the appropriate QPS.	§ 60.19(a)(1) QPS Appendices A, B, C, or D.
E.20.	A policy, process, and/or procedure specifying how the sponsor completes and records a functional preflight check of the FSTD within the preceding 24 hours of FSTD use, including a description of the functional preflight.	§ 60.19(a)(2) QPS Appendices A, B, C, or D.
E.21.	A policy, process, and/or procedure specifying how the sponsor schedules with the NSPM continuing qualification evaluations not later than 60 days before the evaluation is due.	§ 60.19(b)(2)
E.22.	A policy, process, and/or procedure specifying how the sponsor ensures that the FSTD has received a continuing qualification evaluation at the interval as described in the respective MQTG, allowing for the 1-month grace period before or after the calendar month required.	§ 60.19(b)(5)-(6)
E.23.	A policy, process, and/or procedure describing that when a discrepancy is discovered the following is recorded in the FSTD discrepancy log:	
E.23.a.	A description of each discrepancy is entered and remains in the log until the discrepancy is corrected; and	§ 60.19(c); § 60.19(c)(2)(i); § 60.19(c)(2)(ii).
E.23.b.	A description of the corrective action taken for each discrepancy, the identity of the individual taking the action, and the date that action is taken.	
E.24.	A policy, process, and/or procedure specifying how the discrepancy log is kept in a form and manner acceptable to the Administrator and is kept in or adjacent to the FSTD. (An electronic log that may be accessed by an appropriate terminal or display in or adjacent to the FSTD is satisfactory.)	§ 60.19(c)(2)(iii)

Table E1.
Minimum Requirements for Satisfactory FSTD Quality Management System

Number	QPS Requirement	Information (Reference)
E.25.	A policy, process, and/or procedure that requires each instructor, check airman, or representative of the Administrator conducting training, evaluation, or flight experience, and each person conducting the preflight inspection, who discovers a discrepancy, including any missing, malfunctioning, or inoperative components in the FSTD, to write or cause to be written a description of that discrepancy into the discrepancy log at the end of the FSTD preflight or FSTD use session.	§ 60.20
E.26.	A policy, process, and/or procedure specifying how the sponsor will (if operating an FSTD based on an interim qualification), within twelve months of the release of the final aircraft data package by the aircraft manufacturer (but no later than two years after the issuance of the interim qualification status the sponsor) apply for initial qualification based on the final aircraft data package approved by the aircraft manufacturer.	§ 60.21(c)
E.27.	A policy, process, and/or procedure specifying how the sponsor determines whether an FSTD change qualifies as a modification as described in 14CFR part 60.	§ 60.23(a)(1)-(2)
E.28.	A policy, process, and/or procedure specifying how the sponsor will ensure the FSTD is modified in accordance with any FSTD Directive regardless of the original qualification basis.	§ 60.23(b)
E.29.	A policy, process, and/or procedure specifying how, if an FSTD change is determined to be a modification as defined in 14CRF part 60, the sponsor will notify the NSPM and TPAA of their intent to use the modified FSTD and to ensure that the modified FSTD will not be used prior to:	
E.29.a.	Twenty-one days since the sponsor notified the NSPM and the TPAA of the proposed modification and the sponsor has not received any response from either the NSPM or the TPAA; or	§ 60.23(c)(1)(i),(ii), and (iv)
E.29.b.	Twenty-one days since the sponsor notified the NSPM and the TPAA of the proposed modification and one has approved the proposed modification and the other has not responded; or	
E.29.c.	The FSTD successfully completing any evaluation the NSPM may require in accordance with the standards for an evaluation for initial qualification or any part thereof before the modified FSTD is placed in service.	
E.30	A policy, process, and/or procedure specifying how, after a FSTD modification is approved by the NSPM, the sponsor will:	
E.30.a.	Post an addendum to the Statement of Qualification until such time as a permanent, updated statement is received from the NSPM and posted;	§ 60.23(d)-(e)
E.30.b.	Update the MQTG with current objective test results and appropriate objective data for each affected objective test or other MQTG section that is affected by the modification; and	
E.30.c.	File in the MQTG the direction to make the modification and the record of the modification completion.	
E.31.	A policy, process, and/or procedure specifying how the sponsor will track the length of time a component has been missing, malfunctioning, or inoperative (MMI), including:	
E.31.a.	How the sponsor will post a list of MMI components in or adjacent to the FSTD; and	§ 60.25(b)-(c), and

Table E1.
Minimum Requirements for Satisfactory FSTD Quality Management System

Number	QPS Requirement	Information (Reference)
E.31.b.	How the sponsor will notify the NSPM if the MMI has not been repaired or replaced within 30 days. (*Please see Note 1 at the end of this table.)	QPS Appendices A, B, C, or D.
E.32.	A policy, process, and/or procedure specifying how the sponsor will notify the NSPM and how the sponsor will seek requalification of the FSTD if the FSTD is moved and reinstalled in a different location.	§ 60.27(a)(3)
E.33.	A policy, process, and/or procedure specifying how the sponsor will maintain control of the following: [The sponsor must specify how these records are maintained in plain language form or in coded form; but if the coded form is used, the sponsor must specify how the preservation and retrieval of information will be conducted.]	
E.33.a.	The MQTG and each amendment thereto;	§ 60.31
E.33.b.	A record of all FSTD modifications required by this part since the issuance of the original Statement of Qualification;	
E.33.c.	Results of the qualification evaluations (initial and each upgrade) since the issuance of the original Statement of Qualification;	
E.33.d.	Results of the objective tests conducted in accordance with this part for a period of 2 years;	
E.33.e.	Results of the previous three continuing qualification evaluations, or the continuing qualification evaluations from the previous 2 years, whichever covers a longer period;	
E.334.f.	Comments obtained in accordance with Section 60.9(b);	
E.33.g.	A record of all discrepancies entered in the discrepancy log over the previous 2 years, including the following:	
E.33.g.1.	A list of the components or equipment that were or are missing, malfunctioning, or inoperative;	
E.33.g.2.	The action taken to correct the discrepancy;	
E.33.g.3.	The date the corrective action was taken; and	
E.33.g.4.	The identity of the person determining that the discrepancy has been corrected.	

*Note 1: If the sponsor has an approved discrepancy prioritization system, item E.31.b. is satisfied by describing how discrepancies are prioritized, describe what actions are taken, and how the sponsor will notify the NSPM if the MMI has not been repaired or replaced within the specified timeframe.

Begin Information

f. Table E2 contains a sample Assessment Tool that will be used by the NSPM when conducting the desk assessment of a sponsor's request for initial evaluation of the required elements of a QMS program.

g. Table E3 contains a sample Assessment Tool that will be used by the NSPM when conducting the on-site practical evaluation of a sponsor's request for initial and continuing evaluation of the required elements of a QMS program.

h. Table E4 contains a sample Assessment Tool that will be used by the NSPM when conducting the desk assessment of a sponsor's request for initial evaluation of the voluntary elements of a QMS program.

i. Table E5 contains a sample Assessment Tool that will be used by the NSPM when conducting the on-site practical evaluation of a sponsor's request for initial and continuing evaluation of the voluntary elements of a QMS program.

j. Additional Information.

(1) In addition to specifically designated QMS evaluations, the NSPM will evaluate the sponsor's QMS program as part of regularly scheduled FSTD continuing qualification evaluations and no-notice FSTD evaluations, focusing in part on the effectiveness and viability of the QMS program and its contribution to the overall capability of the FSTD to meet the requirements of 14CFR part 60.

(2) The sponsor, through the MR, may delegate duties associated with maintaining the qualification of the FSTD (e.g., corrective and preventive maintenance, scheduling for and the conducting of tests and/or inspections, functional preflight checks, etc.) but retains the responsibility and authority for the day-to-day qualification and quality of the FSTD. One person may serve in this capacity for more than one FSTD, but one FSTD would not have more than one person serving in this capacity.

(3) The QMS requirements should not be read to preclude a given QMS program from being applicable to more than one certificate holder (e.g., part 119 and part 142 or two part 119 certificate holders) and should not be read to preclude an individual from being a Management Representative (MR) for more than one certificate holder (e.g., part 119 and part 142 or two part 119 certificate holders) as long as the other QMS program requirements and/or the other MR requirements are respectively met for each such certificate holder.

(4) The NSPM may conditionally approve a QMS program, on a temporary basis, under appropriate circumstances (e.g., meaningful progress being made, management completely committed, adequate resources appropriated, etc.) even though additional work might be necessary to develop the QMS program to the point that it would meet the requirements of part 60.

(5) Sources of Training: Quality management courses are available from various national or international standards institutions, and an FSTD sponsor must consider whether to offer such courses to those likely to be involved in the management of QMS programs. FSTD sponsors with sufficient appropriately qualified staff must consider whether to carry out in-house training.

(6) Standard Measurements for Flight Simulator Quality: A QMS system tied to measurement of FSTD performance will probably lead to improving and maintaining training quality. One acceptable means of measuring FSTD performance is as defined and agreed by

industry in ARINC report 433 (as amended) entitled "Standard Measurements for Flight Simulator Quality."

(7) The NSPM will use the results of the assessment(s) of the voluntary portions of the QMS program (as described in Tables E4 and E5) to assist in determining whether or not a given sponsor or a given FSTD (or set of FSTDs) may have the interval between NSPM-conducted evaluations extended and what any such interval extension might be.

k. While the FAA does not mandate any specific QMS program format, the following subparagraphs outline those points that would be found in a typically acceptable QMS program.

- (1) Establishment of a Quality Policy. This is a formal written Quality Policy Statement that is a commitment by the sponsor, as represented by the Management Representative (MR) outlining what the QMS System is intended to achieve.
- (2) The selected MR should be someone who, by virtue of his position, has overall authority and responsibility for monitoring the on-going qualification of assigned FSTD's to ensure that all matters regarding FSTD qualification are being carried out as provided for in 14CFR part 60 and ensuring that the QMS program is properly established, implemented, and maintained by overseeing the structure (and modifying where necessary) of the QMS program. The MR should regularly:
  - (a) Brief the sponsor's management regarding the status of on-going qualification processes; and
  - (b) Serve as the primary contact point for all matters between the sponsor and the NSPM regarding the qualification of the assigned FSTDs.
  - (c) Oversee the day-to-day control of quality.
- (3) The system utilized (the "Quality System") should enable the sponsor to monitor compliance with 14CFR part 60, and any other standards specified by sponsor, to ensure correct maintenance and performance of the FSTD.
- (4) A QMS program, together with a statement acknowledging completion of a periodic review by the MR, should include the following:
  - (a) A maintenance facility which provides suitable FSTD hardware and software test and maintenance capability.
  - (b) A recording system in the form of a technical log in which defects, deferred defects, and development works are listed, interpreted, assigned and reviewed within a specified time scale.
  - (c) Planned routine maintenance of the FSTD and periodic running of the QTG tests with adequate manning to cover FSTD operating periods and routine maintenance work.
  - (d) A planned internal assessment schedule and a periodic review should be used to verify that corrective action was carried out and that it was effective. The assessor should have adequate knowledge of FSTDs and should be acceptable to the NSPM.
- (5) The MR should receive appropriate QMS System training and brief other personnel on the procedures.

End Information

Table E2. - Information

Element Number	Assessment Tool – INITIAL (Desk) Elements Does the sponsor have:	Rating See Element Assessment Table N	P	Y	Comments
E2.1.	A QMS program approved by the NSPM including a QMS manual that sets out the policies, processes, and/or procedures required by 14CFR part 60 and Part 60, Appendix E?				
E2.2.	A policy, process, and/or procedure specifying how the sponsor will identify deficiencies in the QMS?				
E2.3.	A policy, process, and/or procedure specifying how the sponsor will document how the QMS program will be changed to address deficiencies when found?				
E2.4.	A policy, process, and/or procedure specifying how the sponsor will propose program changes to the NSPM and receive approval prior to their implementation?				
E2.5.	A policy, process, and/or procedure specifying how the sponsor will document that at least one FSTD is used within the sponsor's FAA-approved flight training program for the aircraft or set of aircraft at least once within the 12-month period following the initial/upgrade evaluation conducted by the NSP and at least once within each subsequent 12-month period thereafter?				
E2.6.	A policy, process, and/or procedure specifying how the sponsor will document that at least one FSTD is used within the sponsor's FAA-approved flight training program for the aircraft or set of aircraft at least once within the 12-month period following the first continuing qualification evaluation conducted by the NSP and at least once within each subsequent 12-month period thereafter?				
E.7.	A policy, process, and/or procedure specifying how the sponsor will obtain an annual written statement from a qualified pilot (after having flown the subject aircraft or set of aircraft during the preceding 12-month period) that the performance and handling qualities of the subject FSTD represents the subject aircraft or set of aircraft (within the normal operating envelope). Required only if the subject FSTD is not used in the sponsor's FAA-approved flight training program for the aircraft or set of aircraft at least once within the preceding 12-month period?				
E.8.	A policy, process, and/or procedure specifying how written comments will be received by the sponsor regarding the FSTD and its operation?				
E.9.	A policy, process, and/or procedure specifying how and where the FSTD Statement of Qualification will be posted, or accessed by an appropriate terminal or display, in or adjacent to the FSTD?				
E.10.	A policy, process, and/or procedure specifying how the sponsor's management representative (MR) is selected and identified by name to the NSPM?				
E.11.	A policy, process, and/or procedure specifying the MR's authority and responsibility for the following:				
E.11.a.	Monitoring the on-going qualification of assigned FSTD's to ensure all matters regarding FSTD qualification are being carried out as provided for in 14CFR part 60?				
E.11.b.	Ensuring that the QMS is properly established, implemented, and maintained by overseeing the QMS policies, practices, and/or procedures and by and modifying when and where necessary?				
E.11.c.	Regularly (designate interval) briefing sponsor's management on the status of the on-going FSTD qualification program and the effectiveness and efficiency of the QMS? (designate maximum interval)				

Table E2. - Information

Element Number	Assessment Tool – INITIAL (Desk) Elements **Does the sponsor have:**	Rating (See Element Assessment Table) N	P	Y	Comments
E.11.d.	Serving as the primary contact point for all matters between the sponsor and the NSPM regarding the qualification of assigned FSTD's?				
E.11.e.	Delegating the MR assigned duties to an individual at each of the sponsor's locations, when/if/where appropriate?				
E.12.	A policy, process, and/or procedure specifying how the sponsor will:				
E.12.a	Ensure that the data made available to the NSPM (the validation data package) includes the aircraft manufacturer's flight test data (or other data approved by the NSPM) and all relevant data developed after the type certificate was issued (e.g., data developed in response to an airworthiness directive) if such data results from a change in performance, handling qualities, functions, or other characteristics of the aircraft that must be considered for flight crew member training, evaluation, or for meeting experience requirements of this chapter?				
E.12.b.	Immediately notify the NSPM when an addition to or a revision of the flight related data or airplane systems related data is available if this data is used to program and/or operate a qualified FFS, including technical information about this data to the NSPM relative to the data's significance for training, evaluation, or flight experience activities in the FFS?				
E.12.c.	Maintain a liaison with the manufacturer of the aircraft being simulated (or with the holder of the aircraft type certificate for the aircraft being simulated if the manufacturer is no longer in business), and/or, if appropriate, with the person having supplied the aircraft data package for the FFS for the purposes of receiving notification of data package changes?				
E.13.	A policy, process, and/or procedure specifying how the sponsor will make available all special equipment and qualified personnel needed to accomplish or assist in the accomplishment of tests during initial, continuing qualification, or special evaluations?				
E.14.	A policy, process, and/or procedure specifying how the sponsor will submit to the NSPM a request to evaluate the FSTD for initial qualification at a specific level and simultaneously request the TPAA forward a concurring letter to the NSPM; including how the MR will use qualified personnel to confirm the following:				
E.14.a.	That the performance and handling qualities of the FSTD represents those of the aircraft or set of aircraft within the normal operating envelope?				
E.14.b.	The FSTD systems and sub-systems (including the simulated aircraft systems) functionally represent those in the aircraft or set of aircraft?				
E.14.c.	The cockpit represents the configuration of the specific type; or aircraft make, model, and series aircraft being simulated, as appropriate?				
E.15.	A policy, process, and/or procedure specifying how, for an initial evaluation, all of the subjective tests and all of the objective tests are accomplished at the sponsor's training facility, except as provided for in the appropriate QPS?				
E.16.	A policy, process, and/or procedure specifying how, after the NSPM completes the evaluation for initial qualification, the sponsor will update the QTG with the results of the FAA-witnessed tests and demonstrations together with the results of all the objective tests and demonstrations described in the appropriate QPS?				
E.17.	A policy, process, and/or procedure specifying how the sponsor will make the MQTG available to the NSPM upon request?				

Table E2. - Information

Element Number	Assessment Tool – INITIAL (Desk)	Rating See Element Assessment Table			Comments
	Elements				
	Does the sponsor have:	N	P	Y	
E.18.	A policy, process, and/or procedure specifying how the sponsor will apply to the NSPM to add (an) additional qualification(s) to the Statement of Qualification?				
E.19.	A policy, process, and/or procedure specifying how the MR will use qualified personnel to confirm:				
E.19.a.	That the performance and handling qualities of the FSTD represent(s) those of the aircraft or set of aircraft within the normal operating envelope?				
E.19.b.	That the FSTD systems and sub-systems (including the simulated aircraft systems) functionally represent(s) that (those) in the aircraft or set of aircraft?				
E.19.c.	That the cockpit represents the configuration of the specific type; or aircraft make, model, and series aircraft being simulated, as appropriate?				
E.20.	A policy, process, and/or procedure specifying how the sponsor accomplishes all appropriate QPS Attachment 2 objective tests each year in a minimum of four evenly spaced inspections as specified in the appropriate QPS?				
E.21.	A policy, process, and/or procedure specifying how the sponsor completes a functional preflight check of the FSTD within the preceding 24 hours of FSTD use?				
E.22.	A policy, process, and/or procedure specifying how the sponsor schedules with the NSPM continuing qualification evaluations not later than 60 days before the evaluation is due?				
E.23.	A policy, process, and/or procedure specifying how the sponsor ensures that the FSTD has received a continuing qualification evaluation at the interval as described in the respective MQTG, allowing for the 1-month grace period before or after the calendar month required?				
E.24.	A policy, process, and/or procedure describing that when a discrepancy is discovered the following is recorded in the FSTD discrepancy log:				
E.24.a.	A description of each discrepancy is entered and remains in the log until the discrepancy is corrected?				
E.24.b.	A description of the corrective action taken for each discrepancy, the identity of the individual taking the action, and the date that action is taken?				
E.25.	A policy, process, and/or procedure specifying how the discrepancy log is kept in a form and manner acceptable to the Administrator and is kept in or adjacent to the FSTD? (An electronic log that may be accessed by an appropriate terminal or display in or adjacent to the FSTD is satisfactory.)				
E.26.	A policy, process, and/or procedure that requires each instructor, check airman, or representative of the Administrator conducting training, evaluation, or flight experience for flight crew members, and each person conducting the preflight inspection, who discovers a discrepancy, including any missing, malfunctioning, or inoperative components in the FSTD, to write or cause to be written a description of that discrepancy into the discrepancy log at the end of the FSTD preflight or FSTD use session?				
E.27.	A policy, process, and/or procedure specifying how the sponsor will (if operating an FSTD based on an interim qualification), within twelve months of the release of the final aircraft data package by the aircraft manufacturer (but no later than two years after the issuance of the interim qualification status the sponsor) apply for initial qualification based on the final aircraft data package approved by the aircraft manufacturer?				

Table E2. - Information

Element Number	Assessment Tool – INITIAL (Desk) Elements	Rating See Element Assessment Table			Comments
	Does the sponsor have:	**N**	**P**	**Y**	
E.28.	A policy, process, and/or procedure specifying how the sponsor determines whether an FSTD change qualifies as a modification as described in 14CFR part 60?				
E.29.	A policy, process, and/or procedure specifying how the sponsor will ensure the FSTD is modified in accordance with any FSTD Directive regardless of the original qualification basis?				
E.30.	A policy, process, and/or procedure specifying how, if an FSTD change is determined to be a modification as defined in 14CRF part 60, the sponsor will notify the NSPM and TPAA of their intent to use the modified FSTD and to ensure that the modified FSTD will not be used prior to:				
E.30.a.	Twenty-one days since the sponsor notified the NSPM and the TPAA of the proposed modification and the sponsor has not received any response from either the NSPM or the TPAA?				
E.30.b.	Twenty-one days since the sponsor notified the NSPM and the TPAA of the proposed modification and one has approved the proposed modification and the other has not responded?				
E.30.c.	The FSTD successfully completing any evaluation the NSPM may require in accordance with the standards for an evaluation for initial qualification or any part thereof before the modified FSTD is placed in service?				
E.31.	A policy, process, and/or procedure specifying how, after a FSTD modification is approved by the NSPM, the sponsor will:				
E.31.a.	Post an addendum to the Statement of Qualification until such time as a permanent, updated statement is received from the NSPM and posted?				
E.31.b.	Update the MQTG with current objective test results and appropriate objective data for each affected objective test or other MQTG section that is affected by the modification?				
E.31.c.	File in the MQTG the direction to make the modification and the record of the modification completion?				
E.32.	A policy, process, and/or procedure specifying how the sponsor will track the length of time a component has been missing, malfunctioning, or inoperative (MMI), including:				
E.32.a.	How the sponsor will post a list of MMI components in or adjacent to the FSTD?				
E.32.b.	How the sponsor will notify the NSPM if the MMI has not been repaired or replaced within 30 days; or if the sponsor has a discrepancy prioritization system, describe how discrepancies are prioritized and how the sponsor will notify the NSPM if the MMI has not been repaired or replaced within the specified timeframe?				
E.33.	A policy, process, and/or procedure specifying how the sponsor will notify the NSPM and how the sponsor will seek re-qualification of the FSTD if the FSTD is moved and reinstalled in a different location?				
E.34.	A policy, process, and/or procedure specifying how the sponsor will maintain control of the following documents: [The sponsor must specify how these records are maintained in plain language form or in coded form; but if the coded form is used, the sponsor must specify how the preservation and retrieval of information will be conducted.]				
E.34.a.	The MQTG and each amendment thereto?				
E.34.b.	A record of all FSTD modifications required by this part since the issuance of the original Statement of Qualification?				
E.34.c.	Results of the qualification evaluations (initial and each upgrade) since the issuance of the original Statement of Qualification?				

Table E2. - Information

Element Number	Assessment Tool – INITIAL (Desk) Elements	Rating See Element Assessment Table			Comments
	Does the sponsor have:	**N**	**P**	**Y**	
E.34.d.	Results of the objective tests conducted in accordance with this part for a period of 2 years?				
E.34.e.	Results of the previous three continuing qualification evaluations, or the continuing qualification evaluations from the previous 2 years, whichever covers a longer period?				
E.34.f.	Comments obtained in accordance with this part for a period of at least 90 days?				
E.34.g.	A record of all discrepancies entered in the discrepancy log over the previous 2 years, including the following:				
E.34.g.1.	A list of the components or equipment that were or are missing, malfunctioning, or inoperative?				
E.34.g.2.	The action taken to correct the discrepancy?				
E.34.g.3.	The date the corrective action was taken?				
E.34.g.4.	The identity of the person determining that the discrepancy has been corrected?				

(Use Continuation Sheet As Necessary)

Table E3. – Information

Element Number	Assessment Tool – ON-SITE Elements There is evidence that the element has been/is: (1) Utilized/applied as is necessary and as specified/defined by the QMS; (2) Achieving/producing effective results:	Element Present N	P	Y	Comments (Designate N/A Elements)
E.1.	The QMS Manual sets out current QMS policies, processes and/or procedures.				
E.2.	The policy, process, and/or procedure specifying how the sponsor will identify deficiencies in the QMS.				
E.3.	The policy, process, and/or procedure specifying how the sponsor will document how the QMS program will be changed to address deficiencies when found.				
E.4.	The policy, process, and/or procedure specifying how the sponsor will propose program changes to the NSPM and receive approval prior to their implementation.				
E.5.	The policy, process, and/or procedure specifying how the sponsor will document that at least one FSTD is used within the sponsor's FAA-approved flight training program for the aircraft or set of aircraft at least once within the 12-month period following the initial/upgrade evaluation conducted by the NSP and at least once within each subsequent 12-month period thereafter.				
E.6.	The policy, process, and/or procedure specifying how the sponsor will document that at least one FSTD is used within the sponsor's FAA-approved flight training program for the aircraft or set of aircraft at least once within the 12-month period following the first continuing qualification evaluation conducted by the NSP and at least once within each subsequent 12-month period thereafter.				
E.7.	The policy, process, and/or procedure specifying how the sponsor will obtain an annual written statement from a qualified pilot (after having flown the subject aircraft or set of aircraft during the preceding 12-month period) that the performance and handling qualities of the subject FSTD represents the subject aircraft or set of aircraft (within the normal operating envelope). Required only if the subject FSTD is not used in the sponsor's FAA-approved flight training program for the aircraft or set of aircraft at least once within the preceding 12-month period.				
E.8.	The policy, process, and/or procedure specifying how written comments will be received by the sponsor regarding the FSTD and its operation.				
E.9.	The policy, process, and/or procedure specifying how and where the FSTD Statement of Qualification will be posted, or accessed by an appropriate terminal or display, in or adjacent to the FSTD.				
E.10.	The policy, process, and/or procedure specifying how the sponsor's management representative (MR) is selected and identified by name to the NSPM.				
E.11.	The policy, process, and/or procedure specifying the MR's authority and responsibility for the following:				
E.11.a.	Monitoring the on-going qualification of assigned FSTD's to ensure all matters regarding FSTD qualification are being carried out as provided for in 14CFR part 60.				
E.11.b.	Ensuring that the QMS is properly established, implemented, and maintained by overseeing the QMS policies, practices, and/or procedures and by and modifying when and where necessary.				
E.11.c.	Regularly briefing sponsor's management on the status of the on-going FSTD qualification program and the effectiveness and efficiency of the QMS. (designate maximum interval)				

Table E3. – Information

Element Number	Assessment Tool – ON-SITE Elements There is evidence that the element has been/is: (1) Utilized/applied as is necessary and as specified/defined by the QMS; (2) Achieving/producing effective results:	Element Present N	P	Y	Comments (Designate N/A Elements)
E.11.d.	Serving as the primary contact point for all matters between the sponsor and the NSPM regarding the qualification of assigned FSTD's.				
E.11.e.	Delegating the MR assigned duties to an individual at each of the sponsor's locations, when/if/where appropriate.				
E.12.	A policy, process, and/or procedure specifying how the sponsor will:				
E.12.a.	Ensure that the data made available to the NSPM (the validation data package) includes the aircraft manufacturer's flight test data (or other data approved by the NSPM) and all relevant data developed after the type certificate was issued (e.g., data developed in response to an airworthiness directive) if such data results from a change in performance, handling qualities, functions, or other characteristics of the aircraft that must be considered for flight crew member training, evaluation, or for meeting experience requirements of this chapter.				
E.12.b.	Immediately notify the NSPM when an addition to or a revision of the flight related data or airplane systems related data is available if this data is used to program and/or operate a qualified FFS, including technical information about this data to the NSPM relative to the data's significance for training, evaluation, or flight experience activities in the FFS.				
E.12.c.	Maintain a liaison with the manufacturer of the aircraft being simulated (or with the holder of the aircraft type certificate for the aircraft being simulated if the manufacturer is no longer in business), and/or, if appropriate, with the person having supplied the aircraft data package for the FFS for the purposes of receiving notification of data package changes.				
E.13.	A policy, process, and/or procedure specifying how the sponsor will make available all special equipment and qualified personnel needed to accomplish or assist in the accomplishment of tests during initial, continuing qualification, or special evaluations.				
E.14.	A policy, process, and/or procedure specifying how the sponsor will submit to the NSPM a request to evaluate the FSTD for initial qualification at a specific level and simultaneously request the TPAA forward a concurring letter to the NSPM; including how the MR will use qualified personnel to confirm the following:				
E.14.a.	That the performance and handling qualities of the FSTD represents those of the aircraft or set of aircraft within the normal operating envelope.				
E.14.b.	The FSTD systems and sub-systems (including the simulated aircraft systems) functionally represent those in the aircraft or set of aircraft.				
E.14.c.	The cockpit represents the configuration of the specific type; or aircraft make, model, and series aircraft being simulated, as appropriate.				
E.15.	A policy, process, and/or procedure specifying how, for an initial evaluation, all of the subjective tests and all of the objective tests are accomplished at the sponsor's training facility, except as provided for in the appropriate QPS.				
E.16.	A policy, process, and/or procedure specifying how, after the NSPM completes the evaluation for initial qualification, the sponsor will update the QTG with the results of the FAA-witnessed tests and demonstrations together with the results of all the objective tests and demonstrations described in the appropriate QPS.				
E.17.	A policy, process, and/or procedure specifying how the sponsor will make the MQTG available to the NSPM upon request.				

Table E3. – Information

Element Number	Assessment Tool – ON-SITE Elements There is evidence that the element has been/is: (1) Utilized/applied as is necessary and as specified/defined by the QMS; (2) Achieving/producing effective results:	Element Present N	P	Y	Comments (Designate N/A Elements)
E.18.	A policy, process, and/or procedure specifying how the sponsor will apply to the NSPM to add (an) additional qualification(s) to the Statement of Qualification.				
E.19.	A policy, process, and/or procedure specifying how the MR will use qualified personnel to confirm:				
E.19.a.	That the performance and handling qualities of the FSTD represent(s) those of the aircraft or set of aircraft within the normal operating envelope.				
E.19.b.	That the FSTD systems and sub-systems (including the simulated aircraft systems) functionally represent(s) that (those) in the aircraft or set of aircraft.				
E.19.c.	That the cockpit represents the configuration of the specific type; or aircraft make, model, and series aircraft being simulated, as appropriate.				
E.20.	A policy, process, and/or procedure specifying how the sponsor accomplishes all appropriate QPS Attachment 2 objective tests each year in a minimum of four evenly spaced inspections as specified in the appropriate QPS.				
E.21.	A policy, process, and/or procedure specifying how the sponsor completes a functional preflight check of the FSTD within the preceding 24 hours of FSTD use.				
E.22.	A policy, process, and/or procedure specifying how the sponsor schedules with the NSPM continuing qualification evaluations not later than 60 days before the evaluation is due.				
E.23.	A policy, process, and/or procedure specifying how the sponsor ensures that the FSTD has received a continuing qualification evaluation at the interval as described in the respective MQTG, allowing for the 1-month grace period before or after the calendar month required.				
E.24.	A policy, process, and/or procedure describing that when a discrepancy is discovered the following is recorded in the FSTD discrepancy log:				
E.24.a.	A description of each discrepancy is entered and remains in the log until the discrepancy is corrected.				
E.24.b.	A description of the corrective action taken for each discrepancy, the identity of the individual taking the action, and the date that action is taken.				
E.25.	A policy, process, and/or procedure specifying how the discrepancy log is kept in a form and manner acceptable to the Administrator and is kept in or adjacent to the FSTD. [An electronic log that may be accessed by an appropriate terminal or display in or adjacent to the FSTD is satisfactory.]				
E.26.	A policy, process, and/or procedure that requires each instructor, check airman, or representative of the Administrator conducting training, evaluation, or flight experience for flight crew members, and each person conducting the preflight inspection, who discovers a discrepancy, including any missing, malfunctioning, or inoperative components in the FSTD, to write or cause to be written a description of that discrepancy into the discrepancy log at the end of the FSTD preflight or FSTD use session.				

Table E3. – Information

Element Number	Assessment Tool – ON-SITE Elements There is evidence that the element has been/is: (1) Utilized/applied as is necessary and as specified/defined by the QMS; (2) Achieving/producing effective results:	Element Present N	P	Y	Comments (Designate N/A Elements)
E.27.	A policy, process, and/or procedure specifying how the sponsor will (if operating an FSTD based on an interim qualification), within twelve months of the release of the final aircraft data package by the aircraft manufacturer (but no later than two years after the issuance of the interim qualification status the sponsor) apply for initial qualification based on the final aircraft data package approved by the aircraft manufacturer.				
E.28.	A policy, process, and/or procedure specifying how the sponsor determines whether an FSTD change qualifies as a modification as described in 14CFR part 60.				
E.29.	A policy, process, and/or procedure specifying how the sponsor will ensure the FSTD is modified in accordance with any FSTD Directive regardless of the original qualification basis.				
E.30.	A policy, process, and/or procedure specifying how, if an FSTD change is determined to be a modification as defined in 14CRF part 60, the sponsor will notify the NSPM and TPAA of their intent to use the modified FSTD and to ensure that the modified FSTD will not be used prior to:				
E.30.a.	Twenty-one days since the sponsor notified the NSPM and the TPAA of the proposed modification and the sponsor has not received any response from either the NSPM or the TPAA?				
E.30.b.	Twenty-one days since the sponsor notified the NSPM and the TPAA of the proposed modification and one has approved the proposed modification and the other has not responded.				
E.30.c.	The FSTD successfully completing any evaluation the NSPM may require in accordance with the standards for an evaluation for initial qualification or any part thereof before the modified FSTD is placed in service.				
E.31.	A policy, process, and/or procedure specifying how, after a FSTD modification is approved by the NSPM, the sponsor will:				
E.31.a.	Post an addendum to the Statement of Qualification until such time as a permanent, updated statement is received from the NSPM and posted.				
E.31.b.	Update the MQTG with current objective test results and appropriate objective data for each affected objective test or other MQTG section that is affected by the modification.				
E.31.c.	File in the MQTG the direction to make the modification and the record of the modification completion.				
E.32.	A policy, process, and/or procedure specifying how the sponsor will track the length of time a component has been missing, malfunctioning, or inoperative (MMI), including:				
E.32.a.	How the sponsor will post a list of MMI components in or adjacent to the FSTD.				
E.32.b.	How the sponsor will notify the NSPM if the MMI has not been repaired or replaced within 30 days; or if the sponsor has a discrepancy prioritization system, describe how discrepancies are prioritized and how the sponsor will notify the NSPM if the MMI has not been repaired or replaced within the specified timeframe.				
E.33.	A policy, process, and/or procedure specifying how the sponsor will notify the NSPM and how the sponsor will seek re-qualification of the FSTD if the FSTD is moved and reinstalled in a different location.				
E.34.	A policy, process, and/or procedure specifying how the sponsor will maintain control of the following documents: [The sponsor must specify how these records are maintained in plain language form or in coded form; but if the coded form is used, the sponsor must specify how the preservation and retrieval of information will be conducted.]				

Table E3. – Information

Element Number	Assessment Tool – ON-SITE Elements There is evidence that the element has been/is: (1) Utilized/applied as is necessary and as specified/defined by the QMS; (2) Achieving/producing effective results:	Element Present N	P	Y	Comments (Designate N/A Elements)
E.34.a.	The MQTG and each amendment thereto.				
E.34.b.	A record of all FSTD modifications required by this part since the issuance of the original Statement of Qualification.				
E.34.c.	Results of the qualification evaluations (initial and each upgrade) since the issuance of the original Statement of Qualification.				
E.34.d.	Results of the objective tests conducted in accordance with this part for a period of 2 years.				
E.34.e.	Results of the previous three continuing qualification evaluations, or the continuing qualification evaluations from the previous 2 years, whichever covers a longer period.				
E.34.f.	Comments obtained in accordance with this part for a period of at least 90 days.				
E.34.g.	A record of all discrepancies entered in the discrepancy log over the previous 2 years, including the following:				
E.34.g.1.	A list of the components or equipment that were or are missing, malfunctioning, or inoperative.				
E.34.g.2.	The action taken to correct the discrepancy.				
E.34.g.3.	The date the corrective action was taken.				
E.34.g.4.	The identity of the person determining that the discrepancy has been corrected.				

(Use Continuation Sheet As Necessary)

Table E4. - Information

Element Number	Assessment Tool – INITIAL (Desk) Voluntary Elements Does the sponsor have:	Rating See Element Assessment Table N	P	Y	Comments
QMS Manual:					
V.1.	QMS charts and identified/detailed policies and processes (supplemented by diagrams and/or flow charts at sponsor's discretion) for policies and processes that directly affect quality, including: (1). The sequence and interaction of the processes and (2). Documented procedures or reference to them? [S: 4.1.1.1.a, b; 4.2.6.1.b, c]				
V.2.	The QMS Manual set up as a controlled document? [S: 4.2.6.2]				
V.3.	Provision for identification of current revision status with the date of last revision imprinted on each page concerned in the QMS Manual? [*F121.13 5(a)(3), F125.73, F135.23,* S: 4.3.1.1.c]				
Quality Policy and Objectives:					
V.4.	A quality policy, appropriate to the purpose of the sponsor's QMS? [S: 4.2.2.1.a]				
V.5.	Quality objectives, appropriate to the purpose of the sponsor's QMS that have been established for relevant functions and at relevant levels within the organization. [S: 4.2.1.1.b, 4.2.3.1]				
V.6.	Quality objectives that are measurable and are consistent with the Quality Policy? [S: 4.2.3.1]				
V.7.	A quality objective that includes the ultimate objective of providing the continuous presentation of a qualified FSD, or FSDs, for credible flight training, evaluation or meeting experience requirements? [S: 4.2.3.1]				
Management Commitment:					
V.8.	A policy, process, and/or procedure that specifies how the sponsor will communicate and ensure that the quality policy is understood at appropriate levels of the organization? [S: 4.2.2.1.d]				
V.9	A policy, process, and/or procedure that specifies how the sponsor will train and ensure that employees are aware of the relevance and importance of their activities and how they contribute to the achievement of the quality objectives? [S: 4.4.2.1.b, d]				
V.10	A policy, process, and/or procedure that:				
V.10.a.	Specifies how the sponsor will ensure that the resources (human and financial) necessary to achieve the quality objectives are identified and planned? [S: 4.2.1.1.d, 4.2.4.1]				
V.10.b.	Provides for appropriate allocation of these resources? [S: 4.2.4.1]				
V.10.c.	Specifies how the sponsor will document management resource planning output? [S: 4.2.4.1]				
V.11.	A policy, process, and/or procedure that specifies how the sponsor will provide for the monitoring, measurement, and analysis of QMS processes and implementation of action necessary to achieve planned operational results/quality objectives? [S: 4.1.1.1.e]				
V.12.	A policy, process, and/or procedure that specifies how the sponsor will ensure the availability of information necessary to support the monitoring, measurement, analysis and operation of QMS processes? [S: 4.1.1.1.d]				
V.13.	A policy, process, and/or procedure that specifies how the sponsor will conduct periodic (stated minimum interval required) management reviews of the QMS [S: 4.2.7.1] including:				

Table E4. - Information

Element Number	Assessment Tool – INITIAL (Desk) / Voluntary Elements / Does the sponsor have:	Rating (See Element Assessment Table) N	P	Y	Comments
V.13.a.	The quality policy for continuing suitability, adequacy, and effectiveness? [S: 4.2.2.1.c]				
V.13.b.	The quality objectives for continuing suitability, adequacy, and effectiveness? [S: 4.2.2.1.c]				
V.13.c.	The QMS for continuing suitability, adequacy and effectiveness? [S: 4.2.7.1]				
V.13.d	A specific provision for recording these reviews? [S: 4.2.7.1]				
Document Control:					
V.14.	A policy, process, and/or procedure that:				
V.14.a.	Provides for approval of documents for adequacy prior to issue? [S: 4.3.1.1.a] [Is this responsibility assigned by a title, position or name?]				
V.14.b.	Where necessary, provides for periodic review, updating, re-approval/retention/disposal of documents (where necessary)? [S: 4.3.1.1.b] [Is this responsibility assigned by a title, position or name?]				
V.14.c.	Provides for identification of current document revision status including the date of last revision on each page concerned? [*F121.135 (a)(3), F125.73, F135.23,* S: 4.3.1.1.c] [Is this responsibility assigned by a title, position or name?]				
V.14.d.	Ensures that current relevant versions of applicable documents are available at point-of-use? [S: 4.3.1.1.d] [Is this responsibility assigned by a title, position or name?]				
V.14.e.	Suitably identifies obsolete documents if they are retained for any purpose? [S: 4.3.1.1.h] [Is this responsibility assigned by a title, position or name?]				
V.14.f.	Provides for preventing the unintended use of obsolete documents? [S: 4.3.1.1.g] [Is this responsibility assigned by a title, position or name?]				
V.14.g	Ensures that documents of external origin are identified and their distribution/accessibility controlled? [S: 4.3.1.1.f] [Is this responsibility assigned by a title, position or name?]				
V.14.h.	Provides for protection, storage/archiving of records/documents? [S: 4.3.2.1] *[Are these responsibilities assigned by a title, position or name?]*				
V.15.	A policy, process, and/or procedure specifying how the sponsor will maintain control of the following documents: [The sponsor must specify how these records are maintained in plain language form or in coded form; but if the coded form is used, the sponsor must specify how the preservation and retrieval of information will be conducted.]				
V.15.a.	A record of training time lost due to FSTD discrepancies for a period of two years? [S: 4.3.2.2.e]				
V.15.b.	Two most recent NSPM assessments for a period of two years? [S: 4.3.2.1]				
V.15.c.	Two most recent Sponsor assessments for a period of two years? [S: 4.3.2.2.g]				

Table E4. - Information

Element Number	Assessment Tool – INITIAL (Desk) Voluntary Elements Does the sponsor have:	Rating See Element Assessment Table N	P	Y	Comments
V.15.d.	Documents required to ensure the effective operation and control of the organization's QMS processes (e.g. Master list(s)/tabulation(s) of internal/external documents and documented procedures; designated, as applicable, by publisher/originator, title/description, volume no./version, revision no./effective date)? [S: 4.1.2.1.b]				
Training					
V.16.	Appropriate training/education/skill/experience logs/records indicating the qualifications of those who perform engineering/maintenance on FSDs? [S: 4.3.2.2.k; 4.4.1.1; 4.4.2.1.e]				
V.17.	The method(s) of evaluating the effectiveness of sponsor-provided training defined/specified? [S: 4.4.2.1.c]				
Policy, Process, and/or Procedure Control:					
V.18.	Documented policies, processes, and/or procedures for essential QMS operational or maintenance functions that directly affect quality (and that are not specified elsewhere)? [S: 4.1.1.1.a]				
V.19.	A policy, process, and/or procedure for determining that the FSD meets appropriate standards each day that it is used? [S: 4.5.2.1.k]				
V.20.	A policy, process, and/or procedure for assigning and tracking inspection, testing and maintenance (preventive and corrective) on each FSD? [S: 4.5.2.1.b]				
V.21.	A policy, process, and/or procedure to designate responsibility by position, name or title, for approval of equipment and approval/control of each processes and procedure that is not specifically so assigned to the MR? [S: 4.5.1.1.e]				
V.22.	A policy, process, and/or procedure specifying how the sponsor will use training, education, skill-sets and/or experience to qualify those performing activities affecting quality (e.g. inspection, testing, engineering and/or maintenance (preventive and corrective) on FSTDs)? [S: 4.4.2.1.a]				
V.23.	A policy, process, and/or procedure that specifies how the sponsor will ensure that instructors and check airmen are completely and accurately logging the number of disruptions and time not available for training, evaluation or for obtaining flight experience during a scheduled FSTD use-period? [S: 4.5.2.1.d]				
V.24.	A provision for establishment of controlled conditions that provide:				
V.24.a.	A suitable work environment? [S: 4.5.1.1.c]				
V.24.b.	Availability of suitable equipment and suitable equipment maintenance? [S: 4.5.1.1.b]				
V.24.c.	Compliance with reference standards/codes and/or documented procedures as set out in the QMS Manual? [S: 4.5.1.1.d]				
V.25.	A policy, process, and/or procedure that specifies how the sponsor will utilize criteria for workmanship (e.g. written standards, representative samples or illustrations)? [S: 4.5.1.1.f]				
V.26.	A policy, process, and/or procedure that specifies how the sponsor will record the basis for the periodic, or prior to use, calibration of measurement devices? [S: 4.7.1.a, S: 4.7.1.d]				
V.27.	A policy, process, and/or procedure that specifies how the sponsor will determine FSTD training, evaluation, and/or flight experience restrictions including their implementation & subsequent removal? [S: 4.5.2.1.h(3), (4)]				

Table E4. - Information

Element Number	Assessment Tool – INITIAL (Desk) Voluntary Elements Does the sponsor have:	Rating See Element Assessment Table N	P	Y	Comments
V.28.	A policy, process, and/or procedure that specifies how the sponsor will record NSPM assessments? [S: 4.5.2.1.f]				
Internal Assessment:					
V.29.	A policy, process, and/or procedure that specifies how the sponsor will conduct internal assessments to determine whether the QMS conforms to regulatory standards, the requirements of the approved QMS; including:				
V.29.a.	Responsibilities and requirements for conducting assessments? [S: 4.8.2.a]				
V.29.b.	Assessment frequency (at least annually)? [S: 4.8.2.d]				
V.29.c.	Assessment scope? [S: 4.8.2.c]				
V.29.d.	How assessments are conducted? [S: 4.8.2.e]				
V.29.e.	Personnel other than those who control/perform the activity, process, procedure or practice being assessed conduct the assessment (Authorization to deviate from this standard may be approved by the NSPM for those sponsors that have limited personnel resources)? [S: 4.8.3]				
V.29.f.	When, how and by whom the results of such assessments and the associated corrective action are reported to Responsible Management and the NSPM? [S: 4.8.2.b]				
V.30.	A policy, process, and/or procedure that specifies how the sponsor will verify implementation of:				
V.30.a	Proper corrective action on valid assessment deficiencies? [S: 4.8.4]				
V.30b.	The recording and reporting of these results? [S: 4.8.4]				
Corrective Action:					
V.31.	A policy, process, and/or procedure that specifies how the sponsor will utilize the Corrective Action process to:				
V.31.a.	Identify program deficiencies. [S: 4.9.2.a]				
V.31.b.	Determine causes of program deficiencies. [S: 4.9.2.b]				
V.31.c.	Determine and implement action to correct program deficiencies.[S: 4.9.2.d]				
V.31.d.	Record the results of the actions taken. [S: 4.9.2.e]				
V.31.e.	Review the effectiveness of corrective action taken [S: 4.9.2.f]				
V.31.f.	Analyze the cause and evaluate the need for action to prevent recurrence and realize continual QMS improvement. [S: 4.9.2.c]				

(Use Continuation Sheet As Necessary)

Table E5. - Information

Element Number	Assessment Tool – ON-SITE Voluntary Elements There is evidence that the element is: (1) Being utilized/applied as is necessary and as specified/defined by the QMS; (2) Achieving/producing effective results:	Rating (See Element Assessment Table) N	P	Y	Comments (Designate N/A Elements)
QMS Manual:					
V.1.	Contains the current sequence and interaction of QMS processes and documented procedures or reference to them. [S: 4.2.6.1]				
V.2.	Is being controlled as specified in the QMS. [S: 4.2.6.2]				
V.3.	Current revision(s) and revision status have been entered providing the date of last revision on each page concerned. [*F121.135 (a)(3), F125.73, F135.23,* S: 4.3.1.1.c]				
Quality Policy and Objectives:					
V.4.	The defined quality policy is appropriate for the sponsor's QMS [S: 4.2.2.1.a, 4.2.3.1]				
V.5.	Current written quality objectives exist for relevant QMS functions and are established for relevant levels within the organization. [S: 4.2.1.1.b]				
V.6.	Quality objectives are measurable and are consistent with the Quality Policy. [S: 4.2.3.1]				
V.7.	(Reserved)				
Management Commitment:					
V.8.	Management is effectively using their stated QMS method(s) to communicate and ensure that the quality policy is understood at appropriate levels of the organization. [S: 4.2.1.1.a, 4.2.5.1c]				
V.9	Management is effectively using their stated QMS method(s) to train and ensure that employees are aware of the relevance and importance of their activities and how they contribute to the achievement of the quality objectives. [S: 4.2.2.1.b, d]				
V.10.	Management is effectively appropriating the allocation of resources (human and financial) according to the documented plan in order to achieve the quality objectives. [S: 4.2.1.1.d, 4.2.4.1]				
V.11.	Management is effectively measuring, monitoring and analyzing QMS processes and implementing action necessary to achieve planned operational results/quality objectives. [S: 4.1.1.1c]				
V.12.	Management is ensuring availability of information necessary to support the monitoring, measurement, analysis and operation of QMS processes. [S: 4.1.1.1d], of QMS processes				
V.13.	Periodic management reviews of the QMS have been conducted in accordance with the stated QMS procedure(s) and schedule (as specified in the SQAP) including:				
V.13.a.	The quality policy for continuing suitability , adequacy and effectiveness. [S: 4.2.2.1.e]				
V.13.b.	The quality objectives for continuing suitability, adequacy and effectiveness. [S: 4.2.2.1.c]				
V.13.c.	The QMS for continuing suitability, adequacy and effectiveness. [S: 4.2.7.1]				
V.13.d.	Management reviews. [S: 4.2.7.1]				
Document Control:					
V.15.	Documents are approved for adequacy prior to issue. [S: 4.3.1.1.a]				

Table E5. - Information

Element Number	Assessment Tool – ON-SITE Voluntary Elements There is evidence that the element is: (1) Being utilized/applied as is necessary and as specified/defined by the QMS; (2) Achieving/producing effective results:	Rating (See Element Assessment Table) N	P	Y	Comments (Designate N/A Elements)
V.16	Documents and records are reviewed, updated and re-approved/ retained/disposed of periodically (where necessary). [S: 4.3.1.1.b]				
V.17.	Current revision(s) and revision status have been entered providing the date of last revision on each page concerned. [*F121.135 (a)(3), F125.73, F135.23,* S: 4.3.1.1.c]				
V.18.	Current relevant versions of applicable documents are available at point-of-use. [S: 4.3.1.1.d]				
V.19.	Obsolete documents are suitably identified & designated as such if they are retained for any purpose. [S: 4.3.1.1.h]				
V.20.	Unintended use of obsolete documents is prevented. [S: 4.3.1.1.g]				
V.21.	Documents of external origin are identified and distribution/ accessibility is controlled. [S: 4.3.1.1.f]				
V.22.	Records/documents are adequately protected, stored/archived. [S: 4.3.2.1]				
V.23.	Is the sponsor retaining the following QMS documents/records for two years?				
V.23.a.	Training time lost due to FSD discrepancies. [S: 4.3.2.2.e]				
V.235.b.	Two most recent NSPM-conducted assessments. [S: 4.3.2.1]				
V.23.c.	Two most recent sponsor-conducted assessments. [S: 4.3.2.2.g]				
V.23.d.	Other available documentation [including documents specified in the QMS Master list(s)/tabulation(s) of the internal/external documents designated by the publisher/originator, as to title, description, volume number, version, revision number, effective date, etc., as applicable.] [S: 4.1.2.1.b]				
Training					
V.24.	Appropriate training/education/skill/experience logs/records indicate the qualifications of those who perform engineering/maintenance on FSDs. [S: 4.3.2.2.k; 4.4.1.1; 4.4.2.1.e]				
V.25.	The method(s) of evaluating the effectiveness of sponsor-provided training is being used as defined/specified. [S: 4.4.2.1.c]				
Policy, Process, and/or Procedure Control:					
V.26.	The policies, processes, and/or procedures for essential QMS operational functions that directly affect quality (and that are not specified elsewhere). [S: 4.1.1.1.a]				
V.27.	The policy, process, and/or procedure for determining that the FSD meets appropriate standards each day that it is used. [S: 4.5.2.1.k]				
V.28.	The policy, process, and/or procedure for assigning and tracking inspection, testing and maintenance (preventive and corrective) on each FSD. [S: 4.5.2.1.b]				
V.16.	Responsibility (assigned by position, name or title) for approval of equipment and approval/control of each processes and procedure that is not specifically so assigned to the MR [S: 4.5.1.1.e]				

Table E5. - Information

Element Number	Assessment Tool – ON-SITE Voluntary Elements There is evidence that the element is: (1) Being utilized/applied as is necessary and as specified/defined by the QMS; (2) Achieving/producing effective results:	Rating See Element Assessment Table N	P	Y	Comments (Designate N/A Elements)
V.17.	The policy, process, and/or procedure specifying how the sponsor will use training, education, skill-sets and/or experience to qualify those performing activities affecting quality (e.g. inspection, testing, engineering and/or maintenance (preventive and corrective) on FSTDs) [S: 4.4.2.1.a].				
V.18.	Ensuring that instructors and check airmen are completely and accurately logging the number of disruptions and time not available for training, testing, checking or for obtaining flight experience during a scheduled FSTD use-period, including the cause(s) of the disruption. [S: 4.5.2.1.d]				
V.19.	The provision for establishment of controlled conditions that provide for:				
V.19.a.	A suitable work environment. [S: 4.5.1.1.c]				
V.19.b.	Availability of suitable equipment and suitable equipment maintenance. [S: 4.5.1.1.b]				
V.20.	The policy, process, and/or procedure that specifies how the sponsor will utilize criteria for workmanship (e.g. written standards, representative samples or illustrations). [S: 4.5.1.1.f]				
V.21.	The provision for recording the basis for the periodic, or prior to use, calibration of measurement devices is being properly utilized. [S: 4.7.1.a, S: 4.7.1.d]				
V.22.	The policy, process, and/or procedure for determining FSTD training, evaluation, and/or flight experience restrictions including their implementation & subsequent removal. [S: 4.5.2.1.h (3), (4)]				
V.23.	The method used to record NSPM assessments including all recommendations and corrective action taken. [S: 4.5.2.1.f]				
Internal Assessment					
V.24.	A policy, process, and/or procedure that specifies how the sponsor will conduct internal assessments to determine whether the QMS conforms to regulatory standards, the requirements of the approved QMS, including:				
V.24.a.	Responsibilities and requirements for conducting assessments [S: 4.8.2.a]				
V.24.b.	Assessment frequency (at least annually). [S: 4.8.2.d]				
V.24.c.	Assessment scope. [S: 4.8.2.c]				
V.24.d.	How assessments are conducted [S: 4.8.2.e]				
V.24.e.	Personnel other than those who control/perform the activity, process, procedure or practice being assessed conduct the assessment (Authorization to deviate from this standard may be approved by the NSPM for those sponsors that have limited personnel resources). [S: 4.8.3]				
V.24.f.	When, how and by whom the results of such assessments and the associated corrective action are reported to Responsible Management and the NSPM. [S: 4.8.2.b]				
V.25.	A policy, process, and/or procedure that specifies how the sponsor will verify implementation of:				
V.25.a	Proper corrective action on valid assessment deficiencies. [S: 4.8.4]				
V.25.b.	The recording and reporting of these results. [S: 4.8.4]				

Table E5. - Information

Element Number	Assessment Tool – ON-SITE Voluntary Elements There is evidence that the element is: (1) Being utilized/applied as is necessary and as specified/defined by the QMS; (2) Achieving/producing effective results:	Rating See Element Assessment Table N	P	Y	Comments (Designate N/A Elements)
Corrective Action:					
V.26.	A policy, process, and/or procedure that specifies how the sponsor will utilize the Corrective Action process to:				
V.26.a.	Identify program deficiencies. [S: 4.9.2.a]				
V.26.b.	Determine causes of program deficiencies. [S: 4.9.2.b]				
V.26.c.	Determine and implement action to correct program deficiencies. [S: 4.9.2.d]				
V.26.d.	Record the results of the actions taken. [S: 4.9.2.e]				
V.26.e.	Review the effectiveness of corrective action taken [S: 4.9.2.f]				
V.26.f.	Analyze the cause and evaluate the need for action to prevent recurrence and realize continual QMS improvement. [S: 4.9.2.c]				

(Use Continuation Sheet as Necessary)

Continuation Sheet

Sponsor ______________________ Program ________________ Date ____________ Page No. _____ I or O ______

FAA Element Number	Sponsor Item Number	Action*		Comments	Resolved#	
		Status/Category	Date		Status/Category	Date

(Continue as Necessary)

***ACTION**
Rating / Status Codes:
Rating = Yes (Y); Partial (P); None (N)
Status = Advisory (A); Question (Q); Request (R); Observation (O)

#RESOLVED
Rating / Status Codes:
Rating = Yes (Y)
Status = Corrected or Acceptable (OK)

ELEMENT ASSESSMENT TABLE		
Rating/Measurement Standard		
Criteria: Complete, adequate, appropriate, accurate, clearly defined – flow chart, diagram, description		
NONCOMPLIANCE/NONCONFORMITY (N)	PARTIAL COMPLIANCE/CONFORMITY (P)	ACCEBTABLE COMPLIANCE/CONFORMITY (Y)
Corrective Action Required	**Corrective Action Required**	**No Corrective Action Required**
There is no evidence of:	There is evidence of:	There is evidence of:
A. Compliance/Conformity. B/ A written description.	A. A partial compliance/conformity. B. An incomplete written description.	A. Adequate compliance/conformity. B. An adequate written description
B. Identification, definition, documentation (flow chart, diagram, description)	*B. The process or procedure is: (a). Identified/defined inadequately, or (b). Documented inadequately.*	*C. The process or procedure is: (a). Identified/defined adequately, or (b). Documented adequately*
D. Implementation of a process or procedure.	*C. The process or procedure is: (a). Implemented inadequately/inappropriately. or (b). Not current as defined/documented.*	*D. The process or procedure is: (a). Implemented adequately/appropriately. or (b). Current as defined/documented.*
E. Effectiveness of a process or procedure.	*E. Of inadequate or partial effectiveness of a process or procedure.*	*E. Of adequate effectiveness of a process or procedure.*

Appendix F to Part 60--
DEFINITIONS AND ABBREVIATIONS
FOR FLIGHT SIMULATION TRAINING DEVICES

Begin Information

1. The definitions presented below in *Italic type face* are repeated from the regulatory definitions found in part 1 or part 60, as indicated. In the event that a discrepancy exists between a definition found here, and one found in part 1 or part 60, the part 1 or part 60 definition prevails. They are provided here in addition to other definitions, presented in regular type, mixed together, in alphabetical order,

End Information

Begin QPS Requirements

2. Definitions.

1st Segment - is that portion of the takeoff profile from liftoff to gear retraction.

2nd Segment - is that portion of the takeoff profile from after gear retraction to initial flap/slat retraction.

3rd Segment - is that portion of the takeoff profile after flap/slat retraction is complete.

Aircraft data package - is a combination of the various types of data used to design, program, manufacture, modify, and test the FSTD.

Airspeed - is calibrated airspeed unless otherwise specified and is expressed in terms of nautical miles per hour (knots).

Altitude - is pressure altitude (meters or feet) unless specified otherwise.

Angle of attack - is the angle between the aircraft longitudinal axis and the relative wind vector projected onto the aircraft plane of symmetry.

Automatic Testing - is FSTD testing wherein all stimuli are under computer control.

Bank - is the aircraft attitude with respect to or around the longitudinal axis, or roll angle (degrees).

Breakout - is the force required at the pilot's primary controls to achieve initial movement of the control position.

***Certificate holder** - A person issued a certificate under parts 119, 141, or 142 of this chapter or a person holding an approved course of training for flight engineers in accordance with part 63 of this chapter. (Part 60)*

Closed Loop Testing - is a test method for which the input stimuli are generated by controllers, which drive the FSTD to follow a pre-defined target response.

Collimated Visual Display – an optical system that causes the observer to perceive the image to be in focus at or near infinity.

Computer Controlled Airplane - is an airplane where all pilot inputs to the control surfaces are transferred and augmented by computers.

Control Sweep - is movement of the appropriate pilot controller from neutral to an extreme limit in one direction (Forward, Aft, Right, or Left), a continuous movement back through neutral to the opposite extreme position, and then a return to the neutral position.

Convertible FSTD - is an FSTD in which hardware and software can be changed so that the FSTD becomes a replica of a different model, usually of the same type aircraft. The same FSTD platform, cockpit shell, motion system, visual system, computers, and necessary peripheral equipment can thus be used in more than one simulation.

Critical Engine Parameter - is the parameter, which is the most accurate measure of propulsive force.

Daylight Visual System – is a visual system capable of producing, at a minimum, full color presentations, scene content comparable in detail to that produced by 4,000 edges or 1,000 surfaces for daylight and 4,000 light points for night and dusk (twilight) scenes, 6 foot-lamberts (20 cd/m^2) of light measured at the pilot's eye position (highlight brightness) and a display which is free of apparent quantization and other distracting visual effects while the simulator is in motion.

Deadband - is the amount of movement of the input for a system for which there is no reaction in the output or state of the system observed.

Distance - is the length of space between two points and is expressed in terms of nautical miles unless specified otherwise.

Discrepancy – as used in this part, means an aspect of the FSTD that is not correct with respect to the aircraft being simulated. This includes missing, malfunctioning, and/or inoperative components that are required to be present and operate correctly for training, evaluation, and experience functions to be creditable. It also includes errors in the documentation used to support the FSTD (e.g., errors in, or information missing from, the MQTG, required statements from appropriately qualified personnel, etc.).

Downgrade – is a permanent change in the qualification level of an FSTD to a lower level.

Driven - is a test method where the input stimulus or variable is positioned by automatic means, generally a computer input.

Electronic Copy of the MQTG – an electronic copy of the MQTG provided by an electronic scan presented in a Portable Document File (PDF), or similar format, acceptable to the NSPM

Electronic Master Qualification Test Guide – is an electronic version of the MQTG (eMQTG), where all objective data obtained from aircraft testing, or another approved source, together with correlating objective test results obtained from the performance of the FSTD and a description of the equipment necessary to perform the evaluation for the initial and the continuing qualification evaluations is stored, archived, or presented in either reformatted or digitized electronic format.

Engine – as used in this part, means the appliance or structure that supplies propulsive force for movement of the aircraft: i.e., the turbine engine for turbine powered aircraft; the turbine engine and propeller assembly for turbo-propeller powered aircraft; and the reciprocating engine and propeller assembly for reciprocating engine powered aircraft. For purposes of this part, engine failure is the failure of either the engine, or propeller assembly, to provide thrust higher than idle power thrust due to a failure of either the engine or the propeller assembly.

Evaluation *- With respect to an individual, the checking, testing, or review associated with flight crewmember qualification, training, and certification under parts 61, 63, 121, or 135 of this chapter. With respect to an FSTD, the qualification activities (e.g., the objective and subjective tests, the inspections, the continuing qualification evaluations.) associated with the requirements of this part. (Part 60)*

Fictional Airport – is a visual model of an airport that is a collection of non – "real world" terrain, instrument approach procedures, navigation aids, maps, and visual modeling detail sufficient to enable completion of an Airline Transport Pilot Certificate or Type Rating.

Flight experience *- Flight experience means recency of flight experience for landing credit purposes. (Part 60)*

Flight simulation training device (FSTD) *means a full flight simulator (FFS) or a flight training device (FTD). (Part 1)*

Flight test data - *(a subset of Objective data) Aircraft data collected by the aircraft manufacturer (or other supplier of data that are acceptable to the NSPM) during an aircraft flight test program. (Part 60)*

Flight training device (FTD) *means a replica of aircraft instruments, equipment, panels, and controls in an open flight deck area or an enclosed aircraft cockpit replica. It includes the equipment and computer programs necessary to represent aircraft (or set of aircraft) operations in ground and flight conditions having the full range of capabilities of the systems installed in the device as described in part 60 of this chapter and the qualification performance standard (QPS) for a specific FTD qualification level. (Part 1)*

Free Response - is the response of the FSTD after completion of a control input or disturbance.

Frozen - is a test condition where one or more variables are held constant with time.

FSTD Approval - is the extent to which an FSTD may be used by a certificate holder as authorized by the FAA. It takes into account aircraft to FSTD differences and the training ability of the organization.

FSTD Directive *- A document issued by the FAA to an FSTD sponsor, requiring a modification to the FSTD due to a recognized safety-of-flight issue and amending the qualification basis for the FSTD. (Part 60)*

FSTD Latency - is the additional time beyond that of the response time of the aircraft due to the response of the FSTD.

<u>FSTD Performance</u> *- The overall performance of the FSTD includes aircraft performance (e.g., thrust/drag relationships, climb, range) as well as flight and ground handling. (Part 60)*

Full flight simulator (FFS) *means a replica of a specific type; or make, model, and series aircraft cockpit. It includes the assemblage of equipment and computer programs necessary to represent aircraft operations in ground and flight conditions, a visual system providing an out-of-the-cockpit view, a system that provides cues at least equivalent to those of a three-degree-of-freedom motion system, and has the full range of capabilities of the systems installed in the device as described in part 60 of this chapter and the qualification performance standards (QPS) for a specific FFS qualification level. (Part 1)*

Generic Airport – is a Class III visual model that combines correct navigation aids for a real world airport with a visual model which does not correctly depict that same airport.

Grandfathering – as used in this part, means the practice of assigning a qualification basis for an FSTD, based on a period of time during which a published set of standards governs, or has governed, the requirements for the initial and continuing qualification of FSTDs. Each FSTD manufactured during this specified period of time is "grandfathered," or is "held to the standards" that are, or were, in effect during that time period. The grandfathered standards remain applicable to each FSTD manufactured during the stated time period, regardless of any subsequent modification to those standards and regardless of the sponsor, as long as the FSTD remains continuously qualified or is maintained in a non-qualified status in accordance with the specific requirements and time periods set out in this part. Each FSTD manufactured prior to the beginning date (or manufactured after the ending date) of a designated grandfather time period would have as its qualification basis, the standards in effect during the time period prior to, or subsequent to, the designated period.

Gross Weight - For objective test purposes:

Basic Operating Weight – (BOW) is the empty weight of the aircraft plus the weight of the following: normal oil quantity; lavatory servicing fluid; potable water; required crewmembers and their baggage; and emergency equipment.

Near Maximum Gross Weight – is a weight chosen by the sponsor or data provider that is not less than the basic operating weight (BOW) of the aircraft being simulated plus 80% of the difference between the maximum certificated gross weight (either takeoff weight or landing weight, as appropriate for the test) and the BOW.

Light Gross Weight – is a weight chosen by the sponsor or data provider that is not more than 120% of the BOW of the aircraft being simulated or as limited by the minimum practical operating weight of the test aircraft.

Medium Gross Weight – is a weight chosen by the sponsor or data provider that is approximately ±10% of the average of the numerical values of the BOW and the maximum certificated gross weight.

Ground Effect - is the change in aerodynamic characteristics due to modification of the airflow past the aircraft caused by the proximity of the earth's surface to the aircraft.

Hands Off - is a test maneuver conducted or completed without pilot control inputs.

Hands On - is a test maneuver conducted or completed with pilot control inputs as required.

Heave - is FSTD movement with respect to or along the vertical axis.

Height - is the height above ground level (or AGL) expressed in meters or feet.

"In Use" Runway – as used in this part, means the runway that is "active," (is currently "selected" and able to be used for takeoffs and/or landings) and has the surface lighting, surface markings and detail described in Appendix A, Attachment 3, Table A3B, items 5a and 5b, of this part.

Integrated Testing - is testing of the FSTD such that all aircraft system models are active and contribute appropriately to the results where none of the models used are substituted with models or other algorithms intended for testing only.

Irreversible Control System - is a control system in which movement of the control surface will not backdrive the pilot's control in the cockpit.

Latency – is the time measurement from the start of a control input to the appropriate perceivable change in flight instrument indication, visual system response, and/or motion system response, as appropriate (not including aircraft response time), and is typically met by simultaneously recording the output from the pilot's controller(s); the output from an accelerometer attached to the motion system platform located at an acceptable location near the pilots' seats; the output signal to the visual system display (including visual system analog delays); and/or the output signal to the pilot's attitude indicator.

Locked - is a test condition where one or more variables are held constant with time.

Manual Testing - is FSTD testing wherein the pilot conducts the test without computer inputs except for initial setup and all modules of the simulation are active.

Master Qualification Test Guide (MQTG) *- The FAA-approved Qualification Test Guide with the addition of the FAA-witnessed test results, applicable to each individual FSTD. (Part 60)*

Medium - is the normal operational weight for a given flight segment.

National Simulator Program Manager (NSPM) *- The FAA manager responsible for the overall administration and direction of the National Simulator Program (NSP), or a person approved by that FAA manager. (Part 60)*

Nominal - is the normal operational weight, configuration, speed, etc., for the flight segment specified.

Non-Normal Control - is a term used in reference to Computer Controlled Airplanes and is the state where one or more of the intended control, augmentation, or protection functions are not fully working. NOTE: Specific terms such as ALTERNATE, DIRECT, SECONDARY, BACKUP, etc., may be used to define an actual level of degradation.

Normal Control - is a term used in reference to Computer Controlled Airplanes and is the state where the intended control, augmentation, and protection functions are fully working.

Objective data - Quantitative data, acceptable to the NSPM, used to evaluate the FSTD.

Objective test *- A quantitative measurement and evaluation of FSTD performance. (Part 60)*

Parallax Error – is a difference in the apparent position of a viewed image resulting from an offset of the observer from the optimum viewing position.

Pitch - is the aircraft attitude with respect to, or around, the lateral axis expressed in degrees.

Power Lever Angle - is the angle of the pilot's primary engine control lever(s) in the cockpit. This may also be referred to as PLA, THROTTLE, or POWER LEVER.

Predicted data *- Estimations or extrapolations of either existing flight test data or data from other simulation models using engineering analyses, engineering simulations, design data, and/or wind tunnel data. (Part 60)*

Protection Functions - are systems functions designed to protect an aircraft from exceeding its flight maneuver limitations.

Pulse Input - is a step input to a control followed by an immediate return to the initial position.

Qualification Basis – The set of standards against which the FSTD was originally, or is subsequently, evaluated for initial qualification for the level assigned.

Qualification level. *– The categorization of an FSTD established by the NSPM, based on the FSTD's demonstrated technical and operational capabilities as set out in this part. (Part 60)*

Qualification Performance Standard (QPS) *- The collection of procedures and criteria published by the FAA to be used when conducting objective tests and subjective tests, including general FSTD requirements, for establishing FSTD qualification levels. The QPS are set forth in the following FAA appendices: Appendix A, for Airplane Simulators; Appendix B, for Airplane Flight Training Devices; Appendix C, for Helicopter Simulators; Appendix D, for Helicopter Flight Training Devices; and Appendix E for Quality Management Systems for Flight Simulation Training Devices. (Part 60)*

Qualification Test Guide (QTG) *- The primary reference document used for evaluating an aircraft FSTD. It contains test results, statements of compliance and capability, the configuration of the aircraft simulated, and other information for the evaluator to assess the FSTD against the applicable regulatory criteria. (Part 60)*

Quality Management System (QMS) – the initial aviation standard dealing with quality-system requirements addressing flight simulation that can be used for external quality-assurance purposes. It is a collection of requirements, generic and independent of any specific industry or economic sector, not to enforce uniformity of quality systems, but to identify the processes needed; determine the sequence and interaction of these processes; determine criteria and methods required to ensure the effective operation and control of these processes; ensure the availability of information necessary to support the operation and monitoring of these processes; measure, monitor and analyze these processes; and implement the actions necessary to achieve planned results. The design and implementation of a specific quality management system will be influenced by the varying needs of the individual sponsor, their particular objectives, the flight simulation products and services supplied, and the processes and specific practices employed.

Real-World Airport – as used in this part in reference to airport visual models, means a computer generated visual depiction of an airport that exists in reality.

Representative … When used as an adjective in this part, means typical, demonstrative, or characteristic of, or with respect to, the feature being described. For example:

1. Representative "sampling of tests" means a sub-set of the complete set of all tests such that the sample includes one or more of the tests in each of the major categories, the results of which would provide the evaluator a typical, or overall, understanding of the performance and/or handling characteristics of the FSTD.
2. Representative "airport model" (or "ground/airborne traffic," "lights," "runway/taxiway markings," "terrain," "weather phenomena," etc.) means a computer generated visual depiction of (either a real-world or fictional) airport (or traffic, lights, markings, terrain, weather phenomena, etc.) that is typical or characteristic of an airport (or traffic, lights, markings, terrain, weather phenomena, etc.) regularly used or seen by the sponsor, or the sponsor's client using the FSTD, in normal aviation operations.

Reversible Control System - is a control system in which movement of the control surface will backdrive the pilot's control in the cockpit.

Robotic Test – A basic performance check of a system's hardware and software components. Exact test conditions are defined to allow repeatability. Components are tested under normal operational configurations and may be tested independently of other system components.

Roll - is the aircraft attitude with respect to, or around, the longitudinal axis expressed in degrees.

Set of aircraft *- Aircraft that share similar handling and operating characteristics and similar operating envelopes and have the same number and type of engines or power plants. (Part 60)*

Sideslip Angle - is the angle between the relative wind vector and the aircraft plane of symmetry. (note: this definition replaces the current definition of "sideslip.")

Snapshot - is a presentation of one or more variables at a given instant of time.

Special Evaluation – is an evaluation of the FSTD for purposes other than initial, upgrade, or continuing qualification. Circumstances that might indicate the need for a special evaluation would include, but not necessarily be limited to, the following: after the FSTD is moved and reinstalled at another location; after an update to FSTD software or hardware that might affect performance or flying qualities; after a substantial update to FSTD avionics packages (autopilot, flight management systems, etc.); after substantial modifications to FSTD configuration; after a complaint is received from a credible source indicating that the FSTD does not perform or handle like the aircraft it simulates; etc.

Sponsor *- A certificate holder who seeks or maintains FSTD qualification and is responsible for the prescribed actions as set out in this part and the QPS for the appropriate FSTD and qualification level. (Part 60)*

Statement of Compliance and Capability (SOC) - is a declaration that specific requirements have been met. It must declare that compliance with the requirement is achieved and explain how the requirement is met (e.g., gear modeling approach, coefficient of friction sources, etc.). It must also describe the capability of the FSTD to meet the requirement (e.g., computer speed, visual system refresh rate, etc.). In doing this, the statement must provide references to needed sources of information for showing compliance, rationale to explain how the referenced material is used, mathematical equations and parameter values used, and conclusions reached.

Step Input - is an abrupt control input held at a constant value.

Subjective test *- A qualitative assessment of the performance and operation of the FSTD. (Part 60)*

Surge - is FSTD movement with respect to or along the longitudinal axis.

Sway - is FSTD movement with respect to or along the lateral axis.

Time History - is a presentation of the change of a variable with respect to time.

Training Program Approval Authority (TPAA) *- A person authorized by the Administrator to approve the aircraft flight training program in which the FSTD will be used. (Part 60)*

Training Restriction – is a temporary condition where, due to a Missing, Malfunctioning, or Inoperative (MMI) Component condition, the FSTD may continue to be used at the qualification level indicated on its SOQ but restricted from accomplishing the task for which the correct function of the MMI component is required..

Transport Delay or "Throughput" - is the total FSTD system processing time required for an input signal from a pilot primary flight control until motion system, visual system, or instrument response. It is the overall time delay incurred from signal input until output response. It does not include the characteristic delay of the aircraft simulated.

Upgrade *- The improvement or enhancement of an FSTD for the purpose of achieving a higher qualification level. (Part 60)*

Validation Data - Objective data used to determine if the FSTD performance is within the tolerances prescribed in the QPS.

Validation Test – An objective test whereby FSTD parameters are compared to the relevant validation data to ensure that the FSTD performance is within the tolerances prescribed in the QPS.

Visual Data Base – is a display that may include one or more visual models.

Visual Model – is a collection of one or more visual scenes of an airport or portion(s) of an airport, classified according to the following:

(1) Class I (whether modeling real world airports or fictional airports) – those visual models that meet the minimum requirements set out in Appendix A, Attachment 3, Table A3B of this part for qualification at a specified level. These models will be evaluated by the NSP and, if found acceptable, will be listed on the Statement of Qualification (SOQ).

(2) Class II (whether modeling real world airports or fictional airports) – those visual models that meet the minimum requirements set out in Appendix A, Attachment 3, Table A3C of this part for qualification at a specified level and may be available on the simulator without further involvement of the NSPM or the TPAA.

(3) Class III (whether modeling real world airports or fictional airports) – those visual models available on the simulator and approved by the TPAA for specific purposes; e.g., specific airport or runway qualification; very low visibility operations training; use of a specific airport visual model aligned with an instrument procedure for another airport for instrument training, testing, or checking; etc. These models may also be referred to as "special use models."

Visual System Response Time - is the interval from a control input to the completion of the visual display scan of the first video field containing the resulting different information.

Yaw - is aircraft attitude with respect to, or around, the vertical axis expressed in degrees.

3. Abbreviations.

AFM	Approved Flight Manual.
AGL	Above Ground Level (meters or feet).
AOA	Angle of Attack (degrees).
APD	Aircrew Program Designee.
CCA	Computer Controlled Airplane.
cd/m2	candela/meter^2, 3.4263 candela/m^2 = 1 ft-Lambert.
CFR	Code of Federal Regulations.
cm(s)	centimeter, centimeters.
daN	decaNewtons, one (1) decaNewton = 2.27 pounds.
deg(s)	degree, degrees.
DOF	Degrees-of-freedom
eMQTG	Electronic Master Qualification Test Guide
EPR	Engine Pressure Ratio.
FAA	Federal Aviation Administration (U.S.).

fpm	feet per minute.
ft	foot/feet, 1 foot = 0.304801 meters.\
ft-Lambert	foot-Lambert, 1 ft-Lambert = 3.4263 candela/m^2.
g	Acceleration due to Gravity (meters or feet/sec^2); 1g = 9.81 m/sec^2 or 32.2 feet/sec^2.
G/S	Glideslope.
IATA	International Airline Transport Association.
ICAO	International Civil Aviation Organization.
IGE	In ground effect.
ILS	Instrument Landing System.
IQTG	International Qualification Test Guide.
km	Kilometers 1 km = 0.62137 Statute Miles.
kPa	KiloPascal (Kilo Newton/Meters2). 1 psi = 6.89476 kPa.
Kts	Knots calibrated airspeed unless otherwise specified, 1 knot = 0.5148 m/sec or 1.689 ft/sec.
lb(s)	pound(s), one (1) pound = 0.44 decaNewton.
LDP	Landing decision point.
M,m	Meters, 1 Meter = 3.28083 feet.
Min(s)	Minute, minutes.
MLG	Main Landing Gear.
Mpa	MegaPascals (1 psi = 6894.76 pascals).
ms	millisecond(s).
N	NORMAL CONTROL Used in reference to Computer Controlled Airplanes.
nm	Nautical Mile(s) 1 Nautical Mile = 6,080 feet.
NN	NON-NORMAL CONTROL Used in reference to Computer Controlled Airplanes.
N1	Low Pressure Rotor revolutions per minute, expressed in percent of maximum.
N2	High Pressure Rotor revolutions per minute, expressed in percent of maximum.
N3	High Pressure Rotor revolutions per minute, expressed in percent of maximum.
NWA	Nosewheel Angle (degrees).
OGE	Out of ground effect.
PAPI	Precision Approach Path Indicator System.
Pf	Impact or Feel Pressure, often expressed as "q."
PLA	Power Lever Angle.
PLF	Power for Level Flight.
psi	pounds per square inch.
QPS	Qualification Performance Standard.
RAE	Royal Aerospace Establishment.
R/C	Rate of Climb (meters/sec or feet/min).
R/D	Rate of Descent (meters/sec or feet/min).
REIL	Runway End Identifier Lights.
RVR	Runway Visual Range (meters or feet).

s	second(s).
sec(s)	second, seconds.
sm	Statute Mile(s) 1 Statute Mile = 5,280 feet.
SOC	Statement of Compliance and Capability.
Tf	Total time of the flare maneuver duration.
Ti	Total time from initial throttle movement until a 10% response of a critical engine parameter.
TIR	Type Inspection Report.
T/O	Takeoff.
Tt	Total time from Ti to a 90% increase or decrease in the power level specified.
VASI	Visual Approach Slope Indicator System.
VGS	Visual Ground Segment.
V_1	Decision speed.
V_2	Takeoff safety speed.
Vmc	Minimum Control Speed.
Vmca	Minimum Control Speed in the air.
Vmcg	Minimum Control Speed on the ground.
Vmcl	Minimum Control Speed - Landing.
Vmu	The speed at which the last main landing gear leaves the ground.
V_R	Rotate Speed.
Vs	Stall Speed or minimum speed in the stall.
WAT	Weight, Altitude, Temperature.

End QPS Requirements

Table B1A

Minimum FTD Requirements					
<<< QPS Requirements >>>					<< Information >>
Number	General FTD Requirements	FTD Level 4	FTD Level 5	FTD Level 6	Notes
1.	**General Cockpit Configuration.**				
1.a.	The FTD must have a cockpit that is a full-scale replica of the airplane simulated with controls, equipment, observable cockpit indicators, circuit breakers, and bulkheads properly located, functionally accurate and replicating the airplane. The direction of movement of controls and switches must be identical to that in the airplane. Pilot seat(s) must afford the capability for the occupant to be able to achieve the design "eye position." Equipment for the operation of the cockpit windows must be included, but the actual windows need not be operable. Fire axes, extinguishers, spare light bulbs, etc., must be available in the flight simulator but may be relocated to a suitable location as near as practical to the original position. Fire axes, landing gear pins, and any similar purpose instruments need only be represented in silhouette. **An SOC is required.**			X	For FTD purposes, the cockpit consists of all that space forward of a cross section of the fuselage at the most extreme aft setting of the pilots' seats including additional, required flight crewmember duty stations and those required bulkheads aft of the pilot seats. For clarification, bulkheads containing only items such as landing gear pin storage compartments, fire axes or extinguishers, spare light bulbs, aircraft documents pouches etc., are not considered essential and may be omitted.
1.b.	The FTD must have equipment (e.g., instruments, panels, systems, circuit breakers, and controls) simulated sufficiently for the authorized training/checking events to be accomplished. The equipment forward of a cross section of the fuselage at the most extreme aft setting of the pilots' seats (including any additional required flight crewmember duty station aft of the pilot seats) must be located in a spatially correct location and may be in a cockpit or an open flight deck area. Additional equipment required for the authorized training/checking events must be available in the FTD but may be located in a suitable location as near as practical to the spatially correct position. Actuation	X	X		

Federal Register

Monday,
October 30, 2006

Part II

Department of Transportation

Federal Aviation Administration

14 CFR Parts 1, 11, 60, and 121

Flight Simulation Training Device Initial and Continuing Qualification and Use; Final Rule

DEPARTMENT OF TRANSPORTATION

Federal Aviation Administration

14 CFR Parts 1, 11, 60, and 121

[Docket No. FAA–2002–12461; Amendment Nos. 1–54, 11–52, 60–1, 121–327]

RIN 2120–AH07

Flight Simulation Training Device Initial and Continuing Qualification and Use

AGENCY: Federal Aviation Administration (FAA), DOT.

ACTION: Final Rule.

SUMMARY: The FAA is amending the regulations to establish a new part to set forth qualification requirements for flight simulation training devices (FSTD). The new part consolidates and updates FSTD requirements that currently exist in different parts of the FAA's regulations and in advisory circulars. In addition, the FAA is requiring that sponsors of FSTDs have a Quality Management System. These changes are necessary to promote standardization and accountability for FSTD qualification, maintenance, and evaluation. The intended effect of the new part is to ensure that users of FSTDs receive training in devices that closely match the performance and handling characteristics of the aircraft being simulated.

EFFECTIVE DATE: These amendments become effective October 30, 2007.

FOR FURTHER INFORMATION CONTACT: Ed Cook, Air Transportation Division (AFS–200), Flight Standards Service, Federal Aviation Administration, 100 Hartsfield Centre Parkway, Suite 400, Atlanta, GA 30354; telephone: 404–832–4700.

SUPPLEMENTARY INFORMATION:

Availability of Rulemaking Documents

You can get an electronic copy using the Internet by:

(1) Searching the Department of Transportation's electronic Docket Management System (DMS) Web page (*http://dms.dot.gov/search*);

(2) Visiting the FAA's Regulations and Policies Web page at *http://www.faa.gov/regulations_policies/;* or

(3) Accessing the Government Printing Office's Web page at *http://www.gpoaccess.gov/fr/index.html.*

You can also get a copy by sending a request to the Federal Aviation Administration, Office of Rulemaking, ARM–1, 800 Independence Avenue SW., Washington, DC 20591, or by calling (202) 267–9680. Make sure to identify the amendment number or docket number of this rulemaking.

Anyone is able to search the electronic form of all comments received into any of our dockets by the name of the individual submitting the comment (or signing the comment, if submitted on behalf of an association, business, labor union, etc.). You may review DOT's complete Privacy Act statement in the **Federal Register** published on April 11, 2000 (Volume 65, Number 70; Pages 19477–78) or you may visit *http://dms.dot.gov.*

Small Business Regulatory Enforcement Fairness Act

The Small Business Regulatory Enforcement Fairness Act (SBREFA) of 1996 requires FAA to comply with small entity requests for information or advice about compliance with statutes and regulations within its jurisdiction. If you are a small entity and you have a question regarding this document, you may contact its local FAA official, or the person listed under **FOR FURTHER INFORMATION CONTACT.** You can find out more about SBREFA on the Internet at *http://www.faa.gov/regulations_policies/rulemaking/sbre_act/.*

Authority for This Rulemaking

The FAA's authority to issue rules regarding aviation safety is found in Title 49 of the United States Code. Subtitle I, Section 106 describes the authority of the FAA Administrator. Subtitle VII, Aviation Programs, describes in more detail the scope of the agency's authority.

This rulemaking is promulgated under the authority described in Subtitle VII, Part A, subpart I, 49 U.S.C. 44701. Under that section, the FAA is charged with regulating air commerce in a way that best promotes safety.

Background

For many years the flightcrew training regulations in 14 CFR part 121 subparts N and O allowed simulator training as an enhancement to training and testing in the aircraft, but not as a complete replacement for training in the aircraft. Due to improvements in flight simulator performance, appendix H was added to part 121 in 1980. Appendix H permitted and expanded use of simulators by air carriers that took advantage of the new simulator performance through an ''Advanced Simulation Training Program.'' Appendix H permits simulators to be used for varying amounts (up to 100%) of the training, testing, and checking required by the FAA. The amount of training permitted depends on the simulator's qualification level.

As the state-of-the-art in simulator technology has advanced, more effective use has been made of the aircraft simulator in training, checking, and certification of flight crewmembers. Using flight simulators rather than aircraft in training allows for more in-depth training, including the practice of critical emergency procedures, in a safer environment. Not only do simulators provide improvements in safety and in safer training operations, they also provide such benefits as reducing noise, air pollution and air traffic congestion, and conserving petroleum resources.

Since 1980 appendix H of 14 CFR part 121 has provided an Advanced Simulation plan outlining the steps toward optimum use of flight simulators. Most major air carriers have taken advantage of appendix H and conduct most or all of their training and checking in simulators.

The FAA originally placed simulator technical requirements in appendix H because part 121 air carriers were the primary users of aircraft simulators. As the larger aviation community became interested in using simulators, the FAA in 1980 provided guidance in an advisory circular AC 121–14C, Aircraft Simulator and Visual System Evaluation and Approval. The AC more fully described what the technical capabilities of simulators should be, how those capabilities might be verified, and how all these capabilities might be incorporated into training programs.

Over the next several years following publication of AC 121–14C, the FAA, in consultation with the aviation industry, refined and republished its guidance material several times. Because the regulations regarding advanced simulators remained in part 121, appendix H, certificate holders who operated under parts other than 121 (such as parts 125 and 135) had to obtain exemptions in order to use simulators as provided in part 121, appendix H. The number of these operators has continued to grow.

The ability to manage the increasing number of exemptions, each one with slightly different provisions, conditions and limitations, became increasingly difficult. The development of 14 CFR part 142, Certification of Training Centers, was seen to be a logical and necessary way to deal with those operators who wished to conduct training for flight crewmembers but who did not operate under any of the part 121, 125 or 135 rules. However, the regulatory requirements for the technical criteria for a majority of the simulators coming into the U.S. aviation inventory has remained in the part 121 operating rule.

Notice of Proposed Rulemaking

The FAA published a Notice of Proposed Rulemaking (NPRM) for part 60 and related amendments on September 25, 2002, (67 FR 60284) and published a correction to the NPRM on October 25, 2002 (67 FR 65524). From December 2 until December 13, 2002, the FAA hosted an on-line public forum, which provided an opportunity for the public to answer specific questions posed by the FAA and allowed the FAA to respond with clarifying information. After an extension requested by commenters, the comment period closed on February 24, 2003.

In the NPRM the FAA proposed to remove the technical requirements for flight simulation devices (FSD) (flight simulators and flight training devices) from part 121 and place them in a new part 60, titled ''Flight Simulation Device Initial and Continuing Qualification and Use.'' The NPRM proposed to establish FSTD requirements for anyone conducting flight crewmember training, evaluation, and flight experience under any of the Federal Aviation Regulations.

Flight Simulation Device Aviation Rulemaking Committee (ARC)

In order to resolve comments and provide a forum for the FAA and the aviation community to discuss issues regarding Flight Simulation Training Devices (FSTDs), the FAA established the Flight Simulation Device Aviation Rulemaking Committee (ARC) on July 2, 2003. The ARC included participants from: Air Line Pilots Association, Aircraft Owners and Pilots Association, American Airlines, Alteon, Atlas Air, Boeing, CAE Electronics, Continental Airlines, Delta Air Lines, Federal Express, FlightSafety International, Northwest Airlines, Pan Am Flight Academy, Thales Training and Simulation, United Airlines, U.S. Airways, and FAA.

The general goal of the ARC was to provide advice, guidance, and recommendations on FSTD issues including, but not limited to, safety of flight; the suitability and the application of the simulation to flight crewmember training, testing, or checking activities; and implementation of technical changes or scientific advancements in simulation. The ARC provided a forum for the FAA and affected members of the aviation community to discuss issues. The ARC also allowed members of the aviation community to reach consensus on certain recommendations that would be submitted to the FAA and to develop resolutions to facilitate the evolution of FSTDs. The ARC's initial task was to review the FAA's September 25, 2002, proposed rule. On November 24, 2003, the ARC submitted to the FAA its recommendations on how the proposed rule language should be clarified and reorganized. After the FAA received recommendations from the ARC the comment period was reopened on February 10, 2004, to permit interested persons to review these recommendations and submit additional comments. The recommendations from the ARC are available online at *http://dms.dot.gov* by searching for entry 84 in docket number FAA–2002–12461. The comment period closed on March 11, 2004. The overwhelming majority of the clarifications and revisions contained in the final rule are consistent with the ARC recommendations.

Summary of the Final Rule

New part 60 contains the requirements for the evaluation, qualification, and maintenance of FSTDs. These requirements are based on the current guidance regarding the capability and performance of simulators in appendix H of part 121 and § 121.407. As part of this rulemaking project, the FAA has amended appendix H of part 121 and removed the Simulator Requirements and the Visual Requirements for Level B, C and D devices. These requirements are now outlined in the appropriate Qualification Performance Standards (QPS) appendices. In a separate rulemaking project that will follow this final rule, the FAA will propose to move Training and Checking Requirements of appendix H to a new subpart of part 121, and to delete appendix H.

Part 60 also contains items (such as frequency, content, and method of evaluation) previously found in the advisory material in AC 120–40B, Airplane Flight Simulator Qualification, in AC 120–45A, Airplane Flight Training Device Qualification, and in AC 120–63, Helicopter Simulator Qualification. Standards from this advisory material and specific items that are subject to change through technological advancements are being placed into one of the first four appendices to part 60:

- *Appendix A*, ''Qualification Performance Standards for Airplane Full Flight Simulators.''
- *Appendix B*, ''Qualification Performance Standards for Airplane Flight Training Devices.''
- *Appendix C*, ''Qualification Performance Standards for Helicopter Full Flight Simulators.''
- *Appendix D*, ''Qualification Performance Standards for Helicopter Flight Training Devices.''

In addition, the FAA has reorganized and clarified some material from the original NPRM into two appendices, *Appendix E*, ''Qualification Performance Standards for Quality Management Systems for Flight Simulation Training Devices,'' and *Appendix F*, ''Definitions and Abbreviations.'' Appendix E will become the single appendix for reference to Quality Management System (QMS) programs for FSTDs under this part. Appendix F will become the single appendix for definitions and abbreviations for terms used throughout part 60 and the QPS appendices.

Some of the terms and abbreviations listed in the new appendix F and added to part 1 are clarifications of terms that appeared in the September 25, 2002, NPRM. For example, FSD has been replaced with the more internationally compatible term—FSTD. The term FSTD more accurately addresses the full range of uses for these devices as addressed in part 60 and also harmonizes with the Joint Aviation Authorities (JAA) of Europe. In addition, to more appropriately describe the devices, the term Flight Simulator has been changed to Full Flight Simulator (FFS). Another clarification the FAA has made with respect to terms and definitions is that the Quality Assurance Program (QAP) is now called a QMS.

The QPS requirements in appendices A through E are regulatory. Future changes and additions to these standards are subject to notice and comment rulemaking procedures under the Administrative Procedure Act, unless ''good cause'' (see 5 U.S.C. 553(b)(B)) exists to justify proceeding without notice and comment. In addition, the FAA has issued FAA Order 1110.136, ''Flight Simulation Device Aviation Rulemaking Committee.''

What Action Is the Agency Taking?

The FAA is adding part 60 to Title 14 of the Code of Federal Regulations to establish qualification requirements for flight simulation training devices (FSTD). These requirements are based on the current requirements found in appendix H of part 121 and § 121.407 for the capability and performance of aircraft simulators. The new rule also incorporates certain existing practices that were previously described in the following Advisory Circulars: AC 120–40B, Airplane Flight Simulator Qualification, AC 120–45A, Airplane Flight Training Device Qualification, and AC 120–63, Helicopter Simulator Qualification.

Why Is the Rule Necessary?

The rule is necessary to promote standardization and accountability for FSTD maintenance, qualification and evaluation for use in an FAA approved flight training program. FSTDs are often used in lieu of aircraft to train and check individuals for purposes of issuing airmen certificates and ratings. FSTDs are also used to meet FAA air carrier training requirements for flight crewmembers. In fact, depending on the status of the airman and the sophistication of the device, an FSTD may be used for 100% of the training, testing, and checking required by the FAA. Training in an FSTD is most effective when the FSTD closely matches the performance and handling characteristics of the aircraft being simulated. This rule sets forth the regulatory process for establishing the qualification level of the FSTD and for the continuous review and inspection of FSTD performance to identify potential problems with FSTD maintenance and operation. The new rule will improve flight crewmember training, reduce operational errors and increase safety. It will also provide the standards that must be reached in order for a device to be qualified at a certain level (*i.e.*, Level A, B, C, or D Simulators and Level 4, 5, or 6 Training Devices).

Generally speaking, the amount of training and testing that can be conducted in an FSTD for the purpose of meeting FAA airmen certification or training requirements is directly proportional to the qualification level of the device. Thus, a device with a higher qualification level (*e.g.*, Level D) will be eligible for more certification and training credits than a device with a lower qualification level (*e.g.*, Level A).

Qualification Performance Standards (QPS)

One of the unique features of the part 60 rule is the incorporation of QPS. The QPS is an appendix to the regulation and outlines requirements and other information regarding the qualification, performance, evaluation and maintenance of FSTDs. The QPS contains several charts. Some of the charts prescribe regulatory requirements, while others outline general information and examples to assist the user in meeting the regulatory requirements.

The charts containing regulatory material are labeled ''QPS Requirements.'' Compliance with the criteria in these charts is mandatory in order to receive and maintain approval from the FAA for the qualification level and use of an FSTD. Changes to a QPS Requirement are subject to notice and comment rulemaking procedures under the Administrative Procedure Act, unless ''good cause'' (see 5 U.S.C. 553(b)(B)) exists to justify proceeding without notice and comment. The charts containing general information and examples are labeled ''Information.'' Compliance with the material contained in these charts is not mandatory, and changes to an Information section are generally not subject to notice and comment rulemaking procedures. The Information charts are included simply to provide additional guidance to the user.

Incorporating both the regulatory and advisory material into the QPS consolidates all of the relevant information and makes it available in one location. This promotes ease of use and greater uniformity among those involved in every aspect of FSTD performance, including manufacturers, airmen, training providers and regulators. Moreover, it gives greater insight to the regulated community regarding the FAA's intent behind the regulation, and the required and approved methods of compliance.

Comments

The FAA received 54 comments in response to the NPRM. Commenters included industry associations, airlines, training centers and schools, aircraft manufacturers, simulator and flight training device manufacturers, pilot associations, governmental organizations, and individuals. The major concerns of the commenters were harmonization of FAA standards with those of International Civil Aviation Organization (ICAO) and the JAA, the cost of complying with the new requirements, grandfathering existing simulators and other flight training devices, the requirement for a Quality Assurance Program (QAP), and the proposed requirements to be approved by the FAA as an FSTD ''sponsor.''

The FAA reviewed all comments. They are more fully explained in the Discussion section to follow. With respect to the major concerns raised by commenters, the FAA took the following actions:

- Revised certain sections of the QPS Requirements to incorporate ICAO/JAA standards that were within the scope of the original NPRM. Changes that are beyond the scope will be incorporated in future revisions to the QPS Requirements.
- Revised certain requirements where appropriate in order to reduce costs. The FAA notes, however, that part 60 is largely a codification of existing practices, and therefore, the agency does not anticipate that sponsors will incur many new or additional costs. The FAA's cost projection is outlined in the Regulatory Evaluation.
- Excluded Levels 2 and –3 Flight Training Devices from this rulemaking effort. The FAA will review its existing advisory material and determine the best method to continue to evaluate and qualify these devices.
- Replaced the QAP proposal with a Quality Management System (QMS). The QMS is significantly less costly than the proposed QAP.
- Eliminated the 600-hour annual use requirement for sponsorship eligibility. Persons are now permitted to sponsor an FSTD as long as the device is used at least once per year in an FAA approved training program, or at least once per year a pilot, appropriately qualified on the aircraft being simulated, flies the FSTD and confirms that the performance and handling qualities are like the aircraft.

Many other detailed comments of an editorial nature were also provided. These are not included in the summary, but have been carefully reviewed by the FAA in preparing the Final Rule. In addition, the specific comments on the QPS appendices are not summarized in the Final Rule summary, but have been carefully reviewed and incorporated, where appropriate, into the Final Rule. The FAA made certain changes to the QPS appendices from the proposed language to include technical corrections and clarifications that did not adversely affect safety and were within the scope of the NPRM. There were other technical changes that the FAA did not incorporate into this final rule because they were beyond the scope of the NPRM. The FAA will issue another NPRM to incorporate the changes that were beyond the scope of the original NPRM, and will incorporate these changes before the rule becomes effective. All of the comments are available for review at *http://dms.dot.gov.* The Docket Number is 12461.

Abbreviations Used in this Preamble

AC Advisory Circular
ALPA Airline Pilots Association
AOPA Aircraft Owners and Pilots Association
ARC Aviation Rulemaking Committee
ATA Air Transport Association
ATOS Air Transportation Oversight System
CBT Computer Based Training
DPE Designated Pilot Examiner
EASA European Aviation Safety Authority (formerly Joint Aviation Authorities (JAA)
FFS Full Flight Simulator
FOQA Flight Operations Quality Assurance
FSB Flight Safety Boeing
FSD Flight Simulation Device

FSDO Flight Standards District Office
FSI FlightSafety International
FSTD Flight Simulation Training Device
FTD Flight Training Device
ICAO International Civil Aviation Organization
MQTG Master Qualification Test Guide
MR Management Representative
NAFI National Association of Flight Instructors
NATA National Air Transport Association
NBAA National Business Aviation Association
NDB Non-Directional Beacon
NPRM Notice of Proposed Rulemaking
NSP National Simulator Program
NSPM National Simulator Program Manager
POI Principal Operations Inspector
QPS Qualification Performance Standards
QAP Quality Assurance Program
QMS Quality Management System
QS Quality System
QTG Qualification Test Guide
RAA Regional Airline Association
SITC Simulation and Instrument Training Center, Inc.
SOQ Statement of Qualification
TCPM Training Center Program Managers
Thales Thales Training & Simulation
TPAA Training Program Approval Authority
UA United Airlines
UAA University Aviation Association
UPS United Parcel Service

General Issues

General Comments

Eclipse, NLX Corporation, JAA, and an individual, applaud and appreciate the FAA's attempt to amend the regulations for FSTDs. JAA writes that the ''proposal takes care of the legal concern that regulations in this area have to have a mandatory basis * * * and it concentrates all related material in one document.'' This commenter states that this proposal did not address the latest modifications applied to the ICAO Manual and questions if using an FSTD instead of an aircraft would be made mandatory. An individual writes that simplification and consolidation of these regulations are appropriate and more detailed regulations and device inspection will force flight training schools to improve and that ''somewhat of a loophole'' in flight training in flight simulators and flight training devices would be closed. NLX indicates that these new regulations are a step forward in the overall process of FSTD qualifications. An individual believes that statistics proving that the use of simulator training has reduced aviation accidents or incidents are needed.

FAA Response: This final rule does not mandate the use of FSTDs instead of aircraft for training. This rule simply establishes FSTD qualification requirements. The FAA is developing an NPRM that proposes to revise the QPS appendices to achieve the desired level of harmonization.

Disposition of Level 7 Flight Training Devices

Regional Airline Association states that the preamble should discuss the disposition of Level 7 FTDs.

FAA Response: The original premise for the Level 7 FTD was that there was to be an aircraft entering service that would not have an ''on-set motion cue'' with the failure of an engine, and that the pilots training in an FSTD for that airplane type could be trained and checked on such an engine failure without requiring a force (motion) cueing system. The FAA determined that a Level C simulator aerodynamic data package would be required for the level 7 FTD to accurately simulate such an aircraft. However, the airplane never entered service and the requirements for the Level 7 FTD quickly became superfluous. Level 6 and Level 7 FTDs had the same authorizations (except for one area involving ''icing accountability''), but the Level 7 FTD continued to require significantly more aerodynamic data for no more value than the Level 6 FTD. The elimination of the Level 7 FTD does not preclude any Level 6 FTD from incorporating a Level C data package and having essentially the same kind of device as the originally described Level 7 device. However, there has been essentially no difference between the two levels in authorized use, and it made little sense to continue with a Level 7 FTD when there was little difference between a Level 6 and Level 7 FTD.

The FAA is considering future rulemaking to develop standards for Level 7 FTDs for helicopters. Any new requirements would be subject to notice and comment.

Rule vs. QPS

Continental asserts that there is a conflict between the rule and the Qualification Performance Standards (QPS). Continental states that the rule addresses a number of technical issues that would be best delegated to the QPS, and also notes that parts of the rule and its application have different definitions than the QPS.

FAA Response: In the final rule, we eliminated the repetition of the rule language in the QPS appendices because it was never the FAA's intent to have different definitions for terms in the rule and the QPS appendices. The FAA has also revised the rule language and the QPS appendices so that technical information is presented in the most appropriate sections and formats.

Codified Design Criteria

Northwest writes, ''The proposed regulation should be streamlined to centrally codify simulator design and qualification criteria.''

FAA Response: The FAA deems it appropriate to stop short of establishing a regulation mandating the design and construction criteria for these devices. While the FAA has type certificate requirements for aircraft instead of individual qualification requirements like we have for FSTDs, the FAA is not including such requirements in this final rule. We believe requiring a type certificate process would create the potential for enormous cost increases with virtually no gain in the quality of the devices.

Clarification of Requirements and Oversight Responsibilities

TWA and CAE were concerned with the lack of clarity in the rule language. Specifically, TWA wants the rule rewritten clearly stating FAA's intentions and adding that the National Simulator Program Manager (NSPM) has full authority over FSTDs and all results of other inspections must go through the NSPM before action can be taken. CAE expressed a similar concern.

FAA Response: The FAA revised the part 60 rule language and QPS appendices to ensure the requirements are clear. The QPS appendices provide examples and additional information and criteria outlining the method of compliance with the regulations. In addition, the FAA has clarified the NSPM will exercise oversight responsibility for the evaluation and qualification of all FSTDs included in part 60.

Use of FSTDs in the Course of Training

FlightSafety Boeing (FSB) believes part 60 ''should be limited to the definition, design criteria, required documentation and record-keeping of Flight Simulation Devices, and the evaluation process to assure continued functionality as designed, for the respective level of device.'' In FSB's opinion the authority on planned or actual use of FSTDs in the course of training should remain with the respective sponsor of the device and the Training Program Approval Authority (TPAA) as presently required in existing regulations. Also, FSB writes that all proposed wording addressing the continued use of a device be eliminated, including the words ''and use'' in the title of the proposal.

FAA Response: The final rule addresses the definition, required documentation and record keeping for

FSTDs. It also outlines the evaluation process to assure continued functionality of FSTDs, including the objective and subjective requirements. However, as stated earlier, the FAA has determined it is not appropriate to include FSTD ''design criteria'' in the final rule. Also, the phrase ''and use'' in the title of the part 60 rule does not apply to the actual ''use'' of an FSTD in the course of training approved by the TPAA. Rather, the term refers to those uses of the FSTD for which representatives of the NSPM have qualified a specific FSTD.

NSP Office

TechniFlite states, ''There should be an official (rather than implied or assumed) FAA office established at the Washington level to be responsible for the oversight of the National Simulation Program. This office could be responsible for reviewing appeals when disputes with the NSP arise.''

FAA Response: The NSP is part of the Flight Standards Service. Specifically, it is part of the Air Transportation Division, AFS–200, and answers directly to the AFS–200 manager in Washington, DC. An appeals process is outlined in §§ 60.5(d) and 60.29(b). In both cases, the Director of the Flight Standards Service, AFS–1, is the person/office to whom appeals should be made.

Level of Detail in Regulations

Thales Training & Simulation (Thales) ''objects to the way that our regulations are becoming so overly prescriptive.''

FAA Response: The part 60 rule is, for the most part, a codification of existing practices. However, there are new requirements such as the QMS requirement in § 60.5. The FAA, working with the ARC, including Thales, developed requirements that balance safety concerns without being overly burdensome.

Necessity of the Rule

Several commenters question whether this rule is needed. American Airlines states that it has worked closely with the NSPM to develop its simulator program and it believes it has the highest quality simulator program in the world. American sees ''nothing in the NPRM that will result in an increase in the quality or effectiveness of the American Airlines training program.'' Similarly the National Business Aviation Association (NBAA) does not think the rule will result in a safety enhancement, stating that, ''there has been no evidence that the current system of certifying and maintaining flight simulator devices has compromised safety in any way.'' The Aircraft Owners and Pilots Association (AOPA) states that the proposed rule ''places an unnecessary regulatory burden on the aviation industry, and it does not address a safety problem or provide a net safety benefit.'' Storm Haven Aviation and a flight instructor make similar comments.

FAA Response: Codifying simulation qualification standards provides for a ''level playing field'' among FSTD manufacturers and sponsors in the United States and a harmonization of interests internationally. Further, these provisions, together with the provision for a QMS, will provide each sponsor a clear understanding of what is required of them for a satisfactory FSTD. The FAA also notes that part 60 is largely a codification of existing practices, and does not impose significantly new burdens. The FAA recognizes the close working relationship that exists between the NSPM and a large portion of the aviation training community. That close working relationship continues with this rulemaking effort and should continue after the rule becomes effective. The FAA believes that the rule will result in an increase in the quality and effectiveness of flight training programs without an undue burden on the industry.

Withdraw NPRM

Air Transport Association (ATA) requests the immediate withdrawal of the NPRM and the formation of an industry-government advisory committee to develop a new proposed rule. In support of this request, ATA states five general concerns with the NPRM:

1. If published as currently written, the NPRM would eliminate the use of a significant number of simulators until they could be qualified or replaced.
2. The proposed rule ignores harmonization efforts between the FAA, the JAA, and the simulator industry.
3. The FAA currently is revising Subparts N & O of FAR Part 121, which deal directly with crew training and the practical use of FSTD. However, the NPRM overlaps and implicates training requirements, and thus it is impossible to determine the overall impacts of the NPRM until the training requirements of Subparts N & O are revised or clarified.
4. The NSP, or each responsible TPAA, would have to be manned on a 24 hour/7 days per week basis to administer the proposed FAR Part 60 requirements in order to prevent unnecessary FSTD downtime.
5. The NPRM places a severe financial burden on U.S. airlines. The cost of the NPRM is not justified by its benefits.

Several other commenters, including Bombardier, FedEx, American Trans Air, TWA, Continental, and DHL agree with ATA's position that the NPRM should be immediately withdrawn and that an industry-government advisory committee should be convened to develop a new proposed rule. Other commenters did not specifically cite the ATA position, but did suggest that a more effective rule would be achieved through government and industry collaboration.

FAA Response: Rather than withdraw the NPRM, the FAA established the ARC. The overwhelming majority of the ARC members, including ATA members and an ATA representative, participated in the development of recommendations to the FAA. As proposed in the NPRM, each currently qualified FSTD will continue to be evaluated against the criteria current at the time of that FSTDs original evaluation (67 FR 60291). No currently qualified FSTDs will be disqualified because of the new part 60 evaluation requirements. Therefore, the FAA does not expect that anyone will be ''driven back into the airplane'' for training, testing, or checking because of the part 60 final rule.

In addition, the standards contained in the final rule have been modified so they are more in line with ICAO and JAA standards. Also, as mentioned previously, the FAA is continuing its efforts to achieve the desired level of harmonization. The FAA would like to note that part 60 is not interdependent with and does not overlap the rulemaking effort to revise 14 CFR part 121, Subparts N and O. The part 121, Subparts N and O rulemaking deals directly with flight crewmember training and the practical use of FSTDs, while part 60 deals with the standards for FSTD qualification and evaluation.

Cost of the Proposed Rule

A group of commenters cite cost as the reason the NPRM should be withdrawn. AOPA states that the proposed rule places an unnecessary regulatory burden by imposing a large cost without properly identifying the cost impact. TechniFlite explains that with the cooperation of the FAA and industry, initiatives can be taken to make significant reductions in the cost of simulators thereby making simulators more available to the broader needs of the industry. Professional Instrument Courses believes that the proposed rule would add needless expense to their company with no gain in the quality of safety of their program and would put their successful 22-year-old instrument flight training company out of business.

FAA Response: The FAA continues to believe that training in an FSTD is most effective when the FSTD closely matches the performance and handling characteristics of the aircraft being simulated. Accordingly, training and checking activities should be accomplished only in those devices that are objectively and subjectively evaluated. The rule creates no new technical requirements for qualification of the basic levels of FTDs. The NSPM has maintained an open and continuous dialogue with aircraft simulator manufacturers and users. This dialogue continues to enhance the quality of simulation, improve the evaluation of simulation devices, and reduce the costs of acquiring, evaluating, and using these devices for flight crewmember training and checking. It is the FAA's intent to maintain this on-going effort.

Advisory Circulars vs. Regulations (Appendices A–D)

Three commenters disagree with including the advisory language that currently exists in the Advisory Circulars (ACs) for airplane simulators and flight training devices in the proposed rule. Delta states that the advisory language is very lengthy and detailed and that after incorporating this language into the rule, the FAA and users will need to strictly abide by it and any changes would need to go through a lengthy revision process. Regional Airline Association (RAA) says the proposed QPS appendices are written as ''engineering standards,'' as opposed to performance standards. RAA believes the FAA should adopt performance based regulations whenever possible because they allow for flexibility and freedom for innovation. RAA states its concern that even seemingly minor requests for deviations from the QPS appendices content will require that operators/owners petition the FAA for deviation approval, a process it says takes weeks and most often months for approval. In addition, RAA notes, ''no specific instances of the proposal were mentioned as to industry's failure to constructively use and follow the content of the AC's.'' FSI says the NPRM preamble incorrectly explains that the FAA is proposing to remove the technical requirements from part 121 and place them in the new part 60. FSI maintains that these requirements have always been advisory and not regulatory, and recommends that the FAA clearly acknowledge that a major purpose of this rulemaking is to make previously advisory material mandatory.

The National Association of Flight Instructors (NAFI) agrees completely with moving the requirements into the proposed rule. It applauds and unequivocally supports the FAA's efforts to make these requirements regulatory rather than advisory.

FAA Response: The FAA disagrees that the QPS appendices are written as an engineering standard, rather than as a performance standard. The QPS appendices are a codification of existing advisory material that was used to determine whether or not a specific FSTD met FAA requirements. These standards have always been ''performance standards,'' involving an objective and subjective evaluation of the device in comparison to the aircraft. There has never been a requirement for an ''engineering standard'' in simulation beyond that which is necessary to meet the stated performance objectives. Part 60 does not change these requirements.

The decision to codify FSTD qualification requirements was made after careful consideration of facts and circumstances. This decision is not a result of ''industry's failure to constructively use and follow the content of the AC's.'' Rather, the FAA has determined that continued oversight through the issuance and application of ACs is not appropriate. Executive Order 12866 states ''(e)ach agency shall draft its regulations to be simple and easy to understand, with the goal of minimizing the potential for uncertainty and litigation arising from such uncertainty'' [section 1(b)(12)]. Additionally, Section 5–1 of FAA Order 1320.46A, ''Advisory Circular System,'' states that

> AC's are not regulations and may not impose or lessen a burden on anyone, nor have a mandatory effect. AC's may not be used to add to, interpret, or relieve a duty imposed by a Federal Aviation Regulation (FAR). Advisory circulars may set forth 'acceptable means' or 'methods of compliance' with a particular FAR. However, the language used to explain the compliance methods in the AC must not imply that it is the only or minimum acceptable means, nor require other methods of compliance to be 'equivalent' to the one described in the AC.

In order to be legally valid, a regulation must establish a requirement or standard that is sufficiently clear to persons required to comply with it so that they can have a reasonable understanding of what is expected of them, without having to resort to material not published in the rule. In other words, the regulation must be able to stand on its own. The regulations that support the current set of ACs describing simulation standards are found in 14 CFR part 121, Subpart N and, since 1980, part 121, appendix H. However, in neither of these rule sections is the regulatory language sufficient to meet the requirement that persons would not have to resort to additional material not published in the rule. Additionally, while FSTD qualification standards have been contained in ACs, they have been treated as though they were regulatory. Clearly, this practice is not in compliance with either the EO or the FAA Order. Therefore, the development of a rule for the qualification of FSTDs was imperative.

Due to a comment, the FAA recognized that it did not have rule language in the part 60 NPRM that proposed to remove technical FSTD requirements from part 121. In the final rule, we have removed from part 121 those technical FSTD requirements that are in part 60. It was an administrative oversight that we neglected to propose removing technical FSTD requirements from part 121, but we were clear in the NPRM that part 60 would serve as the regulatory part for FSTD qualification and evaluation.

The FAA is aware that there are differences in the application of what may be authorized under an advisory circular concept and what may be required or authorized under a regulatory concept. However, the language of this final rule has been carefully constructed to accommodate ''operations and engineering judgment'' when applying flight test data to objective test requirements and tolerances. The goal was to allow the logical application of this judgment while, at the same time, not allow complete ''free play'' with FAA standards.

QPS Document

FSI states ''The Qualification Performance Standard (QPS) contains regulatory language that appears only in the QPS. The combination of information, data, and regulatory language will create misunderstanding between FAA and the industry.'' In addition, FSI believes that the ''tabular technical requirements in the QPS are also confusing due to the outdated condition of the tolerances and test descriptions.'' FSI further states, ''The most glaring of the unrealistic requirements in the QPS is the motion system 'specifications.' In the past when rules have attempted to define hardware and software simulator system 'specifications,' the rules became obsolete before they were published.'' Therefore, FSI recommends the QPS define tolerances, not design specifications.

TWA states that the ''direct quote or a paraphrasing of the Part 60 rule'' in the QPS documents is sometimes very confusing and sometimes they are in disagreement with the rule. TWA recommends removing them to make the QPS smaller and easier to use.

FAA Response: The FAA has revised the final rule to eliminate the motion system standards published in the NPRM. Additionally, the FAA has removed the part 60 rule language from the QPS appendices to avoid confusion and repetition. The FAA recognizes the necessity of additional modifications to certain sections of the QPS appendices that are beyond the scope of the NPRM. The FAA is continuing to revise the QPS, and any recommendations for changes to part 60 will be available for public review and comment as an NPRM prior to being adopted. It is the FAA's intent the part 60 final rule not be effective until the first revision of the QPS appendices have been published in the **Federal Register** as a final rule.

Related to N&O Rulemaking

FSI notes that the preamble states ''In a separate rulemaking project that will follow this proposal, other portions of appendix H would be moved to a new subpart of part 121, and appendix H would be deleted.'' Concerned that timely action may not be taken and considering the length of time for rulemakings, FSI requests that the FAA make the necessary and proper conforming changes now and amend § 121.407 and delete appendix H.

Air Transport Association (ATA) states that this NPRM and subparts N and O of part 121 are very closely linked, and ''recommends that any proposed changes to Subparts N and O be coordinated with this rulemaking and, in particular, that any changes to Subparts N and O precede this rulemaking.''

FAA Response: The FAA recognizes 14 CFR part 121, appendix H has both technical requirements and operational authorizations. By ''removing and reserving'' certain sections in the current part 121, appendix H, (*i.e.*, those sections dealing with technical requirements of FFSs) without canceling the entire appendix, the remaining sections of appendix H will continue to serve operational necessities until such time as appendix H is cancelled. The requirements contained in 14 CFR 121.407 are not contrary to the requirements contained in part 60.

Changes to 14 CFR part 121, Subparts N and O will include references to FSTDs, but only to the extent of defining what tasks may be authorized for part 121 flight crewmembers in a given level of FSTD. Part 60, including all of the evaluation and qualification requirements, is not dependent upon or interdependent with, any future Subparts N and O changes that may be proposed or adopted.

Harmonization and ICAO

Many commenters address the issue of harmonization of FAA's FSD qualification standards with those of ICAO and the JAA. Boeing, United, Continental, American, FSI, FSB, NLX, CAE, and Eclipse are concerned that the NPRM does not include recent industry efforts to harmonize the latest regulatory standards for the qualification of FSDs. Delta commented that an opportunity to revise the rule would provide a chance to define an improved revision process for the advisory material and to incorporate harmonization with the ICAO Manual of Criteria for the Qualification of Flight Simulators. Eclipse states that the ICAO Manual of the Criteria for the Qualification of Flight Simulators, 2nd edition, which was endorsed by the FAA, should be incorporated into the QPS appendices. Continental states that a lack of harmonization will impose a financial burden on the carriers when they sponsor or use FSDs that are currently approved under the ICAO standard. American states that, instead of matching the ICAO criteria, the NPRM appendices contain a version of the criteria contained in the Draft AC 120–40C, modified with additional requirements. American states that since the FAA is on record as planning to eventually adopt the ICAO criteria, there is no reason not to do it in this rule.

NLX comments that although updating the QPS should not require the lengthy time frames experienced with changes like AC 120–40C, the industry has no assurance this will occur. NLX is concerned that after the rule is in place, updating the QPS will result in an extended time frame of possibly several years during which the industry must comply with the obsolete requirements. NLX states that, without some guarantee that this will not be the case, it recommends that the QPS be updated to reflect the latest JAR/ICAO material before the rule is put into effect.

FSB states that the proposed FAA standards are significantly different from the JAR STD 1A requirements, which are stricter. FSB urges the FAA to reconsider the timetable so as to include the recent updates to the ICAO 9625, JAR STD 1A and to remove changes to the motion standards in appendix A, which were vigorously disapproved by industry when added to the AC 120–40C. If the plan is to go forth with the rulemaking process with the existing differences, FSB strongly suggests that the FAA comment on an implementation plan and timetable for complete harmonization to take place.

United comments that the proposed standards decouple the functional and subjective test requirements from the FSD qualification level and require an FSD qualification task list without offering any criteria against which such tasks would be approved. United states that this is a break from past FAA practice, from the current JAA practice, and from the recommendations in the ICAO Manual.

Boeing comments that considerable industry time and expense has been expended over the past years to harmonize the standards. The results of these efforts have been incorporated into the ICAO Manual and are in the process of being incorporated into the JAA's JAR–STD 1A document, *Aeroplane Flight Simulators.* In addition, Boeing states, a set of ''best practices'' advisory material has been developed and is being included in both JAR–STD 1A and ICAO Document 9625. According to Boeing,

> The latest standards and best practices material has not been included in the FAA's proposed Part 60. If the NPRM were to go forward as proposed, there would be two different sets of standards for the regulated public to comply with. This would impose an unnecessary adverse economic impact on the industry, including the data provider. We consider that the proposed Part 60, as currently structured, would be unacceptable to the industry, and both difficult and costly for the FAA to administer. We strongly recommend that the FAA revise the NPRM prior to any further action.

Boeing includes in its comments an extensive history of the harmonization efforts and detailed suggestions on how to harmonize the NPRM with the JAA and ICAO material.

CAE comments that ''The United States has been a leading voice in encouraging other countries to adopt and maintain international standards; implementation of Part 60 regulations that are inconsistent with ICAO standards would undermine the U.S. Government's credibility in making these arguments to other countries.''

Several commenters disagreed with the statement in the NPRM paragraph on ''International Compatibility'' that the FAA had identified ''no differences'' between the proposal and the ICAO Standards and Recommended Practices. Thales Training and Simulation states ''where there are major deviations between the proposed Part 60 standards and the latest agreed ICAO standards, the motion requirements being a good example, industry needs to be aware of how the Part 60 standards will evolve towards the ICAO standards. It is unreasonable for industry to be expected to expend major investment to meet a standard that may only be in existence for a few months.'' CAE states there are several instances in which the proposed rule significantly differs from ICAO standards, including areas such as latency, tolerances, organization of validation test cases, numbering, and definitions. CAE recommends that the FAA identify and clarify the differences between the two standards and confirm whether the ICAO standards could be used as an acceptable alternative for obtaining FAA qualification of an FSD. ATA states that the rule should not be published until the QPS documents are updated to reflect the ICAO guidance.

FAA Response: The FAA recognizes it is necessary for simulator qualification technical requirements to reflect international standards as appropriate. The FAA plans to harmonize the simulator qualification technical requirements as part of the first revision of the QPS appendices.

Impacts on General Aviation

Several commenters are concerned about the impact of the proposed rule on the use of FSDs by general aviation, particularly with respect to Level 1–3 FTDs.

FSI states that the NPRM preamble language stating that ''other certificate holders may seek approval to use the same FSD'' seems to eliminate non-certificate holders, such as corporate or private operators under part 91, from doing the same thing. FSI comments that fractional ownership operators would be precluded from being sponsors by the same wording.

Fidelity comments that due to the recent advent of affordable, significant computing power, general aviation is able to use advanced simulation and that part 61 allows for a significant usage of FSDs. Fidelity comments that the proposed rule is unclear as to whether a sponsor must be a certificate holder in order to use the FSD for part 61 training.

NAFI is also concerned about the potential impact of the proposed rule on general aviation flight instruction. NAFI states that the required level of actual aircraft emulation for high-end, full motion simulation should be vastly different from general aviation flight training devices, and this proposed rule appears to lump them together. Specifically, NAFI states, smaller operators with less sophisticated FTDs will be unnecessarily burdened by the required establishment of the QAP and daily inspections.

National Air Transportation Association (NATA) comments that the proposal seems to give consideration only to training that targets commercial and high-end corporate aircraft operators and makes no attempt to provide a framework that enables the greater deployment of these devices for light general aviation and corporate aircraft. Furthermore, NATA states that placing the responsibility for qualification of FSDs and FTDs with the National Simulator Program Office will limit the ability of the aviation industry to use such devices.

FAA Response: Only those persons required to have an FAA approved flight training program or otherwise authorized under § 60.7 are eligible to sponsor an FSTD. The FAA acknowledges that Fractional Ownership Program Managers are required by § 91.1073 to have an FAA approved flight training program. However, this requirement did not exist when the proposed part 60 was being drafted because the fractional program regulations had not been finalized. It is beyond the scope of this rulemaking project to include Fractional Ownership Program Managers as eligible FSTD sponsors. Therefore, the FAA will initiate a separate rulemaking project to incorporate Fractional Ownership Program Managers into the class of persons eligible to sponsor FSTDs. The FAA does not intend to allow other part 91 operators to be FSTD sponsors because they are not required to have an FAA approved flight training program.

The FAA has not included the qualification requirements for Level 2 and 3 FTDs in this final rule. The FAA has determined that these devices should continue to be monitored and qualified under advisory material. The FAA has posted, for comment, an Advisory Circular providing guidance about the evaluation and approval of Basic Aircraft Training Devices and Advanced Aircraft Training Devices. To view and comment on the Advisory Circular go to the following Web address: *http://www.faa.gov/aircraft/draft_docs*

Conforming Changes (Parts 61, 63, 125, 137, 141, and 142)

FSI states that training, testing, and checking requirements of parts 125 and 137 may be accomplished in FSDs, but there is no reference to these parts. FSI suggests that the FAA clearly state the permitted uses of FSDs.

FSI, NATA, University Aviation Association (UAA), and Purdue University comment that the NPRM states that the devices described in § 61.4 may be used only for private pilot certification and instrument ratings. These commenters state that training for a commercial pilot certificate and training under part 141, Pilot Schools, can also be done in an approved training device; they ask the FAA to verify the uses permitted for approved training devices under parts 61 and 141.

FSI states that it is mandatory to withdraw appendix H of part 121 in order for part 60 to be possible. FSI also cites other sections that should be changed (*e.g.*, §§ 121.407, 135.335, 142.59, 141.41, 135.324, 135.321, and 121.402). FSI suggests that the FAA conduct a comprehensive review of all rules that may be in contradiction to part 60 and make the appropriate changes.

FAA Response: The permitted uses of FSTDs for credit purposes (*i.e.*, to meet airmen certification standards or certain commercial operator training requirements) are a topic for a different rule. Part 60 addresses only the requirements for the evaluation and qualification of FSTDs. Section 61.4 does not state that FSTDs may only be used for private pilot certification and the instrument rating. Rather, § 61.4(a) specifically refers to ''any training, testing, or checking requirement under this chapter.'' ''This chapter'' refers to Chapter I, Subchapter D (Airmen), and specifically, all airmen, certificates, and ratings falling under the purview of part 61, Certification of pilots, flight instructors, and ground instructors.

It is not necessary to withdraw all of 14 CFR part 121, appendix H because of part 60. As stated earlier, the FAA is ''removing and reserving'' appropriate sections of appendix H to eliminate those technical requirements that have been moved into part 60 and is retaining those operational requirements in appendix H until such time as those sections are combined in a subsequent rulemaking effort and appendix H is cancelled. Additionally, the requirements contained in §§ 121.407, 135.335, 141.41, and 142.59 are not contrary to the requirements contained in part 60. The FAA has reviewed all other sections to see if any additional conforming changes need to be made because of part 60.

In addition, the FAA has determined that the conforming changes to parts 61, 141, and 142 proposed in the NPRM are no longer necessary since Level 2 and 3 FTDs are not included in this final rule.

Impact on Part 142

FSI states that when part 142 was issued, training centers were given regulatory assurance that if they did certain things, the Administrator was obligated to issue a certificate under that part. FSI believes that for the FAA to propose now that another step is required, *i.e.*, gaining approval as a sponsor, is improper. Also, FSI states training centers were told they would not be required to have any specific relationship with an air carrier, yet under this proposal a training center may have to have an air carrier client as the sponsor of the FSD, for example, to meet the minimum annual usage requirement.

FAA Response: The FAA eliminated the hourly usage requirements for sponsor qualification. The FAA eliminated the proposed requirement for sponsor utilization of additional simulators, except for the initial FSTD to qualify an applicant for a part 142 Training Certificate or the initial FSTD as part of a part 119 FAA-approved flight training program. The FAA has determined that these proposed requirements are not necessary because the requirements for an FAA approved training program are sufficiently robust to ensure safety.

Elimination of Exemptions

AOPA states that the proposal places additional regulatory burdens on the entire aviation industry, including small pilot training centers, simply to allow the FAA to rid itself of the burden of issuing exemptions to part 125 and 135 operators who wish to use Level A–D flight simulators under part 121, appendix H. Instead, AOPA suggests making the appropriate changes in parts 125, 135, and 142 by cross referencing part 121, appendix H. According to AOPA, the proposal should then be modified to address only part 125 and 135 operators and Level A–D flight simulators.

FAA Response: The purpose of this final rule is not to relieve the FAA of the task of issuing exemptions. The requirements set out under part 60 are for the evaluation and qualification of FSTDs, a task that the FAA has to perform regardless of whether the device will be used in air carrier operations or not. This final rule codifies existing practices and provides uniform standards for all FSTDs regardless of where they will be used. Authorized uses under any individual part of 14 CFR are contained in the respective part. Therefore, even if a device is evaluated and qualified for certain tasks and maneuvers, the FAA, independent of part 60, will still need to determine whether the device is suitable for use in a particular FAA approved training program.

Comments Regarding Definitions

ATA states that the definition of flight simulator uses the term ‘‘series’’ of aircraft, while the definition of flight training device uses ‘‘set’’ of aircraft. Since proposed § 60.3 does not define ‘‘series’’ of aircraft and since an aircraft series meets the proposed definition for ‘‘set of aircraft’’ and a definition for ‘‘set of aircraft’’ is already proposed, ATA recommends that the term ‘‘series’’ should be deleted and replaced with the term ‘‘set of aircraft’’ throughout the document. In addition, the term ‘‘ground operation’’ should be replaced with the term ‘‘surface operation,’’ since surface operation is utilized in Attachment 3 to appendix A as operational task b. ‘‘Surface Operations.’’ Also, ATA notes that the definition of flight training device uses the term ‘‘full size replica,’’ while appendix B does not use this term in describing the FTD requirements. ATA recommends using the language in appendix B, while Delta suggests using ‘‘realistic replica’’ instead of ‘‘full size replica.’’

CAE states that in the definition of ‘‘evaluation’’ in the use of ‘‘etc.’’ is open to interpretation and should be removed. Likewise, CAE claims that the word ‘‘performance’’ is used in a very general sense in the definition of ‘‘flight test data’’ and in many other places. CAE states, ‘‘Performance in simulators has traditionally meant airplane performance with regard to thrust/drag relationships, climb, range, etc.’’ CAE recommends defining ‘‘Approved data supplier’’ as ‘‘the aircraft manufacturer or other supplier of data acceptable to the NSPM.’’ CAE also recommends defining ‘‘Performance’’ as ‘‘the overall performance of the FSD to include aerodynamic performance as well as flight and ground handling.’’ Additionally, CAE recommends changing the definition for ‘‘flight test data’’ to ‘‘Actual aircraft performance data collected by an approved data supplier during an aircraft flight test program. This includes the aircraft on the ground test data as well as in the air.’’

FSI states that the definition of ‘‘flight experience’’ is at odds with § 61.1 and other parts of 14 CFR. FSI recommends deleting this definition or more accurately defining it.

Boeing recommends changing the phrase ‘‘actual or predicted aircraft performance data’’ in the definition of ‘‘objective test’’ to ‘‘final test or approved aircraft data’’ because it is not clear what is meant by ‘‘actual’’ or ‘‘predicted’’ data. Boeing states that ‘‘predicted data’’ should apply to data that are truly predicted, *i.e.*, data that are estimated for regions of the flight envelope where there are no relevant flight test data (for example, for very high angle of attack), or for a new airplane configuration that has not yet been flight-tested. Boeing believes the definition should exclude engineering simulation data from a simulation that has been flight test updated and that the definition of ‘‘predicted data’’ should not include all aircraft performance data derived from sources other than flight data.

ATA states that the definition of ‘‘Qualification Performance Standard’’ should refer to ‘‘the collection of procedures and regulatory criteria’’ instead of ‘‘the collection of procedures and criteria.’’ ATA further recommends that the definition of ‘‘Qualification Test Guide’’ refer to ‘‘initial’’ evaluation and that ‘‘approved objective data’’ be added to the list of contents. Also, ‘‘MQTG is the reference document for subsequent evaluations’’ should be added to the definition of ‘‘Master Qualification Test Guide.’’

Boeing asks whether ‘‘set of aircraft’’ is a derivative series of models produced by the same manufacturer or does it encompass a class of aircraft, such as a medium twin-engine jet transport? CAE states that in the definition of ‘‘Set of Aircraft,’’ a reference is made to ‘‘handling,’’ when in all previous places ‘‘performance’’ has been used to cover both the conventional aerodynamic performance and handling. To be more consistent, CAE recommends replacing ‘‘handling’’ with ‘‘performance.’’

FSB believes that the term ‘‘Sponsor’’ must be more clearly defined to include who may be or must be the ‘‘Sponsor’’ of a particular simulator (FSD). FSB states, ‘‘There are many proposed references in the NPRM that place a requirement, responsibility, or burden on the actual owner of the FSD that will effectively eliminate the ability to acquire and maintain U.S. certification of the FSD. The overall impact of this NPRM, if adopted without major changes, could potentially eliminate Part 142 Certificate Holders as providers of U.S. certified FSDs.’’ FSB recommends that the entity that is the financially responsible owner of the FSD, and is a certificate holder, must be the sponsor of the FSD. The rule must not disqualify this entity as the sponsor because of arbitrary conditions such as how or how much the FSD will be used as long as the device continues to meet applicable qualification standards.

ATA states that the definition of ‘‘Subjective test’’ is inconsistent with appendix A, Attachment 3, Item 3, Simulator Systems. CAE states that in the definition of ‘‘Subjective test,’’ it is stated ‘‘FSD performs and handles.’’ CAE recommends changing the definition of ‘‘Subjective test’’ as follows: ''A qualitative comparison to determine the extent to which the FSD performs like the aircraft being simulated.''

CAE states, in reference to the definition for ''Training Program Approval Authority,'' that parts 121, 135, and 142 are currently established as to who may approve training programs. In CAE's opinion, no new authority needs to be introduced or created by part 60.

FAA Response: The FAA wishes to clarify the distinction between a ''series'' and a ''set of aircraft.'' An example of ''series'' would be the Boeing B–737 aircraft, where –200 is a ''series'' (*e.g.*, –222, or –252, or –265 are part of the –200 ''series'') as opposed to a –300 aircraft in the same make and model (Boeing, B–737 line). ''Set of aircraft,'' is defined as ''aircraft that share similar handling and operating characteristics and similar operating envelopes and have the same number and type of engines or power plants.'' While aircraft in the same ''series'' can certainly be described as being within the same ''set of aircraft,'' it is not true that aircraft that are legitimately in the same ''set'' are necessarily in the same ''series.'' For example, we can consider the Boeing B–737–222, the Boeing B–757–252, and the Embraer EMB–170–100 within the same ''set'' of aircraft (*i.e.*, they share similar handling and operating characteristics and similar operating envelopes and have the same number and type of engines); however, it is obvious that these three are not the same ''series'' of aircraft. A ''series'' of an aircraft make and model is not the same as a ''set'' of aircraft.

The FAA has clarified the definition of ''set of aircraft.'' In response to Boeing's question about set of aircraft, the FAA notes that while a ''set of aircraft'' may include a derivative series of models produced by the same manufacturer, the definition does not restrict ''set'' to derivative series. Rather, ''set'' encompasses aircraft with similar handling and operating characteristics, a similar operating envelope, as well as the same number and type of engines or power plants as in the commenter's example of a ''medium twin engine jet.''

In the NPRM, the FAA used the terms ''ground operation'' and ''surface operation'' interchangeably. The FAA recognizes that this could be confusing and has clarified the final rule to use the term ''surface operations'' throughout the document to be consistent with international harmonization.

In the final rule, we changed references from ''full size replica'' to the more simple term ''replica'' and clarified the definition by changing the phrase ''ground and flight operations'' to ''operations in ground and flight conditions.'' We made a similar change to the definition of ''Flight Training Device (FTD)'' where we used the simplified term ''replica'' instead of the term ''full size replica'' and to the phrase ''aircraft in ground and flight conditions'' where we used ''aircraft operations in ground and flight conditions'' for consistency with the definition of an FFS.

To avoid the confusion of including ''etc.'' in the definition of ''evaluation'' as raised by CAE, we have included ''*e.g.*'' instead so the sentence now reads ''With respect to an FSTD, the qualification activities (*e.g.*, the objective and subjective tests, the inspections, the continuing qualification evaluations) associated with the requirements of this part.''

We have added a definition of ''FSTD Performance'' to read ''The overall performance of the FSTD includes aircraft performance (*e.g.*, thrust/drag relationships, climb, range) as well as flight and ground handling.''

The definition of flight experience is limited to part 60. Therefore, it does not conflict with other parts. The FAA has clarified the definitions of ''flight test data,'' ''objective test'' and ''predicted data'' to be more precise. The FAA notes that the use of engineering simulation, as an engineering analysis tool, may be integrally involved in the development of aircraft performance predictions.

The FAA did not revise the definition of ''Qualification Performance Standard (QPS)'' except to include a reference to appendix E, Quality Management System for Flight Simulation Training Devices. Also, the FAA did not revise the definition for Master Qualification Test Guide (MQTG); however, we did clarify the definition of Qualification Test Guide (QTG). The FAA did not revise the definition of ''sponsor.'' The FAA has not substantively changed the definitions of QPS, MQTG, QTG, and sponsor from the definitions as proposed in the NPRM. However, the FAA has addressed the concerns raised by the commenters by making other appropriate changes to part 60 and the QPS appendices. The definitions of these terms are consistent with the recommendations made by the ARC.

The FAA has reformatted the material originally located in appendix A, Attachment 3. That material is now found in a table entitled ''Table of Functions and Subjective Tests,'' and is consistent with the title of the appendix. Additionally, the FAA has clarified the definition of ''subjective test.'' The changes are consistent with the ARC recommendation.

The FAA is not proposing to establish a new entity to approve training programs. The term Training Program Approval Authority (TPAA) was introduced as a ''shorthand'' way of listing the various combinations of titles of those who are currently authorized to provide such approvals; *i.e.*, ''Principal Operations Inspectors (POI), Training Center Program Managers (TCPM), or Flight Standards District Office (FSDO) operations inspectors assigned the duties of training program oversight and approval.'' The FAA has not changed the definition of TPAA as proposed in the NPRM.

Comments Regarding Abbreviations

CAE suggests adding new abbreviations to differentiate between airplanes and helicopters, as follows:

AFSD—Airplane Flight Simulation Device
HFSD—Helicopter Flight Simulation Device
AFTD—Airplane Flight Training Device
HFTD—Helicopter Flight Training Device

FAA Response: The FAA has not added these abbreviations and does not consider them necessary for clarity.

Comments Regarding the Applicability of the Part 60 Rule and the Use of Flight Simulators

Use of FSTDs

ATA states:

> This rule provides regulatory information and further guidance to those who wish to become Sponsors of one or more FSDs and how a Sponsor must act to qualify and maintain the qualification of an FSD. In addition, it provides the technical requirements for an FSD to be awarded a specific level of qualification. This rule should not address how an FSD is used. That information is contained within other parts of this Chapter and should be between the Training Program Approval Authority (TPAA), the Sponsor, and the user.

United agrees with ATA's recommendation to remove the words ''and use'' from the title of part 60 and § 60.1(a).

FAA Response: This rule is not intended to infringe upon the FAA designated TPAA. The phrase ''and use'' in the title of the part 60 rule has specific and limited application: (1) To the ''use'' requirements for simulator sponsorship; (2) to the ''use'' limitations with missing, malfunctioning, or inoperative components; (3) to those for whom ''use'' of the FSTD is authorized and for whom its ''use'' may apply; and (4) to those ''uses'' of the FSTD for which representatives of the NSPM have evaluated and qualified a specific FSTD and may be referenced in the Statement of Qualification, Non-Qualified Maneuvers, Procedures, and Tasks (as listed by exception to those maneuvers, procedures, and tasks listed in the subjective evaluation contents found in Attachment 3 to each of the applicable QPS appendices). Examples might include a circling approach; windshear training in accordance with 14 CFR 121.409(d); Surface Movement and Guidance System (SMGS); or Weather Radar System. These ''uses'' are not to be confused with the uses for which a specific FSTD may or may not be approved by the FAA designated TPAA.

Qualified FSDs

ATA states:

* * * this applies to ALL FSDs. It does not address the use of FSDs that are not qualified by the FAA but are used as part of an approved training program even though no training credits are granted. For example, one carrier has used their B727 CPT and a DC–10 Level 4 equivalent device for training in an approved training program even though neither was qualified by the NSP * * *. This paragraph should be changed to allow for the use of non-qualified FSDs as training aids in an approved training program. This is then under the jurisdiction of the POI. This could be done in paragraph 1.1, definitions, to exclude unapproved devices from the definition of FSDs. Similarly, the rules, requirements, and penalties associated with using an FSD that is not qualified should themselves be clarified to allow for the use of non-qualified FSDs with TPAA approval.

FAA Response: The FAA recognizes the functionality of many pieces of equipment (*e.g.*, FSTDs, books, Computer Based Training Aids) that can be used in an effective pilot or other flight crewmember training program. This final rule does not prohibit a POI from authorizing the use of any training aid that will provide valuable instruction to flight crewmembers. While these devices can be authorized for use in a training program, only those devices that meet the definitional requirements in part 60 (*i.e.*, that have been evaluated and found to be qualified at a stated level) can be referred to as ''FSTDs.'' To be called an FSTD, and to fall under this part, the device has to meet the stated definition and evaluation requirements. Other equipment that may or may not be found to be suitable for use in a pilot training curriculum, whether or not that curriculum is approved by the FAA, may not be called FSTDs (either FFSs or FTDs) when the device being referenced does not meet the definition or evaluation requirements of an FSTD.

Clarification of Terms

FSI states that the preamble statement regarding ''operating experience'' makes it unclear what is prohibited in an FSD. FSI recommends that the FAA list the sections of 14 CFR for which an FSD may not be used.

Two commenters address the term ''each person'' in paragraphs (b) and (c). JAA states, ''It is still difficult to understand why an individual of an FSD user organization, which does not (necessarily) own the FSD, would be responsible for the quality of the FSD and not the FSD operator.'' CAE recommends that in paragraph (c) ''each person'' should be the sponsor or a person leasing the equipment.

FAA Response: The FAA did not adopt a specific list of sections in 14 CFR for which an FSTD may not be used. The TPAA determines what the FSTD may be used for on a case by case basis. However, the FSTD may never be used for satisfying the operating experience requirements of § 121.434 or § 135.244.

The term ''person'' is a multiple use term that, in the vernacular, might be read ''the appropriate party.'' It is important to note that the term ''person,'' as used in the referenced sections (*i.e.*, ''each person using'' and ''each person who uses''), is defined in 14 CFR part 1 as ''an individual, firm, partnership, corporation, company, association, joint-stock association, or governmental entity. It includes a trustee, receiver, assignee, or similar representative of any of them.''

Comments Regarding the Applicability of Sponsor Rules to Persons Who Conduct Sponsor Activities Without Being Qualified Sponsors (§ 60.2)

FSI states that, contrary to the NPRM preamble discussion, the issue of a non-sponsor using or allowing the use of an FSD is clearly an administrative rule, not a safety rule; even the discussion uses the word ''inappropriately,'' not ''unsafely.'' FSI further states that the FAA goes on to illustrate in the actual proposed section text with examples of permitted practices rather than listing prohibited practices. FSI recommends that the FAA clearly articulate those practices that are prohibited in the actual text, and accurately discuss applicability of this section to non-sponsors. In addition, FSI states that paragraph (a)(1) adds another step in the process of being able to use an FSD, *i.e.*, separate approval as a sponsor.

CAE states that the use of the term ''causes'' in § 60.2(a) is too general. For example, a technician asked to switch the motion pump on cannot be considered to be the cause for the use of the device for unauthorized training. CAE recommends changing the text to be more specific about the persons to which this rule applies.

FAA Response: The purpose of the rule language in § 60.2(a) is to give the FAA a legal means by which it could charge a nonsponsor with violations of the safety rules if that person inappropriately used or caused the use of an FSTD for the purpose of meeting an airmen certification or training requirement under the Federal Aviation Regulations. The FAA believes that a safety issue could be raised if a non-sponsor uses or allows the use of an FSTD because the quality of the device could be called into question. Therefore, the FAA believes that the prohibition on non-sponsor use of a device is a safety rule and did not adopt changes to this section other than changing the term ''FSD'' to FSTD.''

The FAA does not consider the term ''causes'' in paragraph (a) to be too general. The FAA does not consider someone who merely turns on the hydraulic motion pump to be the person who ''causes'' the use of the FSTD. An example of ''causing'' the use of the device would be someone fraudulently holding themselves out as a sponsor, thereby ''causing'' an unqualified device to be used in an FAA approved training program.

Comments Regarding Quality Management System (§ 60.5)

JAA notes with appreciation that the FAA is introducing a mandatory QAP. JAA suggests making the QAP into a full Quality System (QS) and adding the components that are found in the required JAA QS.

CAE supports the requirement that each sponsor implement a QAP, but believes that the sponsor should be allowed to use its own quality assurance processes to meet the NSP standards. CAE states, ''It would be inefficient and costly to force all sponsors to adopt quality assurance measures based on a specific, FAA-selected QAP as described in Section 60.5. Companies must be given the flexibility to implement a QAP that is consistent with their operations and business practices and plans.''

FAA Response: To harmonize with ICAO, the FAA changed the title of § 60.5 Quality Assurance Program to Quality Management System (QMS). The new title is not just a name change, but is in fact a complete revision of the quality assurance program that is significantly less costly and onerous than what the FAA originally proposed. The specific requirements for the QMS are outlined in a new appendix to the QPS requirements entitled Appendix E, Quality Management Systems for Flight

Simulation Training Devices. This new appendix does not add new requirements outside the scope of the requirements proposed in the NPRM, but expands on the rule language of § 60.5, Quality Management System.

The requirements contained in appendix E have been carefully designed to allow each FSTD sponsor the capability of using its own QMS process to meet the described standards.

Justification for Quality Programs

ATA does not oppose the concept of a QAP, but states that the FAA has not offered any evidence that there currently exists a quality control problem in the way part 121 operators maintain their FSDs. For example, an analysis of nine years of FAA evaluations at one major carrier yielded a discrepancy rate of 2.8 discrepancies per evaluation. ATA believes the other regulations would allow the NSPM to take action against an operator that does not meet minimum quality levels. ATA and FedEx believe the incremental benefit of creating and administering a QAP will not be worth the cost of doing so. NLX makes a similar comment, citing the present state of the airline industry.

FAA Response: The FAA did not propose to incorporate a quality assurance program, which differs from a traditional ''quality control'' program, to rectify bad or deteriorating maintenance practices for individual FSTDs or at specific FSTD sponsor locations. As described in the original NPRM, the basic precept of the program is for the sponsor ''to say what it does; to do what it says; and to keep good records.'' The QMS program will require each sponsor to develop a working knowledge of the requirements of part 60 and the relevant QPS document. This knowledge will be demonstrated to the NSPM through a written description of how, how often, when, where, and with what resources the sponsor's organization plans to comply with the requirements of part 60.

By having this written description, the NSPM and the sponsor will be able to compare what is actually done with what the sponsor says is done regarding FSTD repair, modification, regular maintenance, and daily readiness. The FAA has determined that the standardization required for such satisfactory comparisons will add to the already existing efficiency and effectiveness of the FSTD—regardless of the level of that existing efficiency and effectiveness. Through the added reliability of the maintenance and the daily readiness provided by a sound QMS program, any flight crewmember training, evaluation, and flight experience should be able to be accomplished with less interruption, more accuracy and more reliability. The QMS program will help provide consistency in the current training and the availability of repetitive practice in the desirable environment of accurate and realistic simulation. The FAA continues to believe that under such circumstances the students will more easily retain the knowledge and skills learned through such an increase in reliability and through such uninterrupted training.

There are three areas of significance in this regard:

The first, in two parts. Part one is an already existing precedence for the regulatory requirement for a QMS program found in the regulations covering air carrier aircraft maintenance. Part two is that several air carriers currently participate in voluntary quality programs (involving FFSs and FTDs) due to their participation in the FAA's Air Transportation Oversight System (ATOS).

The second area is that of existing FSTD sponsors already obtaining advantages from either developing an FSTD QMS program or contemplating doing so. One major airline, in comments made to this NPRM, stated that while reviewing the proposed QMS program requirements they recognized that ''the proposed (QMS) did provide a vehicle for developing a more efficient management tool for simulator maintenance and control.''

The third area is one of international perspective. The FAA has not noticed that many of the world's regulatory authorities are beginning to embrace QMS programs or quality management systems as a means of conducting their regulatory responsibilities. Example of such regulatory authorities include the individual regulatory authorities in Europe, under the auspices of the European Aviation Safety Authority (EASA) and several regulatory authorities in the Pacific Rim (the Australian CAA and the Singapore CAAC are two examples), who are aiming to pattern their systems after that of the JAA. Additionally, if FAA requirements are to be truly ''harmonized'' with the JAA, then it must be noted that the JAA's JAR–STD–1A document, *Aeroplane Flight Simulators*, requires an FSTD operator to have, and operate under, a quality management program, which is far more demanding than the QMS that we adopted under part 60.

Cost Consequences of Quality Programs

RAA requests the removal of the proposed QAP requirement from the final rule. RAA states that the FAA has made no effort to evaluate the necessity or effectiveness of the proposed QAP. RAA believes the QAP would require airline operators to maintain technical staff on site, which would be particularly cost prohibitive for regional airline operators who often buy time on simulators at distant and even foreign locations. TechniFlite makes a similar comment. If the FAA retains the requirement, RAA suggests allowing the owner-operator to designate a simulator evaluator or to outsource QAP duties.

FAA Response: Neither the original NPRM nor the revised wording in the final rule would require an airline to maintain their own technical employees at the FSTD site, if that airline is using another sponsor's FSTD, for QMS issues any more than the current practice of arranging with another party to provide for maintenance, upkeep, modification, evaluation, evaluation scheduling of an FSTD it sponsors. In either case, the sponsor would be the responsible party concerning issues with the FSTD that relate to technical aspects or to the QMS program.

Six Month Time Limit

UPS objects to the 6 month time limit for submission and approval of a QAP, stating that the NSPM would have an influx of approximately 66 proposals from sponsors to review, comment and approve within that timeframe. Also UPS states that 6 months is an insufficient amount of time for UPS to develop and implement a program that would meet the requirements. UPS recommends an 18 month timeframe, 6 months to submit a proposed program, 6 months for the FAA to review and approve, and 6 months for the sponsor to implement the program. American makes a similar comment. ATA suggests a longer timeframe, one year for submitting a proposal, 6 months for the FAA to review and approve, and one year to implement and audit the QAP.

FAA Response: The FAA has revised this time frame to 24 months. The FAA has determined that this is a sufficient amount of time to implement the QMS.

Dry Lease of Simulators

FSI suggests a problem with the concept of a sponsor for operators who dry lease flight simulators that are used by several air carrier certificate holders. FSI states, ''Under the proposed concept, quality would be assured for only one (sponsor) user, but not for other users.'' FSI believes that the

purpose of a QAP should be to ensure that any training provider (*i.e.*, not just the sponsor) is capable of providing FSDs that continually meet the training, testing, checking, and experience requirements of its client's FAA-approved flight training programs. FSB makes a similar comment, stating, ''Particularly in a part 142 operation, this would result in each device within a single facility being subject to a different Sponsor's QA program.'' In this situation FSB believes the owner/certificate holder should qualify as the sponsor, even if they don't otherwise meet the sponsorship qualifications, because they have ultimate responsibility for the devices under the QAP.
regarding sponsor qualification requirements to address the concerns and recommendations raised by commenters. The QMS program assures that any given FSTD continually meets the training, testing, checking, and experience requirements of the respective FAA-approved flight training program in which it is used.

Conflict With Other Quality Programs

ATA and United comment that inclusion of this quality program places airlines under two dissimilar quality programs; that required by § 60.5 and the Air Transport Oversight System (ATOS) item 4.2.8, Simulators/Training Devices. Since the goal of these two quality requirements are the same—system safety—ATA and United suggest that these two quality program requirements should be appropriately harmonized so that a sponsor now subject to part 60 and ATOS will be required to meet the standards of only one FSD quality program.

FAA Response: The FAA has revised the ATOS inspection checklists and eliminated the Airworthiness SAI/EPI components for an FSS or an FTD inspection to avoid different quality management programs for aircraft simulators. The changes to the ATOS program checklists will become effective at the same time as this final rule.

Conflict Between NPRM Preamble and Rule

Several commenters address an inconsistency between the preamble discussion of proposed § 60.5 and the rule text itself. Paragraphs (b) and (d), as described in the preamble, do not appear in the rule text.

FAA Response: The FAA recognizes that an error occurred with the original publication of the NPRM. We removed paragraph (d) that appeared in the NPRM and incorporated the requirements of that paragraph into § 60.9 in the final rule. The FAA has reinserted as § 60.5(d) the correct paragraph (d) that was described in the NPRM preamble. This paragraph reads the same as a similar paragraph published in the NPRM under § 60.29(b).

Location of Simulator

ATA comments that the paragraph described in the preamble that addressed the location of the simulator would be impossible to comply with. ATA cites as an example, an operator who sponsors a foreign owned simulator located in an area of the world where it bases pilots. It is cost-effective to use that simulator rather than bring pilots back to the U.S. for training. ATA states the paragraph would require operators to impose a QAP on the foreign simulator owner, which would be impossible for the FAA to enforce. Similarly, FedEx believes the requirement should not appear in the final rule or should be modified to facilitate the use of foreign simulators.

FAA Response: Prior to the use of any FSTD, regardless of its location (domestic or foreign), the certificate holder is responsible for determining that the FSTD meets the appropriate training program requirements and that supplemental ''differences'' training is accomplished to accommodate any differences that may exist. Similarly, the certificate holder is responsible for ensuring that the current maintenance and operational status of the FSTD is such that the planned activities can be successfully accomplished or other arrangements are suitably made. This level of familiarity with the FSTD and this level of interaction with the owner/operator of the FSTD should certainly support the QMS program requirements. The FAA has revised the requirements so that when a sponsor includes a ''foreign simulator'' (*i.e.*, one maintained by a non-U.S. certificate holder) under its sponsorship, the sponsor will continue to be responsible for the QMS program for that simulator; however, if that foreign simulator is maintained under a QMS program accepted by that foreign regulatory authority and that authority and the NSPM have agreed to accept each other's QMS programs (*e.g.*, QMS programs approved by the Joint Aviation Authorities of Europe), no additional requirements must be met. Alternatively, if that foreign simulator is not maintained under a QMS program accepted by that foreign regulatory authority or that authority and the NSPM have not agreed to accept each other's QMS programs, the sponsor then will be required to reach an agreement with the NSPM regarding those aspects of the sponsor's QMS program that may be met by the sponsor in regard to this specific FSTD.

Appeal Process and Determination of Emergency

ATA believes the final rule should include another paragraph described in the preamble, but not included in the proposed rule, which addressed an appeal process for sponsors who disagree with an FAA requirement to modify a QAP. Boeing, CAE, and FSI make similar comments. FSI requests more specific statements on how the determination of an emergency would be made and whether any sanctions would apply to just one FSD or all FSDs operated by the sponsor.

FAA Response: As stated earlier, the FAA has now included the material that was referenced in the original NPRM preamble language but which was inadvertently omitted in the originally proposed rule language. The FAA is reluctant to provide a list of what might constitute an ''emergency'' in that all such possibilities simply cannot be accurately listed. The purpose of this rule is to provide for FSTDs that meet the established criteria to allow flight crewmembers to acquire proper and complete training, testing, checking, and experience for the particular aircraft for which they will be or are type rated. While it is true that the FAA may have the authority to take certificate action or seek monetary penalties for violations of the rules, or seek to remove the qualification of an FSTD, or disqualify an FSTD sponsor from sponsoring FSTDs, these types of actions are a last resort taken only when absolutely necessary. When, how, to what, and to whom any such sanctions might apply would be governed by the circumstance, and therefore, the FAA is unable to provide specifics for such possibilities.

Quality Program Guidance

ATA comments that neither the rule nor the QPS provide information on how the QAP should be set up and administered. ATA also comments that there is no reference to the current guidance documents that appear on the NSP Web site. ATA suggests that the FAA reorganize the QAP requirements by combining proposed § 60.5(b), (c), and (d) with the QAP requirements in appendix A, section 5, and moving them to a new appendix E, which would be a QPS for a QAP. ATA recommends that the new appendix contain appropriate components of the current guidance and sample of an acceptable SQAP.

FAA Response: The FAA has reorganized the QMS requirements in the QPS appendices and established one QMS appendix, appendix E, to provide greater clarity and avoid redundancy.

Identification of Deficiencies

CAE believes the language of proposed § 60.5(b) is too vague and that the FAA should specify the level of detail required in the documentation for correcting deficiencies in the QAP. CAE suggests changing the words ''deficiency in the program'' to ''an issue that has a direct impact on the quality.'' American states that it is unclear whether the deficiencies being identified are in the QAP or in the FSD maintenance program. ATA states that if the deficiency being identified is in the QAP, then the FAA process should specify how it is to be changed.

FAA Response: The FAA has made clarifications to § 60.5. The language of § 60.5, Quality Management System, was chosen to allow for future revisions to the QMS program, as described in appendix E. One of the major precepts of any quality management system is that of continual improvement—improvement as defined by the organization utilizing the quality management system that can be recognized by an outside observer. An improvement might manifest itself in the improved maintenance or the reliability of the FSTD; it might manifest itself in an increased efficiency in being able to track some aspect of the on-going maintenance functions; or it might manifest itself in a more detailed description of a job function or more clearly defined documentation or a better way to ensure that management is involved in decisions regarding the QMS program or the quality management system.

Grace Period for Required Changes

ATA suggests that § 60.5(c) provide a 12 month time limit within which the sponsor must make the required changes to the QAP, so that it is not immediately in violation after being notified of the required change. CAE makes a similar comment. ATA and United request clarification of whether paragraph (c) addresses the pre-approval process or the process when program deficiencies are discovered during an audit.

FAA Response: The FAA made minor clarifications to § 60.5(c). The FAA did not adopt specific time limits as recommended by commenters, because such revisions are outside the scope of the NPRM. However, in future changes to the QPS requirements, the FAA will consider adding specific timeframes as recommended by commenters. Such changes would be subject to notice and comment. In addition, the FAA notes that § 60.5(d) allows sponsors to appeal to the Director of Flight Standards (Director) if the sponsor disagrees with the NSPM's deficiency notice. The filing of an appeal stays the NSPM's notice pending the Director's decision. Thus, a sponsor can appeal to the Director if it believes that the NSPM has not allowed adequate time to resolve a deficiency.

Management Representative

FSI comments that identifying an employee of the sponsor to be the management representative, under proposed paragraph (d), may result in delayed or confused communication if that person is someone other than the training center's designee. American Trans Air asks whether the management representative under this section could be the same person as the liaison with the manufacturer designated under § 60.9(b)(3).

FAA Response: As previously mentioned, the FAA moved proposed paragraph (d) to § 60.9(c) in the final rule. (See the discussion in § 60.9 for additional responsibilities of the sponsor). In the NPRM, the FAA proposed that a sponsor maintain liaison with the aircraft manufacturer or the holder of the type certificate if the manufacturer was out of business. The FAA notes that maintaining a liaison with the aircraft manufacturer does not mean that the sponsor must designate a specific person to serve as a ''liaison.'' The Management Representative (MR) may perform this duty if necessary. There is no requirement that the MR be the training center designee. The only requirement is that the person so designated as the MR by the sponsor have the responsibility and authority to accomplish duties outlined in § 60.9(c).

Comments Regarding Sponsor Qualification Requirements (§ 60.7)

Many commenters are concerned about the concept of FSD sponsorship as proposed in § 60.7(a) and (b). Some commenters request the FAA delete, change, or clarify the sponsorship requirements.

RAA states that § 60.7 proposes to have individuals such as pilots, instructors, and check airmen be sponsors rather than a part 121 or part 135 (*i.e.*, part 119) certificate holder. RAA agrees that such individuals fit the criteria sought by this proposal, but believes that a collective body of ''individuals'' that comprise an air carrier also fit the criteria. RAA states, ''It makes no sense to make a distinction between a person and a certificate holder, particularly since both are subject to loss of their certificate by the FAA.'' RAA requests that the concept of ''sponsor'' be eliminated from the proposed rule.

FAA Response: The FAA has revised and clarified the sponsorship requirements of § 60.7.

The FAA defines the term ''person'' in 14 CFR part 1 as ''an individual, firm, partnership, corporation, company, association, joint-stock association, or governmental entity. It includes a trustee, receiver, assignee, or similar representative of any of them.'' In § 60.7, the FAA uses ''person'' in accordance with the part 1 definition. Additionally, as used in this particular situation, the ''person'' being referred to would hold or be an applicant for a certificate under part 119, 141, or 142, or have a course of training approved under appendix C of part 63. A ''person'' whether corporate or individual, can hold a certificate issued under part 119, 141, or 142. However, an individual person who holds only an airman certificate (*e.g.*, issued under part 61), would not qualify to be an FSTD sponsor.

The National Simulator Program has operated under the concept of ''sponsor'' for over two decades. However, the National Simulator Program has never been specific regarding the definition of the term, nor has the agency been diligent in ensuring that all of the precepts of FSTD utilization were scrupulously followed. The FAA believes that it is time that this concept is completely understood by everyone in the industry.

Sponsorship Qualification Requirements

FSB believes that the proposed sponsorship qualification criteria will seriously affect third party operations and that the NPRM, if adopted without major changes, could potentially eliminate part 142 certificate holders as providers of U.S. certified FSDs. Examples of situations that FSB believes would no longer be allowed are cases where the FSD is owned by a part 142 certificate holder but is used principally by other certificate holders. If neither the owner nor any of the other users met the specified minimum threshold of hours under their approved training programs, none of these users would meet the sponsorship standards, even though the FSD might serve many U.S. certificated operators. Also, the owner might be forced to change the sponsorship of some FSDs from time to time in order to continue to have a sponsor who meets the conditions of sponsorship. FSB recommends that if the owner is a U.S. certificate holder, that the responsible certificate holder should be the sponsor of the FSD, without having to meet all the requirements in this section.

Further, FSB comments that there are circumstances in part 142 operations where FSD certification is necessary, but there is no plan by the FSD owner to conduct training. FSB states, ''This proposal is a case where a prerequisite for Sponsorship is based on intended use of the device. It is the opinion of FSB that the proposed regulation should focus on the quality and functionality of the device and that approvals for how the device will be used should be left [to] the Principle Operations Inspector (POI), or the Training Center Program Manager (TCPM), or other appropriate approval authority.'' FSB recommends that § 60.7(a)(2) be deleted.

FSI objects to the NPRM preamble statements that the sponsorship and approval process proposed is similar to the current practice. FSI states, ''Currently, there are no 'sponsors' of simulation. The FAA has never defined the term; there has never been a requirement to have or to be a sponsor. The term, concept, and obligation is proposed in this Notice of Proposed Rulemaking for the first time. The implication that sponsors exist now and have been required tends to minimize the operational and economic impact of the current proposal.'' Further, FSI comments, ''The process outlined in the proposed part 60 is not at all similar to current practice in one of the major features of the proposed rule. That is, the current practice, (and practice for the past many years), has been for the FAA to evaluate, qualify, and then approve for use FSDs for a certificate holder having an approved training program. Now the FAA would add the major step of approving a person, not necessarily the developer, owner, or custodian of an FSD as a sponsor. This is a major departure from current practice.'' FSI recommends that the FAA delete any requirement for a sponsor to be a certificate holder and specify that a training center may continue to fulfill all proposed roles of a sponsor and the term sponsor be eliminated.

ATA states that proposed § 60.7 does not explain or provide a process for gaining sponsorship approval. ATA recommends that the sponsorship qualifications and systems and processes needed to manage the new requirements be established in a pre-defined order over a certain period as part 60 goes into effect.

In regard to proposed § 60.7(b), FSI asks for clarification of the relationship between the four conditions in this paragraph, *i.e.*, whether the sponsor must meet any or all of the four conditions. ATA identifies an inconsistency between proposed § 60.5(a), which allows a sponsor 6 months to develop a QAP after the final rule is effective, and § 60.7(b)(3), which states that a sponsor must have an approved QAP. ATA recommends a long period of phase-in for the final rule and an automatic qualification for items that were in good standing before the effective date. ATA also comments that proposed § 60.7(b)(4) gives the NSPM full veto power over a candidate sponsorship, with no definitions of how the NSPM will evaluate the candidate sponsor's acceptability to the NSPM.

FAA Response: The changes to the sponsorship requirements discussed previously adequately address the issues raised by the commenters. In the final rule, the FAA eliminated the proposed requirement that a sponsor use the device for 600 hours per year. We are now requiring that at least one FSTD is used at least once per year within the sponsor's FAA-approved flight training program. Also, the final rule permits the sponsor to sponsor additional FSTDs, beyond the first FSTD, without having a ''use'' requirement. If a sponsor sponsors an additional FSTD that is not used within its approved training program then one of the following conditions must be met:

(1) The FSTD must be used in another FAA-approved flight training program.

(2) The sponsor must provide the FAA with a written statement from a qualified pilot having flown the airplane that is simulated at least once during the previous 12 months. The statement must indicate that the configuration, performance, and handling of the FSTD are appropriately representative of those features of the airplane being simulated.

Additionally, while it is true that the FAA does not currently use the specific term ''sponsor,'' the agency, under its existing practices, does assign someone to ''oversee'' each qualified FSTD. Thus, the requirements in § 60.7 are simply a codification of the agency's current policies.

The rule language is clear about what is necessary for a person to become an FSTD sponsor and what requirements of part 60 will apply to existing FSTDs. With limited exceptions, the continuing qualification requirements for existing FSTDs will not change.

Role of TPAA

Eclipse states that the proposed rule puts the sponsor in a precarious position between the NSPM and the sponsor's specific TPAA. Eclipse Aviation would like to see a better delineation of duties and a more formalized coordination process within the FAA between these two bodies.

FAA Response: The FAA has modified its processes regarding coordination and communication with Principal Operations Inspectors (POI) and Training Center Program Managers (TCPM). The NSPM will provide a Statement of Qualification directly to the sponsor (copying the POI/TCPM) and will receive materials directly from the sponsor (provided parallel communication is maintained with the POI/TCPM).

Part 61 Flight Schools

Fidelity states that the proposed rule does not allow a part 61 flight school to sponsor an FSD or FTD. Fidelity believes if an organization is capable of maintaining the quality control program specified by part 60, and if the local POI, FSDO, or TPAA is satisfied, then the FAA should allow part 61 schools to sponsor an FSD. Fidelity cites specific sections in part 61 that allow for FSD usage.

FAA Response: FSTD sponsorship is a very unique responsibility and one that is irrevocably linked to an FAA-approved flight training program along with other equally unique requirements. As a result, the FAA has determined it would be inappropriate to allow a part 61 operator, with no requirement for FAA-approved training programs or other required FAA oversight, to sponsor an FSTD.

Sponsor Responsibility

UPS states that it may not be feasible to place responsibility for the qualification of an FSD owned, operated, and maintained by another business entity on the sponsor because the sponsor would have no direct control of that entity's operation. UPS believes this requirement would further constrain the business of flight simulator training and should be deleted.

In regard to proposed § 60.7(a)(2), DHL agrees with the apparent intent of the rule to give the users who hold vested interest in the simulators (the carriers) the responsibility and motivation to guarantee quality assurance of the simulators. Further, DHL states, ''It is also apparent that the FAA is shifting the responsibility from the National Simulator Program Team (AFS–205) to other entities (the sponsors) and allowing AFS–205 to provide oversight. It is unclear, however, if this is a cost savings measure for the Federal Government, which would place a financial burden on the sponsors.''

FAA Response: The FAA is not shifting any responsibility with this section of the rule, but is simply clarifying that to be a sponsor, one would have to have an FSTD qualified and used as part of their own FAA-approved training program.

Sponsors with Multiple Certificates

United comments that it holds certificates under both parts 119 and 142, offering contract training for aircraft currently flown by United and aircraft no longer flown by United. United requests that the FAA clarify the wording to allow a sponsor who operates FSDs under multiple certificates to be the sole sponsor of those FSDs with only one quality program and one management representative.

FAA Response: The FAA has added information to appendix E. The QMS requirements should not be read to preclude a given QMS program from being applicable to more than one certificate holder (*e.g.*, part 119 and part 142 or two part 119 certificate holders). It should also not be read to preclude an individual from being a Management Representative (MR) for more than one certificate holder (*e.g.*, part 119 and part 142 or two part 119 certificate holders) as long as the other QMS program requirements and the other MR requirements are met for each certificate holder.

Use of Qualified FSDs

TechniFlite states that limiting the use of a qualified FSD to an approved course unduly limits the use of the FSD. TechniFlite states, ''A Designated Pilot Examiner (DPE) should be allowed to use a qualified FSD for all or part of a check ride in accordance with the practical test standards. * * *'' If a pilot applicant has the experience and has otherwise received the appropriate training outside of a 142 training program, that pilot or his employer should not be required to pay for the expense of the 142 program. Many corporate flight departments have excellent in-house training programs. If a qualified FSD is available, the Designated Pilot Examiner should be allowed to utilize the device.'' TechniFlite believes part 61 training should not be denied access to FSDs.

FAA Response: There may have been a misunderstanding of the proposal. Part 60 does not impose any limitations or prohibitions regarding the use of a qualified FSTD for any appropriate, authorized usage. A DPE certificated under part 61 may use an FSTD for any authorized purpose, but a DPE may not sponsor an FSTD.

Minimum of 600 Hours

Most of the commenters on this section object to the proposed requirement in § 60.7(c)(1) that an FSD be used a minimum of 600 hours per year in the sponsor's training program. Commenters state that the proposed minimum hour requirement is arbitrary, unfair, financially burdensome, and creates an unfair financial advantage for large training centers.

FAA Response: As discussed previously, the FAA eliminated the 600-hour requirement. Instead, the sponsor must use at least one FSTD at least once per year in an FAA approved training program. Any additional FSTD sponsored by the sponsor must be used in another FAA-approved flight training program or the sponsor must provide the FAA with a written statement from a qualified pilot having flown the airplane being simulated at least once during the previous 12 months. The statement must indicate that the configuration, performance, and handling of the FSTD is appropriately representative of those features of the airplane being simulated. The revised rule language resolves the concerns raised by commenters.

Sponsorship Under Parts 125 or 137

FSI suggests including parts 125 and 137 in the definition of ''Certificate Holder'' in § 60.3 and in § 60.7(c)(2) to allow for future use of simulation under those parts.

FAA Response: As stated previously, only those persons required to have an FAA approved flight training program are eligible to sponsor an FSTD. The FAA has established an Aviation Rulemaking Committee to review part 125. The FAA will review the recommendations of this Aviation Rulemaking Committee when they are received to determine if an FAA approved training program will be required under the new rules. The FAA will initiate formal rulemaking at that time if warranted by the recommendations. Also, operations conducted under part 137 (Agricultural Aircraft Operations) require the use of pilots with either commercial or airline transport pilot certificates and a rating for the aircraft that is to be used in the agricultural operation. There is no requirement, however, for a part 137 operator to have an FAA approved flight training program. Therefore, it is not appropriate for those operators to sponsor an FSTD.

Dequalified Simulators

In regard to proposed § 60.7(c)(3)(ii), CAE believes that someone else may apply to sponsor the dequalified simulator immediately, since only the current sponsor cannot reapply. American states that this paragraph has the potential for significant impact on sponsors of foreign simulators. American further states that if a valid training requirement for a device exists, the FAA should not be in a position of impacting business decisions. Similarly, ATA opposes any attempt to require that an FSD remain out of service for any enforced period of time. ATA suggests removing the sponsor's qualification, not the FSDs. United and Delta make similar comments.

FAA Response: As discussed previously, the FAA has rewritten the sponsor qualification requirements, specifically the use requirements. Therefore it is highly unlikely that sponsorship will be taken away for non-use of an FSTD. The revisions to § 60.7 adequately address the concerns raised in this area. The FAA has modified § 60.7(c) to remove the statement ''The FSD is not qualified.''

Comments Regarding Additional Responsibilities of the Sponsor (§ 60.9)

Several commenters object to the proposal in § 60.9(a) that sponsors must allow ''immediate'' inspection of the FSD, citing the disruption and extra cost if training is interrupted without notice. The amount of notice requested by commenters ranges from 24 hours to seven days. ATA provides proposed revised rule language, allowing 48 hours notice. Several commenters state the NPRM does not provide any rationale for the change in approach from the current language in §§ 142.29 and 142.73, which provides for inspection of facilities, equipment, and records ''at a reasonable time.'' ATA and United state that if the FAA needs authority to conduct ''emergency'' no-notice inspections, it should add a paragraph containing guidelines for when such emergency inspection might be required.

FAA Response: The FAA has revised the rule language to require that sponsors allow the NSPM upon request to inspect the FSTD ''as soon as practicable.'' In addition, the FAA has clarified in the Information section of the QPS that the phrase ''as soon as practicable'' means without unnecessarily disrupting or delaying beyond a reasonable time the training, evaluation, or experience being conducted in the FSTD. These revisions should address the commenters' concerns. The FAA did not intend for proposed § 60.9 to imply that the FAA would have the right to conduct ''emergency'' no-notice inspections.

Comments Regarding Foreign Devices

FedEx and ATA state that paragraph § 60.9(a) should be applicable to FSDs that are directly under the sponsor's control, and not applicable to those FSDs where the sponsor is not the operator of the FSD.

FAA Response: The FAA appreciates those situations where a sponsor is sponsoring an FSTD owned and operated by a foreign airline or foreign training center located outside of the United States. It is not the FAA's intent to conduct inspections on these FSTDs outside of those times when such an FSTD is being used by the sponsor or another U.S. certificate holder.

Collecting Comments on the FSD

Several commenters state that the proposed requirements in § 60.9(b)(1) and (2) to collect and take action on comments on the FSD and its operation would duplicate the maintenance and discrepancy log requirements elsewhere in part 60 and should be removed. Commenters fear that this paragraph would create the potential for irrelevant, non-factual, personal or pejorative comments, which would be difficult to examine, classify, and take action on, resulting in unnecessary expenditure of time and resources. Commenters particularly state that flight crewmembers might offer comments that reflect the trainee's difficulty and not the performance of the simulator. Such comments should be provided to the instructor or evaluator and not be a requirement under this section.

FAA Response: The FAA adopted revisions to the comment collection provisions in this section. The intent of this requirement is to provide a mechanism for comments to be provided and for the sponsor to be able to review those comments and take whatever action it deems appropriate. The FAA did not specify the method used to collect this information. However, a maintenance log or an addendum to a maintenance log would suffice to meet this requirement. It was the FAA's intent not only to allow, but to encourage comments. If a sponsor determines that a particular comment is motivated by the trainee's difficulty and not the performance of the FSTD, then the sponsor should indicate that fact. Providing a source for comments such as these is logical and has merit.

Liaison with Aircraft Manufacturer

DHL and FSI state that the proposed requirement in § 60.9(b)(3) to maintain a liaison with the aircraft manufacturer would be difficult when the manufacturer is out of business or when the aircraft is no longer being manufactured. FSI points out that the manufacturers would also incur a cost from this requirement and would probably prefer to maintain a liaison only with the FSD manufacturer, and not with every sponsor for a particular FSD. ATA states that the relationship the air carriers and their training departments maintain with the manufacturers should be sufficient and for independent training centers, there should be more specific direction on what constitutes liaison.

FAA Response: The FAA has revised this section of the rule by eliminating the language that was referenced in these comments. However, the FAA has included the following language in the applicable QPS appendices, in the QPS Requirements section addressing § 60.13: The FSTD ''sponsor must maintain a liaison with the manufacturer of the aircraft being simulated (or with the holder of the aircraft type certificate for the aircraft being simulated if the manufacturer is no longer in business), and/or, if appropriate, with the person having supplied the aircraft data package for the'' FSTD ''in order to facilitate the notification described in this paragraph.''

Posting of Statement of Qualification

ATA, FedEx, and United request that the FAA allow for electronic posting of the document.

FAA Response: The FAA has determined that electronic posting would be helpful to the sponsor and the user. Therefore, we have modified § 60.9 to allow for the electronic posting of the Statement of Qualification. In addition, as a result of other changes to this section we have moved the requirements in proposed § 60.9(b)(4) to § 60.9(b)(2).

Comments Regarding FSD use (§ 60.11)

Delta Air Lines (Delta) suggests that § 60.11(a) be reworded to make the sponsor's responsibility limited to not knowingly allowing the FSD to be misused. Delta states that a sponsor cannot ensure that, for example, a rental crew is not using an FSD for training for a system for which the FSD is not approved. Delta also suggests that the preamble statement providing that other persons or certificate holders may arrange to use a sponsor's FSD without an additional qualification process be added to § 60.11(a).

FAA Response: The requirements of this section of the rule do not require that a sponsor keep a lessee from improperly using the FSTD. Rather, this section is to require that the sponsor will not use the FSTD or allow the FSTD to be used unless it: 1) Is properly sponsored (paragraph (a)); 2) is qualified as described in the Statement of Qualification (paragraph (b)); 3) remains qualified (paragraph (c)); 4) is used with the original or properly modified programming (paragraph (d)); and 5) is used in accordance with missing, malfunctioning, and inoperative component requirements of § 60.25 (paragraph (e)). The standard briefing provided to those who ''dry lease'' an FSTD is sufficient to address the concerns raised here.

Confusion About ''Type, Make, Model, and Series''

FSI states that the language of paragraph (b) is a significant departure from current § 142.59(a)(1), because that section does not require that an FSD represent a specific ''configuration'' or even ''variant within type.'' FSI states, ''The intermingling of type, make, model, and series, and ''configuration'' is confusing, contradictory, and not consistent with the FAA's own aircraft nomenclature system. It would preclude using a simulator representing a type of aircraft, for training or testing for another of a common type rating, and then using the FAA's own differences training scheme to address differences.'' FSI states that FAA has not justified the change in the proposed section and has not evaluated the cost of the impact. FSB makes a similar comment, stating that, ''Many aircraft have multiple configurations, which could potentially create the need for multiple Statements of Qualification.''

FAA Response: The FAA has removed the terms ''make, model, and series of aircraft or set of aircraft'' from the rule language in paragraph (b). In the final rule, we only reference the Statement of Qualification. However, the use of these terms is not a departure from the current requirement in § 142.59(a)(1) where the requirement is that approval for use of an FSTD be based on ''each maneuver and procedure for the make, model, and series of aircraft, set of aircraft, or aircraft type simulated, as applicable.'' These requirements are completely compatible and not interdependent. There is nothing in any part 60 requirement, including the particular section referenced, that would preclude the use of an FSTD representing a type of aircraft for training or testing for a common type rating, and then using an FAA-approved differences training program to address any differences that may exist. The FAA reiterates that the requirement is for the qualification of the FSTD. While it is certainly true that many aircraft types have many different configurations, it is also true that each FSTD will reflect a single aircraft type (make, model, and series) and reflect one configuration. There are provisions for ''convertible'' FSTDs and each configuration to which the FSTD is convertible will be annotated on the configuration list as part of the Statement of Qualification. Indeed, some convertible FSTDs are so different they warrant a separate FAA Identification number and a different series of evaluations. The requirement here is that each FSTD meet the requirements stated in part 60, including the applicable QPS appendix, to be qualified. How that FSTD is authorized for use has, and will continue to, come under the jurisdiction of the TPAA.

Required Features

Regarding paragraph (b)(2), Delta states that an FSD should not be required to have all features—just those for which training credits are desired. Delta suggests that paragraph (b)(2) be changed to ''For all tasks and configurations approved in the sponsor's or user's FAA approved Flight Training Program.''

FAA Response: The FAA has removed paragraph (b)(2). There is no requirement that any FSTD be configured to match all possible configurations of a single aircraft type nor that it be able to be used for training, testing or checking for all the tasks that the simulated airplane type may be able to accomplish.

Changes in Software

ATA objects to proposed § 60.11(d), stating that,

It will be impossible for the FSD to operate with the ''same software and active programming'' that was evaluated by the NSPM. After the initial eval and each recurrent eval, the operator continues to make software changes to improve the utility of the training device (adding malfunctions and features), to fix faults, to improve reliability and maintainability, and to keep the simulator current with the aircraft. Other sections in this Part 60 deal with how changes are to be evaluated and monitored by the NSPM. These are sufficient and do not need to be duplicated in this clause * * *. As worded, this paragraph implies that the FSD software and active programming must remain static between NSPM evaluations. One could also infer that the NSPM must evaluate every combination of engine and avionic software variation available in the FSD prior to that software being used for training * * *. This clause should be deleted.

United, FedEx, Delta, FSI, Fidelity, and CAE make similar comments. FSI states that changes might be the result of the requirements in § 60.19(c) or § 60.23 and that most modern simulators require the modification of software parameters to control the simulator mechanics. CAE states that the clause potentially removes the capability of allowing different users to emphasize specific aspects of the training, for example the sponsor may have introduced one effect that is unacceptable to another user who requires a different implementation of cues. United, FSI, and CAE provide suggested language to modify paragraph (d).

FSI questions the meaning of the terms ''active programming'' and ''regular flight crewmember'' in the preamble discussion of § 60.11(d).

FAA Response: The reference to ''regular flight crewmember training'' was used in the original part 60 preamble language to refer to the normally conducted, or routine training of flight crewmembers. However, the FAA has modified this section of the rule language such that the FSTD would have to be operated ''with the software and hardware that was evaluated as satisfactory by the NSPM and, if modified, modified only in accordance with the provisions of this part'' (§ 60.11(d)). This change addresses the concerns raised by commenters.

Comments Regarding FSTD Objective Data Requirements (§ 60.13)

ATA comments that the requirement in proposed § 60.13(a) for aircraft manufacturers' flight test data and all data developed after the type certificate was issued is too broad, impractical, and likely impossible to satisfy. ATA comments that the sponsor has no control over the data product and states, ''The aircraft manufacturer does not provide 'all data' as part of a data package; rather, they only provide certain cases and sets of data. The flight test data package can consist of numerous volumes (particularly for older airplanes), only a portion of which are included in the Qualification Test Guide (QTG). The data the sponsor *does* have is available for review during the initial evaluation if a case is questionable; however, the logistics of submitting the entire flight test package to the NSPM are prohibitive.'' ATA suggests the data referred to in this section should be limited to those data that are sufficient to validate the performance, handling qualities, or other characteristics of the aircraft, including data related to any relevant changes occurring after type certification. Further, according to ATA, other than paragraph (b), the sponsor should have no role in this section. It must be the responsibility of the aircraft manufacturer or other data provider to supply the appropriate validation data for use by the sponsor in the QTG. Finally, ATA concludes, as a minimum, the NSPM should pre-approve the airplane manufacturer's or data provider's validation data roadmap (see the ICAO document, *Manual of Criteria for the Qualification of Flight Simulators*, 2nd edition, Attachment D) prior to allowing the data to be used for validation of a FSD.

NLX, Delta, American, and CAE make similar comments. ATA believes the burden of responsibility for providing these data should be upon the aircraft manufacturer or data provider, for use by the sponsor/operator in the QTG or as additional reference data. (ATA provides suggested new rule text for the entire section.)

FAA Response: The FAA, revised the language of this section to say the following: ''The data made available to the NSPM (the validation data package) must include the aircraft manufacturer's flight test data and all relevant data developed after the type certificate was issued (*e.g.*, data developed in response to an airworthiness directive) if such data results from a change in performance, handling qualities, functions, or other characteristics of the aircraft that must be considered for flight crewmember training, evaluation, or for meeting experience requirements of this chapter.''

The FAA understands the position described by NLX, Delta, American, and CAE regarding the burden of responsibility for providing aircraft data; however, at this juncture, the scope of this rule does not permit the FAA to levy simulation data requirements on those not falling under the regulatory jurisdiction of part 60 (such as aircraft manufacturers). As a result, the organizations that do fall directly under the provisions of part 60 are the sponsors—and it makes sense to levy these requirements on them. The FAA acknowledges that close coordination must exist between the sponsor and the data provider (aircraft manufacturer, simulator manufacturer, or other data supplier) to ensure that the set of data ultimately made available for FSTD evaluation will meet the part 60 requirements as indicated. However, the FAA may task the ARC to consider alternative approaches to this issue and make recommendations. The FAA may consider these recommendations for inclusion a future NPRM.

Validation Data

TWA states that the rule should require that a manufacturer receive NSPM approval for the aerodynamic, engine and proof of match data on all new aircraft types. This would provide for commonality between the performances of various simulators and reduce the time required by National Simulator Program engineers to review the data because for each new type of aircraft they would need to review only one data package. TWA says that the sponsors of new type aircraft would then know they are working with approved data and could proceed accordingly.

United comments that this proposal continues to place the sponsor between the FAA and the FSD data provider, thereby codifying the FAA's ability to *withhold* FSD qualification because of poor data from the data provider.

CAE believes this paragraph is geared to commercial operators and not to business jet airplane manufacturers. CAE recommends revising the text of § 60.13(a) to read: ''Except as noted in paragraphs (b) and (c) of this section, for the purposes of validating FSD performance during evaluation for qualification, the sponsor must submit to the NSPM the flight test data used to define the performance standards of the FSD.''

FAA Response: The FAA adopted revisions to the ''exception'' phrase to clarify that the wording in this section is geared to sponsors and not to commercial operators, airplane manufacturers or individual persons receiving training in a FSTD. The FAA recognizes that the new rule places the sponsor between the FAA and the FSTD data provider, thereby codifying the FAA's ability to withhold qualification of the device if the data provided is inadequate. The FAA notes, however, that it has no authority to compel information from a data provider, which in most cases is proprietary information used, produced, and marketed under exclusive legal right of the airplane manufacturer or other data provider. The FAA expects that sponsors will be able to obtain necessary data through the dictates of the marketplace, similar to the current practices for the acquisition of other types of proprietary information such as the technical requirements for a Supplemental Type Certificate. Sponsors and data suppliers have a mutual interest in ensuring that the FAA has the data it needs to qualify a FSTD, and the agency encourages both parties to work together to achieve that end.

Data Related to Modifications

FSB comments that once a FSD is qualified under initial certification test data, only the additional data related to modifications need be submitted to NSPM. FSB believes this data must fully support the proposed modification and must include appropriate manufacturers' flight test data that relates to performance, handling qualities, functions and aircraft characteristics required for flight crewmember training, evaluation, or experience requirements.

FAA Response: The FAA has modified § 60.13(a) to include language indicating that ''all relevant data developed after the type certificate was issued'' will be required. An example of such data is data developed in response to an airworthiness directive.

Previously Approved Data

Thales Training and Simulation comments that the requirement for prior submission of data to the NSPM for approval does not allow the use of data previously approved by the NSPM by way of the Validation Data Roadmap.

FAA Response: The term ''Validation Data Roadmap'' is used in the Information Section of the QPS to describe the document that contains the plan for acquiring the validation data and the data sources. The Information Sections are advisory and provide general guidance to the user. The Validation Data Roadmap will assist the user in meeting the regulatory requirements.

Use of Flight Test Data

FSI comments that instead of using aircraft certification data, aircraft manufacturers should work with simulator manufacturers to produce flight test data specifically for the development of accurate simulation and math models. FSI believes aircraft certification data are generally incomplete for modeling purposes, that aircraft certification and simulator development have different and specific data requirements, and data developed for one purpose should not be considered acceptable for the other.

Regarding proposed § 60.13(e), ATA comments that this paragraph, as written, could be used to place the sponsor in a position to require the aircraft manufacturer to provide additional flight test data. This has been the case in the recent past and has resulted in sponsors continuing to carry data discrepancies that are years old. ATA believes that, if the NSPM requires additional flight testing, that should be strictly between the NSPM and the data provider. In addition, this paragraph could subject the sponsor to large costs to obtain data as required by the NSPM. This requirement seems inappropriate and too broad, according to ATA. American and CAE make similar comments and request that the FAA provide additional guidance on when additional flight test data might be required.

FAA Response: While the data acquisition processes specifically designed for simulation modeling and subsequent validation would be highly desirable, the FAA acknowledges that the existing practices were developed to minimize the cost of flight testing and to take maximum advantage of the flight testing already required as a function of aircraft certification. Additionally, while flight testing limited strictly to simulation purposes has never been discouraged, the FAA recognizes that a shift in requirements as suggested here might have an unwanted and perhaps unnecessary impact on the cost versus quality of the data as presently acquired and accepted for simulation purposes.

The FAA is interested in having each FSTD mimic as closely as possible the performance and handling of the simulated aircraft. As such, when new generation aircraft are designed, built, and placed into service, it is possible that the existing set of data requirements or the methods used to acquire those data may be found to be inadequate in some way. ATA is correct that certain situations have resulted in some sponsors carrying data discrepancies for much longer than the FAA would desire. The NSPM, the aircraft manufacturer, and other interested parties (*e.g.,* foreign regulatory authorities with the same or similar concerns, and other sponsors) continue to research the best and most acceptable way of addressing the shortcomings. As solutions to these data discrepancies are developed, the FAA may make appropriate changes to the QPS appendices. These changes would be subject to notice and comment.

Use of Flight Operations Quality Assurance (FOQA) Data

In regard to proposed § 60.13(b), ATA comments that some sponsors have on rare occasion used de-identified flight recorder data available from the aircraft onboard FOQA data recorder. These data, usually an averaging of many flights within certain specified parameters, have been used to verify the handling qualities and performance of the FSTD simulation where there is not a good match between the simulation and the manufacturer-supplied objective data in the MQTG. ATA states that this paragraph, as written, makes no allowances for such data, limiting data types to engineering or flight test data.

FAA Response: The FAA recognizes this limited but potentially important source of simulation data. We have made an appropriate adjustment in the alternative data source allowances by adding language that addresses on-board FOQA recorder data into QPS Appendix A, ''Qualification Performance Standards for Airplane Full Flight Simulators.''

Engineering Simulation Data

Boeing suggests adding ''engineering simulation data'' to proposed § 60.13(c) because it believes engineering data are an important source of alternative data. Also, Boeing states that engineering simulation data are not necessarily ''predicted'' data if they are produced by a well-validated engineering simulation, and should not be grouped under the heading ''predicted data.''

FAA Response: The FAA recognizes that engineering simulation data is a valid source of data. Therefore, the FAA revised the rule language to allow for the appropriate use of this type of data.

Form and Manner of Providing Data

ATA states that the form and manner that is acceptable to the NSPM under proposed § 60.13(d) should be defined. ATA states that the sponsor has no direct control over the form and manner of data provided and that the requirement should be placed on the aircraft manufacturer or the STC holder.

FAA Response: The ''form and manner'' acceptable to the NSPM is described in detail in the applicable QPS appendix and resolves the issues raised by the commenter. For example, the QPS appendix states that the information must be in a manner that is clearly readable and annotated correctly and completely with resolution sufficient to determine compliance with the applicable tolerances.

Notification Process

ATA states that if each sponsor follows the requirement in proposed § 60.13(f), the NSPM will receive many notifications from all the various sponsors whenever a common change occurs, such as flight data, avionics data, 28-day navigational ''Jepp'' data updates, visual system database updates. American makes a similar comment. ATA believes this paragraph should clearly identify the scope of data covered by this notification process. Delta suggests limiting the requirement to data ''relevant to flight or ground dynamics, performance or handling characteristics or additional aircraft appliances.'' Boeing believes it should be the responsibility of the aircraft manufacturer or data provider to provide the notification, to avoid redundant notifications from multiple sponsors. However, FSI states that the aircraft manufacturer is not required to provide such data to the sponsors and in many cases would not even know who the sponsor or sponsors operating FSDs representing its aircraft are. Therefore FSI thinks this provision is unenforceable.

Delta and FSI object to the requirement for ''immediate'' notification. Delta suggests allowing at least 30 days to provide the sponsor time to determine if the change will affect the FSTD in the context of § 60.13(a).

FAA Response: The commenters raise two main issues with respect to notifying the FAA of new data. The first issue is that the commenters were worried that we were requiring a notification every time they receive any kind of new data. The second issue is that the commenters were concerned that they would need to make a determination about how the data affected the FSTD before submitting the notification. This second issue was a concern for the commenters because of the proposed requirement that the notification to the FAA be ''immediate.'' They were concerned that they could not provide ''immediate'' notice to the FAA regarding how the data would impact the use of the simulators in their training programs.

In response to the first issue, the FAA has revised paragraph (f) to clarify the type of data we are requesting. The data providers need only provide notice for data related to the handling and performance of the FSTD. The FAA has also added language to the applicable QPS appendices to help clarify the type of data we are requesting. The language states ''[t]he data referred to in this sub-section are those data that are used to validate the performance, handling qualities, or other characteristics of the aircraft, including data related to any relevant changes occurring after the type certification is issued.''

With respect to the second issue, the FAA has also clarified that we are not asking data providers to make a determination about the effect of the new data before sending the notice to the FAA. The final rule only requires that the sponsors give the FAA notice that new data exists that ''may relate to FSTD performance or handling characteristics.'' The applicable QPS appendices provide more information about the type of dialogue the sponsors should have with the NSPM regarding the determinations to be made about the effect of the new data on FSTDs. In addition the FAA has removed the word ''immediately'' from paragraph (f) and provided the timeframe in the applicable QPS appendices. Instead of ''immediately'' the FAA is requiring that the sponsor notify the FAA within 10 working days of receiving notice of the new data.

Comments Regarding Special Equipment and Personnel Requirements for Qualification of the FSTD (§ 60.14)

Flight Safety Boeing (FSB) states that this section places a burden on the sponsor that really should be a burden on the entity that owns and maintains the FSD.

FAA Response: A sponsor may contract with another person for services such as maintenance and scheduling. However, the sponsor still retains the responsibility of ensuring that all of the actions are completed as required. This responsibility extends to initial and recurrent evaluation of the FSTD, including any special equipment and/or personnel.

24 Hour Notice Requirement

Commenters are concerned about the amount of notice before a sponsor must make special equipment and personnel available under § 60.14, stating that the 24 hours notice mentioned in the NPRM preamble and in the QPS is impractical. ATA and Fidelity recommend at least 7 days notice, while FSI recommends at least 10 calendar days notice to prepare special test equipment, such as sound, motion, or control measurement equipment and make operating personnel available. NBAA, CAE, and an individual make similar comments.

FAA Response: The FAA recognizes it takes time for a sponsor to arrange for special equipment and personnel to be made available to the FAA. Therefore, the FAA has modified the language in the applicable QPS appendices to state that ''the NSPM will make every attempt to notify the sponsor at least one (1) week, but in no case less than 72 hours, in advance of the evaluation.''

Specifically Trained Persons

FSI questions whether the requirement for specifically trained persons is not required for recurring evaluations and recommends that the FAA state if there is a requirement for a person current and qualified in the type of aircraft simulated to be present and a part of the subjective testing and declarations for recurrent evaluations.

FAA Response: The FAA has removed the word ''specifically'' in reference to qualified personnel. Qualified personnel are those persons qualified to install or use any special equipment when its use is required. The major focus of this section is on equipment not necessarily used on a regular basis for recurring evaluations of the FSTD. Language in the Information section in the applicable QPS appendices for this section includes examples of special equipment (*e.g.*, spot photometers, flight control measurement devices, sound analyzer).

Special Evaluation

NBAA asks what would constitute a special evaluation.

FAA Response: A special evaluation is an evaluation other than a regularly scheduled initial or continuing (recurrent) evaluation or an evaluation that is considered to be a regular no-notice (or limited notice) evaluation. Special evaluations are conducted where it is determined that a question exists regarding an FSTD's qualification and the answer is not immediately available through any means other than an on-site evaluation. The depth and duration of a special evaluation will depend on the question that exists and the detail that must be acquired to adequately address that question. This term is described in the § 60.14 discussion in appendices A, B, C, and D, and is defined in appendix F.

Comments Regarding Initial Qualification Requirements (§ 60.15)

RAA, FSB, and United disagree with the proposal in § 60.15(a) that a request for initial FSD evaluation be submitted first to the TPAA. These commenters believe TPAA inspectors do not have the expertise to review a QTG and that the application should be made directly to the NSPM, with a copy sent to the TPAA. United suggests that the TPAA be asked to send a concurring letter to the NSPM.

FAA Response: The FAA revised this section to require the sponsor to send the request directly to the NSPM and simultaneously request the TPAA to forward a concurring letter to the NSPM. This clarifies the process for initial qualification of the FSTD.

Request for Initial Qualification

ATA comments that the requirements of proposed § 60.15(b) are unnecessarily burdensome. For example, ATA states that paragraph (b)(2) requires a description of a procedure that should have already been accepted under the QAP. Delta and CAE make similar comments. ATA suggests limiting the requirement to the ''statement'' outlined in paragraph (b)(1).

NLX states that paragraph (b) does not appear to allow for a sponsor to request an initial evaluation until the FSD or FTD is completely tested, all items functional and all tests passing. NLX states that with the lengthy time required to get an initial evaluation scheduled, it is not practical to get an FSD or FTD completely finished and then wait for the evaluation. Within reason, the FAA must allow for some items to not be completed when the request for an initial evaluation is submitted with the understanding that they will be before the evaluation starts, according to NLX. Similarly, CAE requests clarification of the timeline for the activities in paragraph (b) and references the ''Sample Request for Initial Evaluation Date'' letter in the appendix.

In regard to proposed § 60.15(b)(2), FSI states that the maintenance required by proposed § 60.19(c) may also require changes to the configuration of the software or hardware present during the evaluation, in addition to modifications performed under proposed § 60.23.

FAA Response: The FAA has revised paragraph (b)(2) to delete the requirement concerning procedures. Instead, the FAA is requiring a statement from the Management Representative (MR) that is focused on the operation of the FSTD (performance and handling qualities) assessed by a pilot meeting the requirements of part 60. The QMS must contain the procedure that the MR will use to generate this statement.

In response to the points raised regarding timing of the testing and of the statement being sent, the FAA has slightly modified the proposed language and has added language in the applicable QPS appendices. This additional language provides that the statement may contain a confirmation that the sponsor will forward to the NSPM (either by traditional or electronic means) the complete statement described in § 60.15(b) in such time as to be received no later than 5 business days prior to the scheduled evaluation. The language also describes what must be communicated when or if required maintenance results in modification to hardware or software that was present and functioning at the time of the initial evaluation.

Pilot Statement

FSI states that pilots, particularly those of dry lease customers, may be reluctant to sign the statement required by proposed § 60.15(b)(3) because of perceived potential liability. FSI suggests that this provision be made advisory and moved to the QPS or that an appropriately qualified FAA official should sign such statements. Similarly, ATA comments that the terms used in paragraphs (b)(3)(i)–(iii) (''function equivalently,'' ''are equivalent to,'' and ''conforms to'') require pilots to make assertions in writing that they cannot realistically support. ATA states, ''This is particularly true in the case where pilots are required to make these assertions for aircraft types not yet issued a type certificate, a situation addressed in paragraph (d). Also, there are many operations tasks that pilots have never experienced in the aircraft, like a takeoff with an engine malfunction or a windshear encounter during approach.'' ATA suggests using the phrase ''adequately represents'' instead of a form of ''equivalent'' or ''conforms.'' ATA provides suggested rule text and sample Letter of Request text, using the suggested terms. Delta makes a similar comment.

FSB states that, regarding proposed § 60.15(b)(3), it needs to have the flexibility to have both a primary designated evaluation pilot and an alternate, either of whom are certified by the FAA to conduct the evaluation. FSB recommends changing § 60.15(b)(3) to permit any designated pilot to perform the subjective tests and sign the statement that the listed requirements have been met.

FAA Response: In the final rule, the FAA requires that an appropriately qualified pilot must make the comparisons as described. The FAA also adopted revisions to this section to require the appropriately qualified pilot to comment on the performance and handling qualities of the FSTD with respect to the aircraft (or set of aircraft) simulated but only within the normal operating envelope of the aircraft. The pilot making this determination must have flown all of the operational tasks listed in the Table of Functions and Subjective Tests set out in the FSTD subjective tests attachment to the applicable QPS appendix relevant to the qualification level of the FSTD. Additionally, the FAA has modified the requirement to note if any exceptions are necessary.

The FAA is not prescribing the individuals who must perform the required subjective testing, other than to require that the pilot be appropriately qualified and that he/she has actually flown the subject aircraft within the previous 12 month period. It would be a safety concern to have a pilot attest to the correct performance and handling of the subject FSTD if that pilot is not familiar with the performance and handling qualities of the aircraft being simulated.

Tasks Not Tested

ATA comments that the requirements outlined in § 60.15(b)(4) would prevent an operator from requesting an initial evaluation until all of the referenced tasks, systems, and tests are complete and functional. This would result in project schedules being extended by several months, adding a significant financial burden to every certification project. ATA requests the operator be permitted to list under this paragraph any item that, for whatever reason, cannot be tested at the time of the submittal.

Also, ATA and United cite numerous specific problems with this paragraph and state that the concept of requiring such a list is fraught with problems, such as mixing tasks with systems and maneuvers. ATA recommends that the requirement for the table of Qualified/Non-qualified tasks be deleted.

FAA Response: The FAA has revised and reorganized § 60.15 to accommodate the large portion of the recommendations originally made by commenters. As rewritten, the sponsor makes the request for initial evaluation after an appropriately qualified pilot has flown all of the Operations Tasks listed in the applicable QPS appendix relevant to the qualification level of the FSTD. If the sponsor does not subjectively test a task, it must note that in its request for initial evaluation. The FAA also revised this section to separate operational piloting tasks from systems and cockpit configuration determinations and to allow for pilots and for persons other than pilots to make these determinations.

Qualification Test Guide

TechniFlite comments that the NSPM should provide specific guidance on the outline and format of the QTG required by proposed § 60.15(b)(5), stating that the acceptance of the QTG often appears to be subjective and the sponsor is not provided a clear understanding of what is required for compliance. TechniFlite further suggests that the NSPM should be required to respond to the submission of a QTG within 30 days and be required to complete the qualification process within 90 days.

In regard to proposed § 60.15(b)(5)(iv), ATA comments that this list will define the equipment that must be kept calibrated in accordance with appendix A. According to ATA, most new FSDs have internal test equipment built into them; this internal test equipment would have to be removed to be calibrated in the traditional sense. ATA recommends allowing the sponsor to develop repeatability tests with tolerances as part of a quality system. Also ATA recommends changing ‘‘description’’ of the equipment to ‘‘list’’ of the equipment.

FAA Response: The FAA removed the QTG language that was in proposed § 60.15(b)(5) and placed specific guidance regarding the format and content of the QTG in the applicable QPS appendix. Regarding the NSPM response time for scheduling a QTG evaluation, the FAA notes that typically, the NSPM responds to a scheduling request within days and very rarely exceeds a week. Thus, under current practice, the NSPM response time is well under the 30 days recommended by the commenter. The FAA intends to continue this timely response. The commenter also suggested that the NSPM be required to complete the QTG evaluation within 90 days. The current practice consists of the sponsor being able to request an evaluation up to 180 days in advance and provide an ‘‘essentially complete’’ QTG not later than 45 days prior to that proposed evaluation date. The submission of the QTG at this point allows the QTG to be assembled with data and tests that more likely reflect the device’s final form and provides adequate time for the NSPM to review the document for compliance with the appropriate standards and advise the sponsor if questions arise regarding either the quality or quantity of data or the justifications used for comparisons. This timing allows the sponsor to make necessary corrections, re-run tests, provide additional data, and then provide a response with sufficient time for the NSPM to evaluate this additional information for clarity and completeness. This 180-day process provides the best timing and allocation of resources for the sponsor and the FAA personnel. Various processes have been tested over the past 20 years, and the 180 day timeframe has yielded the best results.

New or Changed Standards

In response to proposed § 60.15(c)(1), CAE and ATA question what the effect of new standards would be on FSTDs that have been ordered, but not yet delivered to the sponsor. They suggest that the NSPM be required to notify all sponsors when a change to an existing standard or a new standard is published. The sponsor should then be given more time, *e.g.*, 60 or 90 days, to determine whether the FSTD should comply with the new standards or the standards that were in effect when the FSTD was ordered.

FAA Response: If the FAA changes the standards for initial qualification, a sponsor may request that the NSPM apply the standards that were in effect when the FSTD was ordered for delivery or apply the changed standards. The FAA recognizes that the sponsor needs time to evaluate the changes to determine the standards under which the device should be evaluated. Therefore, the FAA has revised the rule language to give the sponsor 90 days to notify the NSPM which standards to apply.

In the NPRM, proposed § 60.15(c)(1)(iii) included the phrase ‘‘unless circumstances beyond the control of the sponsor prevent the evaluation from occurring within that time.’’ In the final rule, the FAA has removed this phrase. The intent of the language was to prevent the sponsor from being penalized for extraordinary circumstances that were beyond its control such as a labor dispute, natural disasters, or NSPM scheduling conflicts. The FAA has determined that it is more appropriate to resolve these extraordinary cases through the exemption process rather than to include a blanket authorization in the regulation.

Evaluation Pilots

Several commenters have questions and concerns about the evaluation pilot requirements in proposed § 60.15(d).

ALPA is concerned about the provision in proposed § 60.15(d) that allows the testing pilot to be an employee of the sponsor, but does not require that the pilot be a line pilot.

CAE does not understand the process and criteria for obtaining approval from the TPAA. Further, CAE believes the other requirements adequately cover the qualification requirements for the evaluation pilot. CAE recommends removing this requirement.

ATA and United believe the requirement is too restrictive because it would be expensive to maintain line pilots with current qualifications on staff. United says that its experience has shown that a non-qualified pilot with a background in flight test is significantly more effective than a qualified pilot with no such background. Delta states the proposal would make it difficult to use retired or contract personnel for simulator requirements testing. American makes a similar comment. Also ATA and United object to what amounts to the TPAA’s veto power over selection of a simulator test pilot.

United believes that the only legitimate requirement for a pilot who is current in the airplane is to evaluate the subjective performance and handling qualities tests. United states that requiring that this pilot sign an overarching statement attesting to the accuracy of other than the subjective tests would be problematic, given the threat to his license contained in § 60.33(b)(2), and prohibitively expensive. United comments that elsewhere in this part, the NSPM requires the sponsor designate an MR to be the primary point of contact with the NSPM. United suggests that the MR should be required to sign this statement.

FAA Response: The FAA removed the requirement that the pilot be approved by the TPAA. Thus, the concern raised by ATA and United is now moot. The FAA did not adopt ALPA's suggestion to have a line-qualified pilot provide the information required by this section. The FAA understands the concern raised by ALPA and others, but the reason for the pilot assistance is to ensure that the FSTD does, in fact, perform and handle as the simulated aircraft performs and handles. If the sponsor is able to supply an appropriately qualified pilot (whether or not that pilot flies ''the line'') who is able to make those determinations, the NSPM is satisfied that the FSTD will be adequately evaluated.

The FAA has revised the rule language to require that the confirmation statement reflect the performance and handling qualities of the FSTD within the aircraft's (or set of aircraft) normal operating envelope. This determination will be made after the pilot has flown all of the operations tasks listed in the Table of Functions and Subjective Tests set out in the FSTD subjective tests attachment to the applicable QPS appendix relevant to the qualification level of the FSTD.

Statement of Qualification

FSI objects to the requirement in proposed § 60.15(g) that specific details for FSDs (make, model, series of aircraft, configuration, *e.g.*, engine model or models, flight instruments, navigation or other systems) be identified on the Statement of Qualification. FSI states, ''these specific details for FSDs are unprecedented, not justified, and not even addressed in this proposal. The clear implication, if not actual statement, would make each qualification so specific that no other variation in type, or differences in cockpit configuration could be accommodated.'' FSI recommends that FAA continue to allow variants within type and cockpit configuration and specifically to allow the use of a differences training program.

JAA asks why the Statement of Qualification in proposed § 60.15(g) contains the topics for which an FSTD is *not* qualified, instead of all topics for which the FSTD *is* qualified. Delta suggests deleting the requirement for ''all equipment and appliances'' in proposed § 60.35 and instead use the Statement of Qualification to list the equipment and appliances that are not installed and therefore cannot be used for training. Delta also requests clarification as to whether the updated QTG needs to be completed prior to the issuance of the Statement of Qualification.

FAA Response: The FAA has made changes to the language describing the content of the Statement of Qualification (SOQ). The FAA has concluded that listing the tasks for which the FSTD is qualified would likely be an extensive list and redundant from FSTD to FSTD. A shorter and more easily read and understood listing as part of each FSTD SOQ would include the tasks for which that specific FSTD is not qualified. Also, there is nothing in any part 60 requirement, including § 60.15(g) that precludes the use of an FSTD representing a type of aircraft for training or testing for a common type rating, and then using an FAA-approved differences training program to address any differences that may exist.

The FAA reiterates that the requirement is for the qualification of the FSTD. While it is certainly true that many aircraft types have many different configurations, it is also true that each FSTD will reflect a single aircraft type (make, model, and series) and reflect one configuration. As previously explained, there are provisions for ''convertible'' FSTDs and each configuration to which the FSTD is convertible, will be annotated on the configuration list as part of the SOQ. The TPAA will determine the authorized use of the FSTD.

With respect to Delta's question whether the QTG needs to be updated prior to the issuance of the SOQ, the answer is no. The FAA recognizes that there will be times when the SOQ will be issued prior to the actual update of the QTG to the Master QTG. However, the FAA will not issue an SOQ until the NSPM completes all required testing and has found the test results to be acceptable.

Comments Regarding Additional Qualifications for a Currently Qualified FSD (§ 60.16)

Table of Qualified/Non-qualified Tasks

United comments that this entire section seems to exist to only support the requirement for the sponsor to maintain the table of Qualified/Non-Qualified Tasks as required by proposed § 60.15(b)(4). United believes that, if the FAA were to return to the ICAO- and JAA-accepted practice of linking functions and subjective tests to the FSD qualification level, then this section should be used only by those sponsors wishing to remove a previously issued exemption from the requirements of the Table of Functions and Subjective Tests and should be clearly titled as such.

FAA Response: The FAA has moved the contents of the original § 60.15(b)(4) to a new § 60.15(g) and made minor clarifications. The FAA is familiar with the ICAO and JAA practice of linking the functions and subjective tests to the FSTD qualification level, but also notes that not all tasks may be classified as a function of the level of FSTD involved. For example, one Level D FSTD may be qualified for circling approaches, while another Level D FSTD may not be qualified for circling approaches. Therefore, simply stating that a particular FSTD is qualified at Level D, without listing specific tasks, does not indicate which tasks can be accomplished in that particular device.

Statement of Qualification

ATA comments that paragraph (a) implies that any additional training, evaluation, or flight experience requirements not listed on the FSTD SOQ will require that an extensive amount of paperwork be submitted to the NSPM in order to generate a new SOQ even if this new training, evaluation, or flight experience requirement is valid within the initial qualification level of the FSTD and approved by the POI. ATA believes this could present a significant delay in implementing a new or updated training program.

FAA Response: The SOQ is not intended to be and will not be a repository for training, evaluation, or flight experience requirements. The SOQ is merely a convenient place to provide FSTD users with information about whether or not the device is qualified to be used to accomplish certain tasks (*e.g.*, windshear training, circling approaches). Should the sponsor wish to add ''circling approaches,'' for example, to the list of qualified tasks for a given FSTD, the amount of paperwork involved would be a single letter and may be accomplished after a verbal request. The FAA would accomplish the evaluation as soon as practical after receiving the request. This would include a special visit to the FSTD if is necessary, as is done under current practice.

Grandfathering Provisions

Delta suggests that the FAA add language to this section clearly stating that additional qualifications will continue to be qualified under grandfather provisions, and will not require meeting the new part 60 requirements, as long as the original qualification was completed prior to issuance of part 60.

FAA Response: Under the final rule, FSTDs qualified prior to the effective date of part 60 will continue to be qualified in accordance with the original MQTG that was issued at the time of qualification. The FAA did not revise § 60.16 to add language stating that new tasks would be qualified under the grandfather provisions. If the sponsor wants the FSTD qualified for a new task, the NSPM will conduct the initial qualification of the new task in accordance with the part 60 standards for that task. The part 60 standards for the new task will be incorporated into the existing MQTG. For example, a sponsor has a currently qualified FSTD and desires to have the FSTD qualified for windshear training. The sponsor will notify the NSPM of the modifications, additions, or software or hardware changes that will need to be added to the FSTD in order to have it qualified for windshear training. The NSPM will then assess the FSTD to determine if it meets the part 60 standards for windshear training. Once that determination is made, the MQTG will be updated to include the windshear training task. Nothing else in the MQTG will change from the original qualification basis. The FAA does point out that NSPM qualification of additional tasks does not constitute authorization for the sponsor, or any other user of the FSTD, to use the device for credit in any manner other than that approved by the appropriate TPAA.

Responsibility of NSPM vs. TPAA

TechniFlite states that the issue of whether the FSTD faithfully replicates the actual aircraft should be the responsibility of the NSPM, while how the FSTD is used should be the responsibility of the training organization and the TPAA (POI or TCPM) as appropriate.

FAA Response: The NSPM is not involved in the approval of a training program for a sponsor or any other user of an FSTD. Instead, the NSPM qualifies the device while the TPAA approves the use of the device in a particular training program. The qualification of a given FSTD may or may not include qualification for a specific task. For example, if the NSPM does not evaluate and qualify the FSTD for windshear training, a TPAA may not approve that FSTD for use in meeting windshear training tasks required by regulation.

Comments Regarding Previously Qualified FSDs (§ 60.17)

Delta requests clarification of ''other applicable provisions'' in paragraph (a), and several commenters state that paragraph (a) and (b) of proposed § 60.17 appear to be at odds with each other. For example, ATA states that in § 60.17(a), the FAA appears to be allowing for grandfathering along the terms that have been used by the industry and the FAA for the past 20 or 30 years. However, in § 60.17(b), requiring the SOQ implies that the grandfathering is only good for the 6 year period, *i.e.*, that the FAA would require the FSTD to meet the new QPS standards. ATA strongly opposes removing grandfather rights for previously qualified FSTDs, stating that 6 years is an insufficient time and will be cost prohibitive. Similarly, RAA states that for operators who use older aircraft, it is important that they not lose their ability to access simulators that may not meet current standards. TWA, American, and FSB make similar comments.

FSI states that if the FAA's intent was not to remove the grandfathering, but instead to unilaterally issue a new SOQ to every currently qualified FSTD, the language of the final rule should make that intention clear. ATA and Delta ask why the FAA would allow 6 years, if the intention was merely to issue new paperwork. Delta further requests clarification of ''Configuration List'' in paragraph (b). CAE makes a similar comment.

FAA Response: In response to Delta's question regarding ''other applicable provisions,'' the FAA notes that certain requirements in part 60 apply to all FSTDs. For example, all FSTDs must have an official sponsor that meets the requirements of this part, and all sponsors must develop and implement a QMS. The FAA added language to the applicable QPS requirements to clarify this issue.

The FAA does not intend to eliminate the practice of grandfathering. All FSTDs qualified prior to the effective date of part 60 will retain their qualification as long as they continue to meet the standards under which they were originally qualified. Although the FAA is not eliminating grandfathering, the FAA is requiring all sponsors to obtain an SOQ for each FSTD. The purpose of the SOQ is to provide a complete picture of the simulator inventory regulated by the FAA, including the configuration list and the limitations to authorizations. The issuance of the SOQ will not require any additional evaluation or require any adjustment to the qualification basis for the simulator. The FAA added information in the applicable QPS appendices to clarify this requirement. Under the final rule, sponsors have 6 years to obtain an SOQ. This allows the sponsors sufficient time to meet the § 60.17(b) requirements and reduces the sponsor's costs of implementing part 60.

Simulators Not Requalified Within 2 Years

Several commenters object to the requirement in proposed § 60.17(c) that a simulator that has lost its qualification and is not requalified within 2 years, would have to meet the standards in effect at the time of application for requalification. DHL states that if one of its simulators became disqualified and then had to requalify under the new standards, the simulator would have to be shut down, even if it has provided effective training for decades. DHL states that the disqualification of older simulators would severely cripple their fleet. TechniFlite CAE, American, ATA, and FSI make similar comments.

FAA Response: The requirements contained in this section do not significantly differ from the FAA's policy on out of service simulators. For over 22 years, the FAA's policy has been that if an FSTD is taken out of service for an ''extended period of time,'' it must under go an evaluation prior to being returned to service. Current practice is that if this ''out of service time'' is in excess of 12 months, the NSPM will review the qualification basis and may require the evaluation to be in accordance with the standards in existence at the time of requalification. The part 60 rule doubles the ''out of service time'' that would likely result in evaluation in accordance with the current standards at the time of requalification. The FAA recognizes that there may be situations where a sponsor of a device that has been unqualified for 2 or more years would desire requalification under the standards that were previously in effect. However, these are rare and extraordinary situations that are best resolved by the exemption process.

Downgraded FSTDs

ATA and TWA comment that proposed § 60.17(e) does not address the process for a downgraded FSTD to regain its previous qualification level. ATA and TWA believe the FSTD should be evaluated using the same qualification standards under which it was originally qualified.

FAA Response: The FAA wishes to clarify the distinction between a downgraded FSTD and an FSTD that is unable to function at its qualification level due to missing, malfunctioning or inoperative parts. A downgraded FSTD is a device that has had a permanent change of qualification level. On the other hand, an FSTD may not be able to function at its qualification level because of missing, malfunctioning or inoperative parts. For example, if the daylight visual system is inoperative on a level D FSTD, the FSTD may only be able to function as a level C device. In this situation, the NSPM would temporarily restrict the tasks that can be accomplished in the device, and impose other requirements in accordance with § 60.25. However, this temporary restriction is not a ''downgrade'' of the device. Instead, it is a limitation that can and is removed when the device is repaired and able to function as originally qualified.

Finally, the FAA wishes to clarify what it means to upgrade an FSTD. An upgraded FSTD is a device that was originally qualified at one level and is being upgraded to a higher level, *i.e.*, Level C to Level D. An upgraded FSTD is required to undergo an evaluation in accordance with the standards in existence at the time of the upgrade.

Comments Regarding Inspection, Recurrent Evaluation, and Maintenance Requirements (§ 60.19)

Streamlining the Process

TechniFlite comments that the § 60.19 process is a burden and an undue expense. TechniFlite suggests that a panel outside of the NSPM should be formed to overhaul the entire process, for example, a streamlined process could include automated tests that the NSPM could access as required online.

FAA Response: The FAA did not adopt changes to this section as recommended by the commenter. The FAA has been conducting at least annual inspections of each FSTD and a review of the quarterly tests accomplished by the sponsor. This practice has been successful for over 20 years and should not present a significant new burden or increase in expense for the sponsor. The NSPM is considering the feasibility of ''on-line''-testing and review of FSTDs. If the FAA determines ''on-line'' testing has immediate or long term applicability, it would be incorporated into the regulations in accordance with notice and comment rulemaking procedures.

Level of Reliability

An individual suggests that to ensure good, uninterrupted training the FAA should require a minimum average level of reliability as evidenced by Mean Time Between Failures, Mean Time Between Unscheduled Maintenance, or some other objective, definable criteria.

FAA Response: The FAA has determined that each individual sponsor should have some flexibility to ensure satisfactory FSTD reliability on its own. This flexibility, together with a viable QMS, will provide each sponsor with a clearer picture of what is actually happening and allow the sponsor (and the FAA) to determine whether or not the sponsor has an acceptable level of reliability.

Performance Demonstrations

ATA, CAE, and FSI state that it is unclear which ''performance demonstrations'' in Attachment 1 are being referred to in § 60.19(a)(1). Commenters also state that breaking up the tests into four evenly spaced inspections would increase costs and lose training time for the sponsors. ATA cites the example of sound tests that are normally all done in one quarter since it requires a complex test setup using special equipment. TWA suggests allowing sponsors to group tests that require complex test setups or special equipment. Similarly, American states that the order in which the tests are performed should not require NSPM approval. ATA states that the NSPM should not have approval rights, only review rights and that the exact timing of the inspections should be left up to the sponsor. Similarly, Delta states that since the FAA has already approved the QAP process, there is no need for a separate approval of the quarterly checks.

FAA Response: The FAA has removed the reference to ''Attachment 1 performance demonstrations'' and ''Attachment 2'' from paragraph (a)(1). The intent of paragraph (a)(1) is to address only objective tests. Performance demonstrations have been renamed as objective tests or subjective tests and placed in the applicable QPS attachments. During quarterly inspections the sponsor is only required to perform objective tests. The FAA has also removed the requirement that the NSPM approve the objective test sequence and content of each quarterly inspection for each sponsor. Instead, the requirement is that the sponsor develops the objective test sequence and content of each quarterly inspection, which must be acceptable to the NSPM. We changed the term from ''approved'' to ''acceptable'' to clarify that the sponsor can perform the quarterly inspections without prior FAA review and approval. If after review of the objective test sequence and content of the inspections the FAA finds something not acceptable, the FAA will notify the sponsor of the deficiency and require the sponsor to make appropriate changes.

Inspections for Mobile Simulators

Professional Instrument Courses describes its maintenance and repair process for its ATC 610J simulators, which are moved around the country routinely, for reasons such as the location of instructors or maintenance needs. PIC states that inspecting and testing each simulator quarterly would be impossible due to the mobile nature of its instrument training service.

FAA Response: All FSTDs are required to undergo the quarterly inspections. However, the FAA removed the requirement that the quarterly inspection plan for each sponsor be approved by the NSPM. Instead, the sponsor must develop a quarterly inspection plan that is acceptable to the NSPM.

Preflight Test

FSI states that the requirement in proposed § 60.19(a)(2) for a functional preflight test before the first FSTD use each calendar day would be a burden for training operators using simulators that operate close to 24 hours a day, because the simulator would need to be shut down until a technician could complete the work. If the sponsor could conduct one check in each calendar day the sponsor could spread the simulator technicians' work across the entire day, thereby saving labor costs. FSB and Embry-Riddle make similar comments. Embry-Riddle asks whether the preflight could be conducted by the instructor pilot and whether there are special training requirements for the person conducting the preflight. United requests that it be allowed to use an ''operational'' day instead of a ''calendar'' day, since it schedules training between 0600 and 0200 the following morning.

ATA, United, Delta, NBAA, and American state that the preflight check is sufficient if the FSTD hasn't been checked in the previous 24 hours. These commenters also state that the 7-day functional check requirement in proposed § 60.19(a)(3) would be difficult to track and makes no provision for an FSTD that is being modified, overhauled, or is not being used for some other reason. DHL states that this provision should be expanded to allow periods of down time that would not disqualify the simulator. Since DHL does more revenue flying in November and December, it plans its pilot training to occur from January through October. Paragraph (a)(3) would require needless checks during periods when its instructors are needed for line operations and the simulators are not being used, according to DHL. United makes a similar suggestion.

FAA Response: The FAA adopted several changes to the time requirements in this section so that use of the FSTD will now require the completion of a ''functional preflight inspection'' within the previous 24 hours. In addition, the FAA has determined that the 24-hour functional preflight inspection is sufficient, and therefore has not included the proposed 7-day functional check.

Recurrent Evaluations

In regard to proposed § 60.19(b), JAA questions why the term ''recurrent evaluation'' is used here, when ''continuing evaluation'' is used elsewhere.

ATA believes that requiring the sponsor to initiate the scheduling for recurrent evaluations, as required in paragraph (b)(2), is not logical because the NSPM will still be required to maintain resources and an internal process for managing the scheduling. ATA recommends continuing the current practice of the sponsor submitting a letter to the NSPM with requested evaluation dates.

ATA comments that paragraph (b)(3) has no restriction on the amount of FSTD time the NSPM can use for the recurrent evaluations. ATA knows of no historical evidence that the traditional 1 day of FSD availability is in any way insufficient. ATA suggests retaining the current practice of specifying that the testing period will be 1 day, unless otherwise agreed to by the evaluator and sponsor. American states that the QPS doubles the amount of time that the simulator must be available for the recurrent evaluations. American suggests that the NSPM provide a list of those tests required to be run so that they can be accomplished before the start of the evaluation.

FSB believes the specification of time of day and day of week in paragraph (b)(3) is not appropriate for a regulatory document and should be deleted. FSI comments that the FAA limits its availability to the work week under this paragraph, but requires the industry to be available seven days a week, under § 60.9(a).

ATA and Delta object to the NSPM having full power over how often it wishes to impose recurrent testing, through its approval of the MQTG. Since the FAA switched from a biannual evaluation to an annual evaluation for FSDs two years ago and the average number of FAA discrepancies has not increased, ATA and Delta believe the FAA should retain the practice of a 12-month recurrent evaluation period. CAE recommends changing ''MQTG'' in this paragraph to ''QAP.''

ATA recommends adding ''or within the timeframe mentioned in (b)(5)'' to paragraph (b)(6) so that training can continue during the grace period.

ATA comments that it appears that a significant number of the FSTD maintenance and reporting requirements in the proposed rule are designed for a Sponsor who operates their FSTDs at a slower pace than a large carrier, which operates around the clock in excess of 360 days each year. ATA states the NSPM must allow for a high volume user to operate unencumbered by artificially tight timelines and record keeping requirements. If some of the requirements remain unchanged, ATA believes the NSPM would have to staff its office around the clock or immediately move to grant Designee authority to large select high-volume Sponsors. ATA also comments that the section title is confusing by including the word ''inspection,'' implying preventive maintenance, when the section really addresses required recurrent tests. ATA suggests using ''Required QPS testing'' in the section heading instead.

FAA Response: The FAA has replaced references to ''recurrent'' evaluations with ''continuing'' evaluations. The FAA has removed the references to time of day and day of week and has added ''or within the grace period as described in paragraph (b)(5) of this section'' to § 60.19(b)(6). Additionally, the FAA has included language in the QPS appendices that specifically sets out the normal time and testing requirements for such evaluations. In this final rule the FAA continues the existing practice of having the sponsor and NSPM coordinate the best times to conduct the required evaluations.

The final rule codifies the existing authority to impose continuing testing through approval of the MQTG; therefore the FAA has not revised the language regarding this issue. The FAA has retained the reference to ''MQTG'' in paragraph (b)(4) instead of changing the reference to ''QMS'' (formerly QAP in the NPRM), because the MQTG is the FAA approved test guide, whereas the QMS is for quality assurance purposes.

Also the FAA has retained the term ''inspection'' in the title because a continuing qualification evaluation includes not only an evaluation of the device, but also an inspection of records pertinent to the FSTD.

Continuing Corrective and Preventive Maintenance

Delta requests a clarification of the reference to proposed § 60.15(b) in paragraph (c), citing a possible interpretation that a qualified pilot would be required to sign off on each recurrent evaluation and on each change made to the FSTD. ATA suggests changing ''requirements of § 60.15'' to ''requirements of all applicable provisions of appropriate QPS.'' Delta believes the pilot's input should not be required unless a change is made that affects handling qualities. FSB states that this paragraph places a burden on the sponsor that should really be a burden on the entity that owns and maintains the FSD.

FAA Response: The FAA reorganized § 60.19 for greater clarity and ease of understanding. The FAA revised this section to clarify that the sponsor is responsible for continuing corrective and preventive maintenance on the FSTD to ensure that it continues to meet the requirements of this part and the applicable QPS appendix. The FAA also removed the reference to § 60.15(b). In addition, the FAA has clarified when a sponsor may use, allow the use of, or offer the use of an FSTD for flight crewmember training, evaluation, or flight experience. The FAA notes that part 60 is geared toward the sponsor. The sponsor may contract out maintenance, but it still remains responsible for meeting the requirements in this part no matter who owns or maintains the FSTD.

Discrepancy List

In regard to proposed § 60.19(a)(4) and (a)(5), ATA requests that the FAA define specifically what constitutes a discrepancy that must be maintained on a list in or immediately adjacent to the FSD and states that historically, most FSD departments have posted all discrepancies that have the possibility of impacting training or checking. ATA states that if the intent is for every discrepancy written by the flightcrew, preflight checker, or observer to be included on the list, the list would be unnecessarily long. Furthermore, ATA states that almost all of the new documentation required under part 60 evolved or was taken directly from the Simulation Quality Assurance Program for 2000 (SQAP 2000) and asks which parts, if any, of SQAP 2000 will continue to be in effect.

ATA also comments that the wording of paragraph (a)(5)(i) can be construed to mean that discrepancies older than 30 days should specifically not be in the log. ATA suggests changing the wording to ''until at least 30 days.''

ATA suggests that the entry required under paragraph (a)(5)(ii) should also include the name of the individual doing the corrective action. Pan Am states that there is nothing to be gained by maintaining the record of the corrective action for 30 days and suggests reducing the time period to no more than 10 days.

ATA states that the requirement in paragraph (a)(5)(iii) to keep the discrepancy log in a ''form and manner acceptable to the Administrator'' gives the NSPM full veto power over a sponsor's log system, with no definition of what constitutes an acceptable system.

FAA Response: The FAA has changed the time requirements so that discrepant items will remain in the log book until corrected, instead of including a specific length of time. The requirements regarding the recording and correction of discrepancies are now found in § 60.19(c)(2)(i) through (iii). The FAA has revised § 60.19(c)(2)(ii) (formerly § 60.19(a)(5)(ii)) to include the name of the individual doing the corrective action. Also the FAA has modified § 60.19(c)(2)(iii) to permit electronic record keeping.

For clarification the FAA has added a definition of the term ''discrepancy'' in appendix F. Discrepancy means ''an aspect of the FSTD that is not correct with respect to the aircraft being simulated.'' The use of a discrepancy log is not new. Sponsors have been documenting the discrepancies found during the operation of an FSTD for decades. The only difference here is that this process is now coming under a regulatory requirement rather than just being consistent with FAA guidance and good operating practice.

SQAP 2000 is a voluntary QMS program. Under the final rule, the QMS is mandatory and must meet the requirements of appendix E of this part.

The phrase ''form and manner acceptable to the Administrator'' is intended to be permissive rather than restrictive. However, an acceptable discrepancy log will have at least the following characteristics: (1) Be easily maintained by the sponsor; (2) be easily audited; and (3) entries may not be easily altered or removed. Although the FAA is not requiring a specific format, the FAA may request additional information to clarify entries on the discrepancy log if necessary.

Comments Regarding Logging FSD Discrepancies (§ 60.20)

Delta comments that this section should only require discrepancy log write-ups for items that would adversely affect training or which indicate a conflict with the Statement of Qualification. According to Delta, this section could be interpreted to mean that equipment or appliances not simulated would have to be written up every time. An individual comments that this section does not appear to allow maintaining a separate maintenance-only discrepancy log. The commenter states that if discrepancy reports unrelated to the operation of the simulator or simulated aircraft are included (such as shop type supplies, touchup paint, and seat covers), a user might overlook a discrepancy report that might be of significance to their training. Also the commenter asks if the log could be computerized with a terminal at or near the simulator. FSI questions the phrase ''flight experience for flightcrew member certification or qualification,'' stating that its use in this section is inconsistent with the definition of the term in § 60.3. FSI recommends changing ''training or evaluation, or observing flight experience'' to ''training, testing, or checking'' to be consistent with the other rules.

FAA Response: The requirement in § 60.20 does not preclude an FSTD sponsor from maintaining a separate log of items that are in need of repair or replacement, the contents of which do not affect the operation of the FSTD and do not affect the purposes for which the FSTD may be used. However, the FAA does require that all discrepancies are recorded in a log. The FAA has removed the phrase ''for flightcrew member certification or qualification'' to be more clear. Additionally, the phrase ''conducting training, evaluation, or flight experience'' is consistent with other rules in this part. The term ''evaluation'' is defined for use in part 60 as follows: ''with respect to an individual, the checking, testing, or review associated with flight crewmember qualification, training, and certification under parts 61, 63, 121, or 135 of this chapter.'' Also, the FAA modified § 60.19(c)(2)(iii) to permit keeping the discrepancy log in an electronic format.

Comments Regarding Interim Qualification of FSDs for New Aircraft Types or Models (§ 60.21)

Boeing states that the phrase ''even though the flight test data used has not received final approval by the aircraft manufacturer'' in paragraph (a) should be changed to ''even though the aircraft manufacturer's flight test data may be considered preliminary'' because this data has been approved. CAE suggests changing ''aircraft manufacturer'' with ''approved data supplier'' to allow other reliable sources to produce data for this interim level of qualification. CAE states that other sources are often used to produce data for business jet aircraft.

Boeing suggests revising paragraph (a)(1) to more accurately describe the type of data that would be acceptable for an interim qualification.

FAA Response: In the final rule, the FAA has revised § 60.21 to allow a sponsor to apply for and the NSPM to issue an interim qualification level for an FSTD for a new type or model of aircraft, even though the aircraft manufacturer's aircraft data package is preliminary. The additional safeguards in the final rule regarding the use of preliminary data are sufficient to ensure safety until the final data package is released.

The FAA recognizes that in some instances there may be other ''data providers'' who will become involved with development of data, data packages, or the development of simulation models. The FAA did not change the term ''aircraft manufacturer.'' The FAA recognizes that some of the data used might come from prediction or other methodologies developed by another ''data provider'' that would allow for the ''interim'' classification without having full flight test data. However, all such non-flight test data would be dependent on at least some flight test data from the airplane manufacturer. In these cases, the FAA would want not only the aircraft manufacturer's preliminary data, but also the other data and the justification for that other data supplied by whoever supplies that data.

In addition, the FAA revised paragraph (a)(1) to more clarify the type of data that would be acceptable for an interim qualification.

Limit for Interim Qualification

Several commenters object to the one-year limit for interim qualification in paragraphs (b) and (c). ATA states, ''The number of factors that affect a new aircraft type or model is sufficiently complex and unpredictable that there should not be a simple 1-year death penalty on the interim qualification. This issue needs to remain as flexible as possible in order to facilitate new aircraft types and models, because to do otherwise will delay training to the point that too much training will be needed in too little time, resulting in decreased air safety, not increased.'' FSI, Delta, TWA, and Boeing make similar comments. TWA suggests the interim qualification should last six months after the release of the final flight test data package, unless specific conditions warrant a longer period as approved by the NSPM. Boeing states that ''six months after release of final flight data'' is typically at least 18 months after the end of the flight test program and is much later than one year after the issuance of the interim qualification status. Boeing suggests using language equivalent to paragraph 1.6 of Attachment A of the 2nd Edition to the ICAO *Manual of Criteria for the Qualification of Flight Simulators.*

FAA Response: The FAA has revised paragraph (c) to increase the time frame to obtain final qualification. The FAA has reworded the requirement to allow 12 months from the release of the final aircraft data package by the aircraft manufacturer, but no later than 2 years after the issuance of the interim qualification status, for the sponsor to incorporate the final aircraft data package and have the NSPM conduct an evaluation of the FSTD with the new data to remove the ''interim'' status of the FSTD qualification. The FAA considers 2 years to be an adequate amount of time for the sponsor to incorporate the final aircraft data package.

Comments Regarding Modifications to FSTDs (§ 60.23)

ATA, Continental, FSI, Delta, United, and several other commenters ask for a more specific definition of the term modification in proposed § 60.23, stating that the term is subject to a wide range of interpretation and judgment. Commenters believe that as proposed, § 60.23 would place a severe burden on both the FAA and all FSTD sponsors if the FAA does not provide greater clarification.

Boeing and FSI question how the FAA will determine when a modification impacts safety of flight. Also FSI asks that the FAA clearly define the circumstances under which it would produce an FSTD Directive and whether the FSTD manufacturer or FSTD user has any recourse.

FAA Response: The FAA revised this section to address commenters' concerns about the definition of modification and the cost implications if the term is defined too broadly. The FAA clarified the definition of modification and reorganized this section. While the content of the section has essentially remained the same, the rewrite has reduced the length of the section and included sub-headings that should help the reader understand how the main paragraphs and subparagraphs are related. The rewrite has significantly clarified the original intent of this section.

The FAA has not revised the words ''safety of flight'' in § 60.23(b) as requested by commenters. An FSTD Directive would only be issued if safety of flight was at issue and the effect of the FSTD Directive would be to amend the qualification basis for the FSTD. As stated in the NPRM (67 FR 60284, 60286) an FSTD Directive would only be issued in response to a recognized safety-of-flight issue. For example, the FAA may issue an FSTD Directive if a manufacturer or the FAA discovers that the existing data for an aircraft is not accurate and consequently would adversely affect FSTD performance and handling. The FAA will publish each FSTD Directive in the **Federal Register** and will comply with the Administrative Procedure Act requirements.

Comments regarding Operation with Missing, Malfunctioning, or Inoperative Components (§ 60.25)

Many commenters object to the requirement in proposed § 60.25(b) that each missing, malfunctioning, or inoperative component must be repaired or replaced within 7 calendar days. UPS believes this would be an unreasonable burden on both the sponsor and the FAA. UPS predicts that FAA will be burdened with a daily onslaught of routine requests to deviate from this provision. ATA recommends the rule should be written such that if no response to a request to authorize deviation from the rule is received within 2 hours, then it is granted. Also, the commenters note that many simulator-specific parts cannot be obtained within a seven-day timeframe. Further, if the problem is not a malfunctioning part, but rather a computer programming fault, then research, data, or other contractor assistance may be required. American Trans Air makes a similar comment. American states that if the NSPM or TPAA are not available, unnecessary training down time could result.

DHL states that the proposal would, in many cases, be more restrictive than a Minimum Equipment List (MEL) for an actual aircraft. DHL notes there are no safety of flight issues in an FSD. DHL suggests counting only ''training days'' so that the FSD would not need to be repaired during periods of inactivity or when the training facility was not open. CAE provides the example of an unserviceable third VHF radio: The real aircraft can dispatch in this situation, while the simulator would be grounded under this paragraph.

Several commenters believe the FAA would be burdened by an obligation to provide an inspector 24 hours a day, 7 days a week. TWA believes that the sponsors would not wait to find out if they will receive the parts until the seventh day. Rather they would notify the NSPM early, resulting in thousands of notifications, which would unnecessarily burden the NSPM.

Delta, Eclipse, Evans and Sutherland, ATA, Fidelity, and FSI state that the proposed rule allows only seven days for repairing or replacing missing, malfunctioning, or inoperative components, while the appendix states 30 days is allowed. These commenters say the 30 day period is more realistic.

RAA believes the rule should be written in a form similar to the MMEL requirements for an airplane, where specific time requirements are not referenced in the rule itself.

United suggests allowing the sponsor to develop a discrepancy prioritizing system, with the time allowed for replacement or repair dependent on the priority.

FAA Response: In the final rule the FAA will require missing, malfunctioning, or inoperative components to be repaired or replaced within 30 calendar days (instead of the originally required 7 days), while maintaining the original ''unless otherwise required or authorized by the NSPM'' phrasing. Additionally, as stated in the QPS, the FAA will consider a discrepancy prioritizing system where the length of time authorized to repair or replace any given missing, malfunctioning, or inoperative component is based on the level of impact on the capability of the simulator to provide the required training, evaluation, or flight experience, with the larger impact on this capability associated with a higher priority for repair or replacement.

The rewrite of this section provides adequate requirements without getting into the specifics of individual components. This is not an airworthiness issue, but is rather a training efficacy issue that is adequately accommodated with the revisions indicated.

Discrepancies that Directly Affect Training

Eclipse also believes the proposed requirement is too stringent. Eclipse believes this issue should be left to the discretion of the sponsor or the sponsor in coordination with the TPAA for equipment discrepancies that directly affect training. CAE and FSB make similar suggestions.

NBAA states that the provision makes no allowance for components that may be inoperable but are not required for training. NBAA recommends that training be allowed to continue for components that are not training critical. ATA suggests a reference to equipment required in the current training scenario. Delta makes a similar comment.

FAA Response: The purpose of this section is to allow for the operation of the FSTD with missing, malfunctioning, or inoperative components. If a missing, malfunctioning, or inoperative component is not required to be present and correctly operating for the satisfactory completion of a specific maneuver, procedure, or task being performed during the training, the FSTD can be used for that maneuver, procedure or task.

Simulator MEL

FSI states that both appendix H of part 121 and § 142.59 provide a simulator minimum equipment list and that handbook guidance issued to FAA inspectors gives lengthy guidance. FSI recommends that FAA withdraw appendix H and make a conforming change to § 142.59.

FAA Response: In this final rule, the FAA is modifying existing part 121, appendix H, to eliminate all technical requirements regarding FSTDs, including the requirement for a ''simulator MEL.'' The language of this section is not in conflict with and does not require any modification to § 142.59. Additionally, with the provisions of this section, the FAA Handbook guidance issued to FAA inspectors regarding operation of FFSs and FTDs with missing, malfunctioning, or inoperative components will be withdrawn.

Placarding

ATA comments that proposed paragraph (c) would require a maintenance technician to be at the ready (to perform the placarding) when each FSD period is scheduled to begin, adding an enormous financial burden for no perceived gain in training value. ATA and United suggest that the requirement in paragraph (c) to have a list of missing, malfunctioning, or inoperative components available should suffice for daily operations. ATA adds that the placard system is very time consuming and adds nothing to the training, if the item is already in the discrepancy log, which is read before each training session starts.

Pan Am comments that the requirement to placard items in the FSD that do not work should only apply to those items that are missing or malfunctioning, and not to items which are not simulated by design. Systems or controls that are non-functional will be indicated on the qualified or not qualified list in the FSD Statement or Qualification.

FAA Response: The FAA has removed the placarding requirement. Having the list of missing, malfunctioning, and inoperative equipment available for users of the FSTD is sufficient.

Comments Regarding Automatic Loss of Qualification and Procedures for Restoration of Qualification (§ 60.27)

Continental states that the requirement to get NSPM approval prior to putting a FSD back into service following any work that makes the device ''unusable'' has the potential to place severe restrictions on the airline's ability to schedule and use the device for training. It would also mandate that the NSPM be available 24/7 to provide this approval in a timely manner.

FAA Response: The FAA has clarified the requirements that must be met prior to returning an FSTD to qualified service. The revisions include § 60.27(b)(2), which provides that the NSPM may authorize the FSTD to return to service without completing an evaluation.

Qualified Use of FSTDs

ATA and FSB believe that the cross reference to § 60.9(b)(4) in proposed § 60.27(a)(1) is in error, because that paragraph refers to posting the Statement of Qualification, not to the sponsor's training program. TechniFlite and Fidelity object to paragraph (a)(1) because it implies that FSDs used for part 61 training, for personal practice, or even for another certificate holder's training program are not qualified.

FAA Response: The FAA has reviewed cross references and has corrected them. A person is eligible to be a sponsor if the person holds, or is an applicant for, a certificate under part 119, 141, or 142; or holds, or is an applicant for, an approved flight engineer course in accordance with part 63. Therefore, a part 61 Fixed Base Operator (FBO) that conducts training in accordance with part 61 may not *sponsor* an FSTD, but the regulations do not restrict anyone from *using* a qualified FSTD in accordance with that FSTD's authorizations. Also, an FSTD may be used for training in another certificate holder's training program as approved by the TPAA.

Moved or Disassembled FSTDs

Several commenters disagree with the proposed language of § 60.27(a)(3) and (a)(4), stating that it is not necessary to disqualify an FSTD in all cases when it is moved or disassembled. Fidelity states that lower level FTDs can be moved without affecting their capabilities. CAE believes that if a simulator is moved but has been maintained in accordance with the approved SQAP, then requalification should be conducted under the existing qualification basis of the simulator. United and TechniFlite state they have moved simulators with no adverse impact on their integrity. United proposes that the requirement only apply if a simulator needs to be reinstalled, *e.g.*, if the wiring is disconnected and reconnected.

Eclipse states that simple regular maintenance on the FSTD would result in ''disassemble for repair'' and thus require the sponsor to contact the TPAA or NSPM on an almost daily basis. CAE requests clarification or removal of this provision, since whenever maintenance is done, the FSTD is not able to be used for training at that time. ATA states that once an FSTD is reassembled, obtaining FAA approval for returning the device to training will place a major burden on both the sponsor and the FAA. United comments that the requirement should be rewritten to allow normal FSTD maintenance activities. Delta, American, FSB, and FSI make similar comments.

FAA Response: The FAA has revised § 60.27(a) to address those FSTDs that have been moved and reinstalled in a different location. When an FSTD, regardless of level, is moved and reinstalled in a different location, it must be re-evaluated by the NSPM to be sure that it continues to meet the requirements for its original qualification. This is true even in the example of an FSTD that was originally mounted in a transportable conveyance.

The final rule lists four specific situations that result in *automatic* loss of qualification. Disassembly is not one of them. The proposed language about disassembly does not appear in the final rule. For information on modifications, see § 60.23. Although ''disassembly'' does not appear in § 60.27 of the final rule, the FAA recognizes that disassembly may occur in the course of routine or non-routine repairs and maintenance. We want to emphasize that the sponsor is responsible to ensure that the FSTD continues to meet the requirements of this part and the applicable QPS appendix at the completion of *any* repair or maintenance in accordance with § 60.19(c).

Restoration of Qualification

ATA states that proposed § 60.27(b)(1)(i) would eliminate grandfather rights for older FSDs any time they are moved, repaired, or modified. ATA recommends changing the requirement so that the initial requalification is in accordance with the standards that the FSD was most recently qualified under. ATA suggests including the provisions of § 60.17(c), which provides up to two years before requiring requalification based on current standards. CAE makes a similar comment.

FAA Response: There is nothing in the language that would indicate that moving an FSTD would necessarily require re-evaluation in accordance with newer standards. The FAA notes, however, that when an FSTD is taken out of service, this does not automatically guarantee that reevaluation for qualification will be against the original qualification basis. The NSPM will conduct a review to determine the care and under what circumstances the FSTD has been maintained before determinations of qualification basis may be made. Moreover, if the FSTD was out of service for 2 or more years, the FAA would require a reevaluation under current standards that may be different than the standards under which the FSTD was originally qualified.

Authority to Waive Evaluation

ATA and United request that the FAA clarify the lines of authority in proposed § 60.27(b)(2). United suggests removing the reference to the TPAA and allowing only the NSPM the authority to waive the evaluation requirement.

FAA Response: The FAA has clarified the lines of authority by removing the TPAA from exercising authority to waive the evaluation requirement.

Requalification Criteria

ATA and United believe the FAA should develop objective criteria for proposed § 60.27(c). For example, how would the FAA assess the ''care that had been taken of the device since the last evaluation?'' United suggests the FAA specify the number of normally scheduled evaluations that can be missed and the performance of the particular FSD against the sponsor's quality measurements in its QAP.

FAA Response: The FAA has added language to the Information section of the QPS indicating that one of the factors the FAA uses to determine what amount of testing will be required for requalification is how the simulator is maintained during its out-of-service period (*e.g.*, periodic exercise of mechanical, hydraulic, and electrical systems; routine replacement of hydraulic fluid; and control of the environmental factors in which the simulator is to be maintained).

Comments Regarding Other Losses of Qualification and Procedures for Restoration of Qualification (§ 60.29)

ATA and United comment that this section blurs the lines of authority between the NSPM and the TPAA. The commenters believe only the NSPM should have jurisdiction over the qualification of any FSD covered by this part and only the TPAA should have jurisdiction over the use of a qualified FSD in an FAA-approved training program. United suggests removing all references to the TPAA from this section. ATA recommends adding a paragraph (d) to include the procedures for restoring the qualification lost under this section since this issue is not addressed in the proposed rule language.

In regard to the process for handling emergencies under paragraph (c), FSI comments that no emergency in simulation is so dangerous that there is no time to consult with the TPAA. FSI states that the NSPM should not be allowed to suspend the use of an FSD in an approved training program without agreement from the TPAA.

Delta suggests changing ''7 days'' in paragraph (a)(2) to ''30 days'' to be consistent with other references to 30 days in this section.

FAA Response: The FAA has removed all references to the TPPA in § 60.29. Additionally, the FAA inadvertently left out of the NPRM the sub-paragraph addressing procedures for restoring the qualification lost under this section as described by the commenter. The FAA has added such a paragraph in the final rule.

The FAA did not adopt the suggestion to replace ''7 days'' with ''30 days'' in § 60.29(a)(2). The final rule provides time for the sponsor to object to the notification that the FSTD no longer meets some or all of its qualification standards. The 7-day period was originally selected to provide the NSPM up to 23 days between the receipt of the sponsor's objections and justifications and the effective date of any action regarding the FSTD. This provides the most benefit to all affected parties.

Comments Regarding Recordkeeping and Reporting (§ 60.31)

Regarding paragraph (a), ATA states that there will be an additional administrative and storage location overhead cost to maintain previous copies of the MQTG, each of which may be over 10 volumes. Also, ATA suggests changing the wording to require that the sponsor have a system to trace the current version of the simulator back to the original qualification software/hardware and deleting the requirement for maintaining the actual copy of the programming. United and Delta make similar comments. Also, ATA requests that the FAA clarify that, for currently qualified simulators, only records made after the effective date of the rule would be required. Similarly, FSI states that the FAA appears to have little concept of the magnitude and cost of proposed paragraph (a)(2). FSI suggests that instead, the NSPM track changes to the FSD via the modification requirement in § 60.23(e). ATA and United suggest shortening the required time period proposed in § 60.31(a)(3)(iv) to 18 months and Delta suggests deleting paragraph (a)(3)(iv).

ATA suggests that proposed § 60.31(a)(4) also require that sponsors keep the name of the person who determines that a discrepancy is corrected.

Delta suggests rewording proposed § 60.31(a)(5) to say ''initial or upgrade qualification'' to cover upgrade situations that are in effect new ''initial'' qualifications. ATA suggests that ''FSD hardware configurations'' in paragraph (a)(5) should be changed to ''FSD hardware configurations, restricted to ground or flight dynamics or performance and handling or aircraft system function.''

FAA Response: In the NPRM, § 60.31(a)(2) proposed to require the sponsor to maintain a copy of the programming used during the evaluations for initial and upgrade qualifications and a copy of all programming changes made since the evaluation for initial qualification. Revised § 60.31(a)(2) requires the sponsor to maintain a record of all FSTD modifications affected under § 60.23 since the issuance of the original Statement of Qualification. The revision to § 60.31(a)(2) captures the software and hardware changes required in proposed § 60.31(a)(2) and (a)(5). We have therefore deleted § 60.31(a)(5). Also, the FAA has modified § 60.31(a)(4) to require that sponsors keep the name of the person who determines that a discrepancy is corrected.

Record of FSD Users

ATA and United state that proposed § 60.31(b) places an unnecessary burden on the FSD sponsor. Instead they believe the burden should be placed on the user in coordination with their respective TPAA. ATA and United suggest deleting this requirement or requiring that sponsors have 7 days to provide the report upon request of the NSPM. FSB and CAE suggest that such a list of certificate holders may be considered proprietary business information. FSB states that ''This is another instance where the ongoing use of the FSD has been proposed as within the purview of the NSPM as opposed to the operational responsibility remaining with the certificate holder sponsor with the approval of either the TCPM or POI under existing regulations.''

FAA Response: The FAA has eliminated the requirement to maintain the records of users of the FSTD. If the FAA needs such records, it would acquire them through normal FAA oversight channels.

Form of Records

In regard to proposed § 60.31(c), ATA and United state that most airlines have record systems that have proven effective and accurate in actual use. ATA and United state that the NSPM's approval of these systems should be immediate and that the rule language should be changed to add ''information, with appropriate security or controls to prevent the illegal or inappropriate alteration of such records after the fact.''

FAA Response: The FAA added language in the QPS appendix that provides for the preservation and retrieval of this information with appropriate security or controls to prevent the illegal or inappropriate alteration of such records after the fact.

Annual Report

ATA, UPS, Delta, United, FSI, American, Eclipse, American Trans Air, and CAE object to proposed § 60.31(d), stating that the annual report would be redundant.

FAA Response: The FAA has eliminated the requirement for an annual report that was in proposed § 60.31(d). The other requirements of part 60, including the discrepancy log, the recurring inspections, the modification notification and approval, and the QMS are sufficient to ensure that FSTDs are operating at their qualification level.

Comments Regarding Applications, Logbooks, Reports, and Records: Fraud, Falsification, or Incorrect Statements (§ 60.33)

ATA is concerned that the language contained in this section does not provide a clearly defined method for complying with requirements like the quality assurance program, log books, reports, and requests. ATA comments that paragraph (c) provides the authority to remove qualification simply on the basis of an incorrect statement, which could be made by any individual at any level of the organization. According to ATA, while the NSPM has always maintained a cooperative relationship with the industry, others, such as ATOS inspectors, only apply the strict interpretation of requirements and often apply rules without the benefit of the required knowledge of the flight training device industry. ATA further states that, ''This section threatens not only our qualifications but also our personal livelihood. A simple misstatement, mistake, or omission without a clearly demonstrated intent to mislead should not be a basis for action. It should be applied to the intent of the operator and/or sponsor not the individual.'' ATA suggests changing ''No person may make'' to ''No sponsor may knowingly make'' and deleting paragraph (c).

Similarly DHL states that the omission of recording malfunctions or inaccurate statements in logbook entries is very subjective. DHL is concerned that honest mistakes and oversights could lead to the revocation of an airman's ATP, and states ''Such perceived liability could cause the ranks of qualified instructors to dwindle.'' Fidelity, FSI, CAE, and Delta make similar comments.

FAA Response: This section is not intended to address a simple misstatement, mistake, or omission as suggested might occur. The language is included to provide notice to those who are involved with or use FSTDs that the records and reports that are kept, made, or used to show compliance with this part, or to exercise any privileges with respect to FSTD upon which the FAA relies or could rely, is a serious matter and that fraudulent practices will carry consequences. The elements for a charge of making a false statement are: (1) A knowing, (2) misrepresentation, (3) of a material fact. The elements for a fraudulent statement are the same as for a false statement, plus: (4) made with the intent to deceive, and (5) detrimentally relied upon. *See FAA* v. *Bell,* NTSB Order No. 4764 (May 11, 1999). Thus, for either charge, the FAA must have evidence that it was a knowing misstatement and that the misstatement was material (*i.e.,* about an important matter). *See FAA* v. *Twomey,* 821 F.2d 63 (1st Cir. 1987). We have added the word ''material'' to the phrase ''known omission'' to clarify that only important, known omissions will constitute a violation and this will put the violation on par with the fraud and intentionally false statement violation.

Comments Regarding Specific Full Flight Simulator Compliance Requirements (§ 60.35)

Many commenters address the impact of proposed § 60.35 on Level A simulators. The ATA strongly opposes degrading the qualification of all level A simulators after a 2 year period. ATA believes that as long as there are valid training objectives that can be accomplished in a level A simulator it should be the sponsor's business decision as to when the device is no longer viable and not determined by the NSPM. Pan Am states that elimination of the Level A qualification would create specific issues for those aircraft that are no longer manufactured, but continue to operate. Pan Am states, ''These simulators are typically not cost effective to upgrade to current technology standards but have demonstrated and been used for many years as effective training devices * * *. We believe these simulators and the training permitted in them should be grand-fathered in any new rule.'' Pan Am, FSI and Aerospace Aviation are also concerned that this provision would result in a return to using aircraft for training, which would have a negative impact on both the training, safety, and pollution.

FSI addresses the impact on certain aircraft, stating, ''The bottom line would be that users of many aircraft, such as the older King Air, Turbo Commander, Lear 25, Gulfstream I, Jetstar, etc., would have no simulation device at all available to them. The time-tested safety-driven need for these simulators will be there as long as the aircraft they represent are flying. It is obvious that new simulators, Level B through D, will not be developed for these older aircraft, so the withdrawal option is to withdraw all simulation safety advantage from this segment of the aviation population.'' In addition, FSI states that to convert the Level A simulators to Level 6 FTDs ''would be to lose the advantage of motion, which the FAA, in particular the NSPM, has strongly favored and embraced for realism in training and testing, as opposed to simulation with visual cues only. Continuing to maintain a motion system for a Level 6 FTD, for no credit in addition to that afforded a Level 6 FTD, would represent a huge cost with no benefit to offset it.'' FSI further comments, ''Just as the FAA would not propose that all operators of those aircraft abandon their aircraft, it should not propose that Training Centers abandon the representative simulators.''

Similarly, TWA states, ''This paragraph puts an undue burden on the sponsors of older flight simulators. The cost to make all aircraft appliances functional whenever they upgrade an older simulator will effectively eliminate all upgrades. This would severely limit modernization and improvements to these simulators. There is no reason for devices in an FSD to be functional if they are never to be used by the approved training program.'' ATA makes a similar comment.

Several commenters question to what extent the FAA expects the entire cockpit to be simulated, under paragraph (a). Boeing states that for some aircraft there is not enough room in the simulator to simulate the entire area directly behind the Captain and First Officer. ATA and United comment that sponsors with no captive fleet would not have a specific cockpit against which to match an FSD and sponsors with their own fleet would have differences between cockpits of like aircraft. Delta and CAE make similar comments.

DHL states that the language requiring the FSD to simulate the operation of all equipment or devices intended to simulate aircraft appliances is too rigid. DHL states, ''This language would require such devices such as radar and TCAS systems to be fully functional. These devices are often trained in such devices as FTDs or Computer Based Training (CBT) programs. The FAA requires TCAS to be trained in a flight simulator or CBT environment. DHL argues that some devices are better trained in other environments such as CBT. This requirement also usurps the intent of the Advanced Qualification Program that would apply Instructional Systems Design principles to conduct training in lower level devices that may not only be more cost effective but also yield a higher level of learning.''

UPS comments that paragraph (a) would require that equipment not related to flight training be installed at considerable expense. UPS cites examples such as ''equipment used by maintenance personnel, *e.g.,* BIT type diagnostic systems, or equipment used by flight crew but not deemed essential to flight training by the operator or its TPAA, *e.g.,* ACARS.'' Evans and Sutherland ask whether visual terrain and obstacle correlation over the entire visual scene must be provided, *e.g.,* for future additions to the cockpit, such as the Moving Map Display, or for aircraft fitted with EGPWS or TWAS? Also, for weather radar, must all 3D clouds, storms, etc., on the visual scene correlate with a dynamic radar sweep?

FSI states that proposed paragraph (a) seems to say that 18 months after the final rule is issued *all* simulators must simulate everything in the aircraft they represent. FSI asks, ''Would this mean that a Level B simulator must have color weather radar simulated if the aircraft is outfitted with color weather radar, etc.?'' FSI states that proposed QPS requirements for FTD levels 4, 5, and 6, as well as for simulator Levels A, B, and C do not include simulating the operation of all equipment and appliances installed on the airplane (aircraft) being simulated. FTDs could fit the definition of a ''simulator'' and therefore would not be compliant. FSI recommends that FAA strike the all encompassing term ''all equipment or devices'' and clarify the intent of this proposed section to include the equipment simulation requirements for each level of ''flight simulator'' as well as specifically refer to FSD levels A–D and clarify the definition of a ''flight simulator'' to refer to FSD levels A–D. ATA recommends that paragraph (b) be changed to apply to ''any level A simulator'' instead of to ''any flight simulator.''

Delta suggests that § 60.35(b) or the QPS should define the performance criteria that will be used under paragraph (b) and state that a Level A simulator can be downgraded to a level 6 FTD without having to undergo an additional evaluation.

FAA Response: The FAA adopted several changes to this section that are less restrictive than proposed and codify existing practices. The revisions include the following: Level A simulators will not be eliminated as was proposed; the requirement for Level C and Level D simulators in § 60.35(a) will include the equipment and appliances installed and operating to the extent necessary for the issuance of an airman certificate or rating; the requirement for Level A and Level B simulators in § 60.35(b) will include the equipment and appliances installed and operating to the extent necessary for the training, testing, and checking that comprise the simulation portion of the requirements for issuance of an airman certificate or rating. The FAA has been careful to define FTD levels and FSS levels and to use the appropriate term in the appropriate setting. This should eliminate any confusion regarding qualification level and required equipment.

Comments in Response to ARC Recommendation

In order to give the public an opportunity to comment on the recommendations received from the ARC, on February 10, 2004, the FAA reopened the comment period for 30 days (69 FR 6216). The comment period closed March 11, 2004. The FAA received approximately 30 comments during the reopened comment period. However, instead of addressing the ARC proposal, many of the commenters addressed issues from the original NPRM. These comments are similar to comments that were previously submitted. Other comments included suggestions for minor editorial changes from CAE Inc. and a question from the Co-Chairman of the Air Transport Association Simulator Technical Issues Group asking if part 60 provides for self disclosure of possible non-compliance with part 60 requirements.

FAA Response: The FAA reviewed the ARC recommendation and the comments received in response to the ARC recommendation. In response to the comment regarding part 60 self-disclosure programs, the FAA considers the correct vehicle for such self-disclosures to be Advisory Circular (AC) 00–58, Voluntary Disclosure Reporting Program. The FAA recognizes that the AC, as presently written, is applicable only to certificate holders, but believes sponsors qualified under part 60 could develop a similar program based on the available guidance in the advisory material.

Delegation of Authority for Standards Documents

The FAA has delegated in a separate document, final authority to review and issue amendments to appendices A–F to part 60 from the Administrator to the Director, Flight Standards Service. Specifically, these appendices are the Qualification Performance Standards (QPS) documents for: Airplane Full Flight Simulators; Airplane Flight Training Devices; Helicopter Full Flight Simulators; Helicopter Flight Training Devices; Quality Management Systems for FSTDs; and Definitions and Abbreviations for FSTDs.

The FAA anticipates that these documents will require routine changes for a variety of reasons, *e.g.,* increased knowledge about human factors, analysis of incident/accident data, and changes in aircraft or simulation technology. Because these standards will be regulatory in nature, current FAA policy provides for the

Administrator to review changes before final action on them is complete. This process involves significant levels of participation in the review process by individuals at all levels of the agency.

The FAA expects that most future changes to the QPS documents will be published in the **Federal Register** as NPRMs for public comment, just as they are published as part of this NPRM. This will be true unless ''good cause'' exists under the Administrative Procedure Act (APA), which would warrant the FAA publishing a change to a QPS document without following the standard notice and comment procedures. Under the APA, in order for the FAA to issue a rule without following notice and comment procedures, the FAA would have to make a good cause finding that following notice and comment procedures would be impracticable, unnecessary, or contrary to the public interest.

The FAA does not expect that many changes to the QPS documents will justify the expenditure of time and resources at the highest levels of the agency that the standard procedures for final review of rulemakings require. Therefore, consistent with good government, the FAA is streamlining the process for making technical changes to the QPS documents by delegating authority for final review and issuance from the Administrator to the Director, Flight Standards Service. The FAA believes that the delegation will result in more timely responses to incident and accident data and advances in aircraft or simulation technology.

Consistent with similar delegations of authority, this authority will be exercised with the concurrence of the Office of the Chief Counsel. If, at any time during the amendment process the Administrator or the Director, Flight Standards Service, determines that a proposed amendment would not be appropriate for this streamlined process, the rulemaking project would proceed in accordance with the agency's normal rulemaking procedures.

Paperwork Reduction Act

Information collection requirements associated with this final rule have been approved previously by the Office of Management and Budget (OMB) under the provisions of the Paperwork Reduction Act of 1995 (44 U.S.C. 3507(d)), and have been assigned OMB Control Number 2120–0680. This final rule adds the OMB control number to the table of OMB control numbers in 14 CFR 11.201(b). An agency may not collect or sponsor the collection of information, nor may it impose an information collection requirement unless it displays a currently valid Office of Management and Budget (OMB) control number.

International Compatibility

In keeping with U.S. obligations under the Convention on International Civil Aviation, it is FAA policy to comply with International Civil Aviation Organization (ICAO) Standards and Recommended Practices to the maximum extent practicable. The FAA has reviewed the corresponding ICAO Standards and Recommended Practices and has determined that additional modifications to certain QPS sections need to be made before the final rule becomes effective. The FAA has not included these QPS modifications in this final rule because they are beyond the scope of the NPRM. The FAA will make these modifications before this final rule becomes effective to comply with ICAO Standards and Recommended Practices to the maximum extent practicable.

Regulatory Evaluation Summary

This final rule establishes 14 CFR part 60, which contains requirements for the evaluation, qualification, and maintenance of FSTDs.

Total Costs and Benefits of This Rulemaking

The FAA has determined that the total cost of implementing the new part 60 from 2006 to 2015 will be approximately $1.3 million ($1.0 million, discounted). Nearly all of the $1.3 million over the 10-year period will be imposed on the industry. The FAA 10-year cost is estimated at $42,000.

The benefit of this rule is that it will ensure that flight crewmembers using FSTDs receive training in a device that closely matches the performance and handling characteristics of the aircraft being simulated.

Who Is Potentially Affected by This Rulemaking?

Sponsors of FSTDs, which includes training centers and certain airlines, are affected by this rulemaking.

Our Cost Assumptions and Sources of Information

Discount rate: 7%.

Period of Analysis: 2006–2015.

Monetary Values expressed in 2004 dollars.

Costs per individual action vary depending on whether the sponsor is small, medium, or large.

Regulatory Flexibility Determination

The Regulatory Flexibility Act of 1980 (RFA) establishes ''as a principle of regulatory issuance that agencies shall endeavor, consistent with the objective of the rule and of applicable statutes, to fit regulatory and informational requirements to the scale of the business, organizations, and governmental jurisdictions subject to regulation.'' To achieve that principle, the Act requires agencies to solicit and consider flexible regulatory proposals and to explain the rationale for their actions. The Act covers a wide-range of small entities, including small businesses, not-for-profit organizations and small governmental jurisdictions.

Agencies must perform a review to determine whether a proposed or final rule will have a significant economic impact on a substantial number of small entities. If the determination is that it will, the agency must prepare a regulatory flexibility analysis as described in the Act.

However, if an agency determines that a proposed or final rule is not expected to have a significant economic impact on a substantial number of small entities, section 605(b) of the 1980 act provides that the head of the agency may so certify and a regulatory flexibility analysis is not required. The certification must include a statement providing the factual basis for this determination, and the reasoning should be clear.

The Small Business Administration (SBA) recommends 1,500 or fewer employees as the ''small'' size standard that applies to Scheduled Passenger Air Transportation (NAICS code 481111). We believe that this size standard also applies to simulator sponsors, which include air carriers and simulator training centers. For part 60, the FAA identified a total of 11 simulator sponsors that meet this size standard. For each of these sponsors, the FAA attempted to retrieve their annual revenues and to calculate their annualized costs. Annual revenue data was only available for 5 out of the 11 sponsors. After calculating the prorated annualized costs using the same assumptions that were used in the cost section, the FAA then compared annualized costs with annualized revenues (see Table 14 for details).

TABLE 14.—SUMMARY OF RFA DETERMINATION OF ECONOMIC IMPACT

Sponsor	Number of employees	Annual revenues			Annualized cost of compliance [1]	Compliance as percentage of annual revenues			Significant economic impact? y/n		
		2000	2001	2002		2000	2001	2002	2000	2001	2002
1	973	n.a.	$150,712,673	n.a.	$1,828	n.a.	0.00	n.a.	n.a.	N	n.a.
2	116	$63,902,519	53,065,814	$43,396,103	474	0.00	0.00	0.00	N	N	N
3	563	274,420,131	111,560,208	4,350,617	474	0.00	0.00	0.01	N	N	N
4	134	48,765,676	49,320,778	66,015,229	474	0.00	0.00	0.00	N	N	N
5	410	224,249,551	96,951,552	92,035,880	474	0.00	0.00	0.00	N	N	N

Source: U.S. Dept. of Trans., FAA, APO 310.
Notes: 1) Annualized using a capital recovery factor of 0.14238, over 10 years, using a 7 percent rate of interest.

For the 5 sponsors shown in Table 14, annualized costs of the rule will be considerably less than one-tenth of one percent of their annual revenues. The FAA contends that these costs will not have a significant economic impact on these small entities.

Accordingly, pursuant to the Regulatory Flexibility Act, 5 U.S.C. 605(b), the Federal Aviation Administration certifies that this rule will not have a significant economic impact on a substantial number of small entities.

International Trade Impact Assessment

The Trade Agreements Act of 1979 prohibits Federal agencies from engaging in any standards or related activities that create unnecessary obstacles to the foreign commerce of the United States. Legitimate domestic objectives, such as safety, are not considered unnecessary obstacles. The statute also requires consideration of international standards and where appropriate, that they be the basis for U.S. standards.

In accordance with the above statute, the FAA has assessed the potential effect of this final rule and has determined that it will have the same impact on foreign sponsors as on domestic sponsors and, therefore, creates no obstacles to the foreign commerce of the United States.

Unfunded Mandates Assessment

The Unfunded Mandates Reform Act of 1995 (the Act) is intended, among other things, to curb the practice of imposing unfunded Federal mandates on State, local, and tribal governments. Title II of the Act requires each Federal agency to prepare a written statement assessing the effects of any Federal mandate in a proposed or final agency rule that may result in an expenditure of $100 million or more (adjusted annually for inflation) in any one year by State, local, and tribal governments, in the aggregate, or by the private sector; such a mandate is deemed to be a ''significant regulatory action.'' The FAA currently uses an inflation-adjusted value of $128.1 million in lieu of $100 million.

This final rule does not contain an Unfunded Mandate. The requirements of Title II do not apply.

Executive Order 13132, Federalism

The FAA has analyzed this final rule under the principles and criteria of Executive Order 13132, Federalism. We determined that this action will not have a substantial direct effect on the States, on the relationship between the national Government and the States, or on the distribution of power and responsibilities among the various levels of government. Therefore, we determined that this final rule will not have federalism implications.

Environmental Analysis

FAA Order 1050.1E identifies FAA actions that are categorically excluded from preparation of an environmental assessment or environmental impact statement under the National Environmental Policy Act in the absence of extraordinary circumstances. The FAA has determined this rulemaking action qualifies for the categorical exclusion identified in paragraph 312f and involves no extraordinary circumstances.

Regulations that Significantly Affect Energy Supply, Distribution, or Use

The FAA has analyzed this final rule under Executive Order 13211, Actions Concerning Regulations that Significantly Affect Energy Supply, Distribution, or Use (May 18, 2001). We have determined that it is not a ''significant energy action'' under the executive order because it is not a ''significant regulatory action'' under Executive Order 12866, and it is not likely to have a significant adverse effect on the supply, distribution, or use of energy.

List of Subjects

14 CFR Part 1

Air transportation.

14 CFR Part 11

Administrative practice and procedure, Reporting and recordkeeping requirements.

14 CFR Part 60

Airmen, Aviation safety, Reporting and recordkeeping requirements.

14 CFR Part 121

Air carriers, Aircraft, Airmen, Alcohol abuse, Aviation safety, Charter flights, Drug abuse, Drug testing, Reporting and recordkeeping requirements, Safety, Transportation.

The Amendment

■ The Federal Aviation Administration amends Title 14, Chapter I of the Code of Federal Regulations as follows:

PART 1—DEFINITIONS AND ABBREVIATIONS

■ 1. The authority citation for part 1 continues to read as follows:

Authority: 49 U.S.C. 106(g), 40113, 44701.

■ 2. Section 1.1 is amended by adding new definitions in alphabetical order to read as follows:

§ 1.1 General definitions.

* * * * *

Flight simulation training device (FSTD) means a flight simulator or a flight training device.

* * * * *

Flight training device (FTD) means a replica of aircraft instruments, equipment, panels, and controls in an open flight deck area or an enclosed aircraft cockpit replica. It includes the equipment and computer programs necessary to represent aircraft (or set of aircraft) operations in ground and flight conditions having the full range of capabilities of the systems installed in the device as described in part 60 of this chapter and the qualification performance standard (QPS) for a specific FTD qualification level.

* * * * *

Full flight simulator (FFS) means a replica of a specific type; or make, model, and series aircraft cockpit. It includes the assemblage of equipment and computer programs necessary to represent aircraft operations in ground and flight conditions, a visual system providing an out-of-the-cockpit view, a system that provides cues at least equivalent to those of a three-degree-of-freedom motion system, and has the full range of capabilities of the systems installed in the device as described in part 60 of this chapter and the qualification performance standards (QPS) for a specific FFS qualification level.

* * * * *

■ 3. Section 1.2 is amended by adding new abbreviations in alphabetical order to read as follows:

§ 1.2 Abbreviations and symbols.

* * * * *

FFS means full flight simulator.

* * * * *

FSTD means flight simulation training device.

FTD means flight training device.

* * * * *

PART 11—GENERAL RULEMAKING PROCEDURES

■ 4. The authority citation for part 11 continues to read as follows:

Authority: 49 U.S.C. 106(g), 40101, 40103, 40105, 40109, 40113, 44110, 44502, 44701–44702, 44711, and 46102.

■ 5. Amend the table in § 11.201(b) by adding an entry for part 60 to read as follows:

§ 11.201 Office of Management and Budget (OMB) control numbers assigned under the Paperwork Reduction Act.

* * * * *

(b) * * *

14 CFR part or section identified and described	Current OMB control number
* * *	* *
Part 60	2120–0680
* * *	* *

■ 6. Part 60 is added to subchapter D to read as follows:

PART 60—FLIGHT SIMULATION TRAINING DEVICE INITIAL AND CONTINUING QUALIFICATION AND USE

Sec.

Authority: 49 U.S.C. 106(g), 40113, and 44701.

§ 60.1 Applicability.

(a) This part prescribes the rules governing the initial and continuing qualification and use of all aircraft flight simulation training devices (FSTD) used for meeting training, evaluation, or flight experience requirements of this chapter for flight crewmember certification or qualification.

(b) The rules of this part apply to each person using or applying to use an FSTD to meet any requirement of this chapter.

(c) The requirements of § 60.33 regarding falsification of applications, records, or reports also apply to each person who uses an FSTD for training, evaluation, or obtaining flight experience required for flight crewmember certification or qualification under this chapter.

§ 60.2 Applicability of sponsor rules to persons who are not sponsors and who are engaged in certain unauthorized activities.

(a) The rules of this part that are directed to a sponsor of an FSTD also apply to any person who uses or causes the use of an FSTD when—

(1) That person knows that the FSTD does not have an FAA-approved sponsor; and

(2) The use of the FSTD by that person is nonetheless claimed for purposes of meeting any requirement of this chapter or that person knows or should have known that the person's acts or omissions would cause another person to mistakenly credit use of the FSTD for purposes of meeting any requirement of this chapter.

(b) A situation in which paragraph (a) of this section would not apply to a person would be when each of the following conditions are met:

(1) The person sold or leased the FSTD and merely represented to the purchaser or lessee that the FSTD is in a condition in which it should be able to obtain FAA approval and qualification under this part;

(2) The person does not falsely claim to be the FAA-approved sponsor for the FSTD;

(3) The person does not falsely make representations that someone else is the FAA-approved sponsor of the FSTD at a time when that other person is not the FAA-approved sponsor of the FSTD; and

(4) The person's acts or omissions do not cause another person to detrimentally rely on such acts or omissions for the mistaken conclusion that the FSTD is FAA-approved and qualified under this part at the time the FSTD is sold or leased.

§ 60.3 Definitions.

In addition to the definitions in part 1 of this chapter, other terms and definitions applicable to this part are found in appendix F of this part.

§ 60.4 Qualification Performance Standards.

The Qualification Performance Standards (QPS) are published in appendices to this part as follows:

(a) Appendix A contains the QPS for Airplane Flight Simulators.

(b) Appendix B contains the QPS for Airplane Flight Training Devices.

(c) Appendix C contains the QPS for Helicopter Flight Simulators.

(d) Appendix D contains the QPS for Helicopter Flight Training Devices.

(e) Appendix E contains the QPS for Quality Management Systems for FSTDs.

(f) Appendix F contains the QPS for Definitions and Abbreviations for FSTDs.

§ 60.5 Quality management system.

(a) After October 30, 2009, no sponsor may use or allow the use of or offer the use of an FSTD for flight crewmember training or evaluation or for obtaining flight experience to meet any requirement of this chapter unless the sponsor has established and follows a quality management system (QMS), currently approved by the National Simulator Program Manager (NSPM), for the continuing surveillance and analysis of the sponsor's performance and effectiveness in providing a satisfactory FSTD for use on a regular basis as described in QPS appendix E of this part.

(b) The QMS program must provide a process for identifying deficiencies in the program and for documenting how the program will be changed to address these deficiencies.

(c) Whenever the NSPM finds that the QMS program does not adequately address the procedures necessary to meet the requirements of this part, the sponsor must, after notification by the NSPM, change the program so the procedures meet the requirements of this part. Each such change must be approved by the NSPM prior to implementation.

(d) Within 30 days after the sponsor receives a notice described in paragraph (c) of this section, the sponsor may file a petition with the Director of Flight Standards Service (the Director) for reconsideration of the NSPM finding. The sponsor must address its petition to the Director, Flight Standards Service, AFS–1, Federal Aviation Administration, 800 Independence Ave., SW., Washington, DC 20591. The filing of such a petition to reconsider stays the notice pending a decision by the Director. However, if the Director finds that there is a situation that requires immediate action in the interest of safety in air commerce, he may, upon a statement of the reasons, require a change effective without stay.

§ 60.7 Sponsor qualification requirements.

(a) A person is eligible to apply to be a sponsor of an FSTD if the following conditions are met:

(1) The person holds, or is an applicant for, a certificate under part 119, 141, or 142 of this chapter; or holds, or is an applicant for, an approved flight engineer course in accordance with part 63 of this chapter.

(2) The FSTD will be used, or will be offered for use, in the sponsor's FAA-approved flight training program for the aircraft being simulated as evidenced in a request for evaluation submitted to the NSPM.

(b) A person is a sponsor if the following conditions are met:

(1) The person is a certificate holder under part 119, 141, or 142 of this chapter or has an approved flight engineer course in accordance with part 63 of this chapter.

(2) The person has—

(i) Operations specifications authorizing the use of the specific aircraft or set of aircraft and has an FAA-approved training program under which at least one FSTD, simulating the aircraft or set of aircraft and for which the person is the sponsor, is used by the sponsor as described in paragraphs (b)(5) or (b)(6) of this section; or

(ii) Training specifications or an FAA-approved course of training under which at least one FSTD, simulating that aircraft or set of aircraft and for which the person is the sponsor, is used by the sponsor as described in paragraphs (b)(5) or (b)(6) of this section.

(3) The person has a quality management system currently approved by the NSPM in accordance with § 60.5.

(4) The NSPM has accepted the person as the sponsor of the FSTD and that acceptance has not been withdrawn by the FAA.

(5) At least one FSTD (as referenced in paragraph (b)(2)(i) or (b)(2)(ii) of this section) that is initially qualified on or after October 30, 2007, is used within the sponsor's FAA-approved flight training program for the aircraft or set of aircraft at least once within the 12-month period following the initial/upgrade evaluation, and at least once within each subsequent 12-month period thereafter.

(6) At least one FSTD (as referenced in paragraph (b)(2)(i) or (b)(2)(ii) of this section) that was qualified before October 30, 2007, is used within the sponsor's FAA-approved flight training program for the aircraft or set of aircraft at least once within the 12-month period following the first continuing qualification evaluation conducted by the NSPM after October 30, 2007 and at least once within each subsequent 12-month period thereafter.

(c) If the use requirements of paragraphs (b)(2) and either (b)(5) or (b)(6) of this section are not met, the person will forfeit the right to sponsor that FSTD and that person will not be eligible to apply to sponsor that FSTD for at least 12 calendar months following the expiration of the qualification status.

(d) In addition to the FSTD described in paragraph (b) of this section, an FSTD sponsor may sponsor any number of other FSTDs regardless of specific aircraft or set of aircraft provided either—

(1) During the preceding 12-month period, all of the other FSTDs are used within the sponsor's or another certificate holder's FAA-approved flight training program for the aircraft or set of aircraft simulated; or

(2) The sponsor obtains a written statement at least annually from a qualified pilot who has flown the aircraft or set of aircraft (as appropriate) during the preceding 12-month period stating that the subject FSTD's performance and handling qualities, within the normal operating envelope, represent the aircraft or set of aircraft described in the FAA Type Certificate and the type data sheet, if appropriate. The sponsor must retain the two most current written statements for review by the NSPM.

§ 60.9 Additional responsibilities of the sponsor.

(a) The sponsor must allow the NSPM upon request to inspect the FSTD as soon as practicable. This inspection may include all records and documents relating to the FSTD, to determine its compliance with this part.

(b) The sponsor must do the following for each FSTD:

(1) Establish a mechanism to receive written comments regarding the FSTD and its operation in accordance with the QPS appendix E of this part.

(2) Post in or adjacent to the FSTD the Statement of Qualification issued by the NSPM. An electronic copy of the Statement of Qualification that may be accessed by an appropriate terminal or display in or adjacent to the FSTD is satisfactory.

(c) Each sponsor of an FSTD must identify to the NSPM by name, one individual to be the management representative (MR).

(1) One person may serve as an MR for more than one FSTD, but one FSTD must not have more than one person serving in this capacity.

(2) Each MR must be an employee of the sponsor with the responsibility and authority to—

(i) Monitor the on-going qualification of assigned FSTDs to ensure that all matters regarding FSTD qualification are being carried out as provided for in this part;

(ii) Ensure that the QMS is properly established, implemented, and maintained by overseeing the structure (and modifying where necessary) of the QMS policies, practices, and procedures; and

(iii) Regularly brief sponsor's management on the status of the on-going FSTD qualification program and the effectiveness and efficiency of the QMS.

(3) The MR serves as the primary contact point for all matters between the sponsor and the NSPM regarding the qualification of that FSTD as provided for in this part.

(4) The MR may delegate the duties described in paragraph (c)(2) and (c)(3) of this section to an individual at each of the sponsor's locations.

§ 60.11 FSTD use.

No person may use or allow the use of or offer the use of an FSTD for flight crewmember training or evaluation or for obtaining flight experience to meet any of the requirements under this chapter unless, in accordance with the QPS for the specific device, the FSTD meets all of the following:

(a) Has a single sponsor who is qualified under § 60.7. The sponsor may arrange with another person for services of document preparation and presentation, as well as FSTD inspection, maintenance, repair, and servicing; however, the sponsor remains responsible for ensuring that these functions are conducted in a manner and with a result of continually meeting the requirements of this part.

(b) Is qualified as described in the Statement of Qualification.

(c) Remains qualified, through satisfactory inspection, continuing qualification evaluations, appropriate maintenance, and use requirements in accordance with this part and the applicable QPS.

(d) Functions during day-to-day training, evaluation, or flight experience activities with the software and hardware that was evaluated as satisfactory by the NSPM and, if modified, modified only in accordance with the provisions of this part. However, this section does not apply to routine software or hardware changes that do not fall under the requirements of § 60.23.

(e) Is operated in accordance with the provisions and limitations of § 60.25.

§ 60.13 FSTD objective data requirements.

(a) Except as provided in paragraph (b) and (c) of this section, for the purposes of validating FSTD performance and handling qualities during evaluation for qualification, the data made available to the NSPM (the validation data package) must include the aircraft manufacturer's flight test data and all relevant data developed after the type certificate was issued (*e.g.*, data developed in response to an airworthiness directive) if such data results from a change in performance, handling qualities, functions, or other characteristics of the aircraft that must be considered for flight crewmember training, evaluation, or for meeting experience requirements of this chapter.

(b) The validation data package may contain flight test data from a source in addition to or independent of the aircraft manufacturer's data in support of an FSTD qualification, but only if this data is gathered and developed by that source in accordance with flight test methods, including a flight test plan, as described in the applicable QPS.

(c) The validation data package may also contain predicted data, engineering simulation data, data from pilot owner or pilot operating manuals, or data from public domain sources, provided this data is acceptable to the NSPM. If found acceptable the data may then be used in particular applications for FSTD qualification.

(d) Data or other material or elements must be submitted in a form and manner acceptable to the NSPM.

(e) The NSPM may require additional objective data, which may include flight testing if necessary, if the validation data package does not support FSTD qualification requirements as described in this part and the applicable QPS appendix.

(f) When an FSTD sponsor learns, or is advised by an aircraft manufacturer or other data provider, that an addition to, an amendment to, or a revision of data that may relate to FSTD performance or handling characteristics is available, the sponsor must notify the NSPM as described in the applicable QPS.

§ 60.14 Special equipment and personnel requirements for qualification of the FSTD.

When notified by the NSPM, the sponsor must make available all special equipment and qualified personnel needed to accomplish or assist in the accomplishment of tests during initial qualification, continuing qualification, or special evaluations.

§ 60.15 Initial qualification requirements.

(a) For each FSTD, the sponsor must submit a request to the NSPM to evaluate the FSTD for initial qualification at a specific level and simultaneously request the Training Program Approval Authority (TPAA) forward a concurring letter to the NSPM. The request must be submitted in the form and manner described in the applicable QPS.

(b) The management representative described in § 60.9(c) must sign a statement (electronic signature is acceptable for electronic transmissions) after confirming the following:

(1) The performance and handling qualities of the FSTD represent those of the aircraft or set of aircraft within the normal operating envelope. This determination must be made by a pilot(s) meeting the requirements of paragraph (d) of this section after having flown all of the Operations Tasks listed in the applicable QPS appendix relevant to the qualification level of the FSTD. Exceptions, if any, must be noted. The name of the person(s) making this determination must be available to the NSPM upon request.

(2) The FSTD systems and sub-systems (including the simulated aircraft systems) functionally represent those in the aircraft or set of aircraft. This determination must be made by the pilot(s) described in paragraph (b)(1) of this section, or by a person(s) trained on simulator systems/sub-systems and trained on the operation of the simulated aircraft systems, after having exercised the operation of the FSTD and the pertinent functions available through the Instructor Operating Station(s). Exceptions, if any, must be noted. The name of the person(s) making this determination must be available to the NSPM upon request.

(3) The cockpit represents the configuration of the specific type; or aircraft make, model, and series aircraft being simulated, as appropriate. This determination must be made by the pilot(s) described in paragraph (b)(1) of this section, or by a person(s) trained on the configuration and operation of the aircraft simulated. Exceptions, if any, must be noted. The name of the person(s) making this determination must be available to the NSPM upon request.

(c) Except for those FSTDs previously qualified and described in § 60.17, each FSTD evaluated for initial qualification must meet the standard that is in effect at the time of the evaluation. However—

(1) If the FAA publishes a change to the existing standard or publishes a new standard for the evaluation for initial qualification, a sponsor may request that the NSPM apply the standard that was in effect when an FSTD was ordered for delivery if the sponsor—

(i) Within 30 days of the publication of the change to the existing standard or publication of the new standard, notifies the NSPM that an FSTD has been ordered;

(ii) Within 90 days of the NSPM notification described in paragraph (c)(1)(i) of this section, requests that the standard in effect at the time the order was placed be used for the evaluation for initial qualification; and

(iii) The evaluation is conducted within 24 months following the publication of the change to the existing standard or publication of the new standard.

(2) This notification must include a description of the FSTD; the anticipated qualification level of the FSTD; the make, model, and series of aircraft simulated; and any other pertinent information.

(3) Any tests, tolerances, or other requirements that are current at the time of the evaluation may be used during the initial evaluation, at the request of the sponsor, if the sponsor provides acceptable updates to the required qualification test guide.

(4) The standards used for the evaluation for initial qualification will be used for all subsequent evaluations of the FSTD.

(d) The pilot(s) who contributes to the confirmation statement required by paragraph (b) of this section must—

(1) Be designated by the sponsor; and

(2) Be qualified in—

(i) The aircraft or set of aircraft being simulated; or

(ii) For aircraft not yet issued a type certificate, or aircraft not previously operated by the sponsor or not having previous FAA-approved training programs conducted by the sponsor, an aircraft similar in size and configuration.

(e) The subjective tests that form the basis for the statements described in paragraph (b) of this section and the objective tests referenced in paragraph (f) of this section must be accomplished at the sponsor's training facility, except as provided for in the applicable QPS.

(f) The person seeking to qualify the FSTD must provide the NSPM access to the FSTD for the length of time necessary for the NSPM to complete the required evaluation of the FSTD for initial qualification, which includes the conduct and evaluation of objective and subjective tests, including general FSTD requirements, as described in the applicable QPS, to determine that the FSTD meets the standards in that QPS.

(g) When the FSTD passes an evaluation for initial qualification, the NSPM issues a Statement of Qualification that includes all of the following:

(1) Identification of the sponsor.

(2) Identification of the make, model, and series of the aircraft or set of aircraft being simulated.

(3) Identification of the configuration of the aircraft or set of aircraft being simulated (*e.g.*, engine model or models, flight instruments, or navigation or other systems).

(4) A statement that the FSTD is qualified as either a full flight simulator or a flight training device.

(5) Identification of the qualification level of the FSTD.

(6) A statement that (with the exception of the noted exclusions for which the FSTD has not been subjectively tested by the sponsor or the NSPM and for which qualification is not sought) the qualification of the FSTD includes the tasks set out in the applicable QPS appendix relevant to the qualification level of the FSTD.

(h) After the NSPM completes the evaluation for initial qualification, the sponsor must update the Qualification Test Guide (QTG), with the results of the FAA-witnessed tests together with the results of all the objective tests described in the applicable QPS.

(i) Upon issuance of the Statement of Qualification the updated QTG becomes the Master Qualification Test Guide (MQTG). The MQTG must be made available to the NSPM upon request.

§ 60.16 Additional qualifications for a currently qualified FSTD.

(a) A currently qualified FSTD is required to undergo an additional qualification process if a user intends to use the FSTD for meeting training, evaluation, or flight experience requirements of this chapter beyond the qualification issued for that FSTD. This process consists of the following:

(1) The sponsor:

(i) Must submit to the NSPM all modifications to the MQTG that are required to support the additional qualification.

(ii) Must describe to the NSPM all modifications to the FSTD that are required to support the additional qualification.

(iii) Must submit to the NSPM a confirmation statement as described in § 60.15(c) that a pilot, designated by the sponsor in accordance with § 60.15(d), has subjectively evaluated the FSTD in those areas not previously evaluated.

(2) The FSTD must successfully pass an evaluation—

(i) Consisting of all the elements of an initial evaluation for qualification in those circumstances where the NSPM has determined that all the elements of an initial evaluation for qualification is necessary; or

(ii) Consisting of those elements of an initial evaluation for qualification designated as necessary by the NSPM.

(b) In making the determinations described in paragraph (a)(2) of this section, the NSPM considers factors including the existing qualification of the FSTD, any modifications to the FSTD hardware or software that are involved, and any additions or modifications to the MQTG.

(c) The FSTD is qualified for the additional uses when the NSPM issues an amended Statement of Qualification in accordance with § 60.15(h).

(d) The sponsor may not modify the FSTD except as described in § 60.23.

§ 60.17 Previously qualified FSTDs.

(a) Unless otherwise specified by an FSTD Directive, further referenced in the applicable QPS, or as specified in paragraph (e) of this section, an FSTD qualified before October 30, 2007 will retain its qualification basis as long as it continues to meet the standards, including the objective test results recorded in the MQTG and subjective tests, under which it was originally evaluated, regardless of sponsor. The sponsor of such an FSTD must comply with the other applicable provisions of this part.

(b) For each FSTD qualified before October 30, 2007, no sponsor may use or allow the use of or offer the use of such an FSTD after October 30, 2013 for flight crewmember training, evaluation or flight experience to meet any of the requirements of this chapter, unless that FSTD has been issued a Statement of Qualification, including the Configuration List and the List of Qualified Tasks in accordance with the procedures set out in the applicable QPS.

(c) If the FSTD qualification is lost under § 60.27 and—

(i) Restored under § 60.27 in less than (2) years, then the qualification basis (in terms of objective tests and subjective tests) for the re-qualification will be those against which the FSTD was originally evaluated and qualified.

(ii) Not restored under § 60.27 for two (2) years or more, then the qualification basis (in terms of objective tests and subjective tests) for the re-qualification will be those standards in effect and current at the time of re-qualification application.

(d) Except as provided in paragraph (e) of this section, any change in FSTD qualification level initiated on or after October 30, 2007 requires an evaluation for initial qualification in accordance with this part.

(e) A sponsor may request that an FSTD be permanently downgraded. In such a case, the NSPM may downgrade a qualified FSTD without requiring and without conducting an initial evaluation for the new qualification level. Subsequent continuing qualification evaluations will use the existing MQTG, modified as necessary to reflect the new qualification level.

(f) When the sponsor has appropriate validation data available and receives approval from the NSPM, the sponsor may adopt tests and associated tolerances described in the current qualification standards as the tests and tolerances applicable for the continuing qualification of a previously qualified FSTD. The updated test(s) and tolerance(s) must be made a permanent part of the MQTG.

§ 60.19 Inspection, continuing qualification evaluation, and maintenance requirements.

(a) *Inspection.* No sponsor may use or allow the use of or offer the use of an FSTD for flight crewmember training, evaluation, or flight experience to meet any of the requirements of this chapter unless the sponsor does the following:

(1) Accomplishes all appropriate objective tests each year as specified in the applicable QPS.

(2) Completes a functional preflight check within the preceding 24 hours.

(b) *Continuing qualification evaluation.*

(1) This evaluation consists of objective tests, and subjective tests, including general FSTD requirements, as described in the applicable QPS or as may be amended by an FSTD Directive.

(2) The sponsor must contact the NSPM to schedule the FSTD for continuing qualification evaluations not later than 60 days before the evaluation is due.

(3) The sponsor must provide the NSPM access to the objective test results in the MQTG and access to the FSTD for the length of time necessary for the NSPM to complete the required continuing qualification evaluations.

(4) The frequency of NSPM-conducted continuing qualification evaluations for each FSTD will be established by the NSPM and specified in the MQTG.

(5) Continuing qualification evaluations conducted in the calendar month before or after the calendar month in which these continuing qualification evaluations are required will be considered to have been conducted in the calendar month in which they were required.

(6) No sponsor may use or allow the use of or offer the use of an FSTD for flight crewmember training or evaluation or for obtaining flight experience for the flight crewmember to meet any requirement of this chapter unless the FSTD has passed an NSPM-conducted continuing qualification evaluation within the time frame specified in the MQTG or within the grace period as described in paragraph (b)(5) of this section.

(c) *Maintenance.* The sponsor is responsible for continuing corrective and preventive maintenance on the FSTD to ensure that it continues to meet the requirements of this part and the applicable QPS appendix. No sponsor may use or allow the use of or offer the use of an FSTD for flight crewmember training, evaluation, or flight experience to meet any of the requirements of this chapter unless the sponsor does the following:

(1) Maintains a discrepancy log.

(2) Ensures that, when a discrepancy is discovered, the following requirements are met:

(i) A description of each discrepancy is entered in the log and remains in the log until the discrepancy is corrected as specified in § 60.25(b).

(ii) A description of the corrective action taken for each discrepancy, the identity of the individual taking the action, and the date that action is taken is entered in the log.

(iii) The discrepancy log is kept in a form and manner acceptable to the Administrator and is kept in or adjacent to the FSTD. An electronic log that may be accessed by an appropriate terminal or display in or adjacent to the FSTD is satisfactory.

§ 60.20 Logging FSTD discrepancies.

Each instructor, check airman, or representative of the Administrator conducting training, evaluation, or flight experience, and each person conducting the preflight inspection who discovers a discrepancy, including any missing, malfunctioning, or inoperative components in the FSTD, must write or cause to be written a description of that discrepancy into the discrepancy log at the end of the FSTD preflight or FSTD use session.

§ 60.21 Interim qualification of FSTDs for new aircraft types or models.

(a) A sponsor may apply for and the NSPM may issue an interim qualification level for an FSTD for a new type or model of aircraft, even though the aircraft manufacturer's aircraft data package is preliminary, if the sponsor provides the following to the satisfaction of the NSPM—

(1) The aircraft manufacturer's data, which consists of at least predicted data, validated by a limited set of flight test data;

(2) The aircraft manufacturer's description of the prediction methodology used to develop the predicted data; and

(3) The QTG test results.

(b) An FSTD that has been issued interim qualification is deemed to have been issued initial qualification unless the NSPM rescinds the qualification. Interim qualification terminates two years after its issuance, unless the NSPM determines that specific conditions warrant otherwise.

(c) Within twelve months of the release of the final aircraft data package by the aircraft manufacturer, but no later than two years after the issuance of the interim qualification status, the sponsor must apply for initial qualification in accordance with § 60.15 based on the final aircraft data package approved by the aircraft manufacturer, unless the NSPM determines that specific conditions warrant otherwise.

(d) An FSTD with interim qualification may be modified only in accordance with § 60.23.

§ 60.23 Modifications to FSTDs.

(a) *Description of a modification.* For the purposes of this part, an FSTD is said to have been modified when:

(1) Equipment or devices intended to simulate aircraft appliances are added to or removed from FSTD, which change the Statement of Qualification or the MQTG; or

(2) Changes are made to either software or hardware that are intended to impact flight or ground dynamics; changes are made that impact performance or handling characteristics of the FSTD (including motion, visual, control loading, or sound systems for those FSTD levels requiring sound tests and measurements); or changes are made to the MQTG.

(b) *FSTD Directive.* When the FAA determines that FSTD modification is necessary for safety of flight reasons, the sponsor of each affected FSTD must ensure that the FSTD is modified according to the FSTD Directive regardless of the original qualification standards applicable to any specific FSTD.

(c) *Using the modified FSTD.* The sponsor may not use, or allow the use of, or offer the use of, the FSTD with the proposed modification for flight crewmember training or evaluation or for obtaining flight experience for the flight crewmember to meet any requirement of this chapter unless:

(1) The sponsor has notified the NSPM and the TPAA of their intent to incorporate the proposed modification, and one of the following has occurred;

(i) Twenty-one days have passed since the sponsor notified the NSPM and the TPAA of the proposed modification and the sponsor has not received any response from either the NSPM or the TPAA;

(ii) Twenty-one days have passed since the sponsor notified the NSPM and the TPAA of the proposed modification and one has approved the proposed modification and the other has not responded;

(iii) Fewer than twenty-one days have passed since the sponsor notified the NSPM and the TPAA of the proposed modification and the NSPM and TPAA both approve the proposed modification;

(iv) The sponsor has successfully completed any evaluation the NSPM may require in accordance with the standards for an evaluation for initial qualification or any part thereof before the modified FSTD is placed in service.

(2) The notification is submitted with the content as, and in a form and manner as, specified in the applicable QPS.

(d) *User notification.* When a modification is made to an FSTD that affects the Statement of Qualification, the sponsor must post an addendum to the Statement of Qualification until such time as a permanent, updated statement is posted.

(e) *MQTG update.* The MQTG must be updated with current objective test results in accordance with § 60.15(h) and (i) and appropriate objective data in accordance with § 60.13, each time an FSTD is modified and an objective test or other MQTG section is affected by the modification. If an FSTD Directive is the cause of this update, the direction to make the modification and the record of the modification completion must be filed in the MQTG.

§ 60.25 Operation with missing, malfunctioning, or inoperative components.

(a) No person may knowingly use or allow the use of or misrepresent the capability of an FSTD for any maneuver, procedure, or task that is to be accomplished to meet training, evaluation, or flight experience requirements of this chapter for flight crewmember certification or qualification when there is a missing, malfunctioning, or inoperative (MMI) component that is required to be present and correctly operate for the satisfactory completion of that maneuver, procedure, or task.

(b) Each MMI component as described in paragraph (a) of this section, or any MMI component installed and required to operate correctly to meet the current Statement of Qualification, must be repaired or replaced within 30 calendar days, unless otherwise required or authorized by the NSPM.

(c) A list of the current MMI components must be readily available in or adjacent to the FSTD for review by users of the device. Electronic access to this list via an appropriate terminal or display in or adjacent to the FSTD is satisfactory. The discrepancy log may be used to satisfy this requirement provided each currently MMI component is listed in the discrepancy log.

§ 60.27 Automatic loss of qualification and procedures for restoration of qualification.

(a) An FSTD qualification is automatically lost when any of the following occurs:

(1) The FSTD is not used in the sponsor's FAA-approved flight training program in accordance with § 60.7(b)(5) or (b)(6) and the sponsor does not obtain and maintain the written statement as described in § 60.7(d)(2).

(2) The FSTD is not inspected in accordance with § 60.19.

(3) The FSTD is physically moved from one location and installed in a different location, regardless of distance.

(4) The MQTG is missing or otherwise not available and a replacement is not made within 30 days.

(b) If FSTD qualification is lost under paragraph (a) of this section, qualification is restored when either of the following provisions is met:

(1) The FSTD successfully passes an evaluation:

(i) For initial qualification, in accordance with §§ 60.15 and 60.17(c) in those circumstances where the NSPM has determined that a full evaluation for initial qualification is necessary; or

(ii) For those elements of an evaluation for initial qualification, in accordance with §§ 60.15 and 60.17(c), as determined to be necessary by the NSPM.

(2) The NSPM advises the sponsor that an evaluation is not necessary.

(c) In making the determinations described in paragraph (b) of this section, the NSPM considers factors including the number of continuing qualification evaluations missed, the number of sponsor-conducted quarterly inspections missed, and the care that had been taken of the device since the last evaluation.

§ 60.29 Other losses of qualification and procedures for restoration of qualification.

(a) Except as provided in paragraph (c) of this section, when the NSPM determines that the FSTD no longer meets qualification standards, the following procedure applies:

(1) The NSPM notifies the sponsor in writing that the FSTD no longer meets some or all of its qualification standards.

(2) The NSPM sets a reasonable period (but not less than 7 days) within which the sponsor may submit written information, views, and arguments on the FSTD qualification.

(3) After considering all material presented, the NSPM notifies the sponsor about the determination with regard to the qualification of the FSTD.

(4) When the NSPM notifies the sponsor that some or all of the FSTD is no longer qualified, the action described in the notification becomes effective not less than 30 days after the sponsor receives that notice unless—

(i) The NSPM finds under paragraph (c) of this section that there is an emergency requiring immediate action with respect to safety in air commerce; or

(ii) The sponsor petitions the Director of Flight Standards Service for reconsideration of the NSPM finding under paragraph (b) of this section.

(b) When a sponsor seeks reconsideration of a decision from the NSPM concerning the FSTD qualification, the following procedure applies:

(1) The sponsor must petition for reconsideration of that decision within 30 days of the date that the sponsor receives a notice that some or all of the FSTD is no longer qualified.

(2) The sponsor must address its petition to the Director, Flight Standards Service, AFS–1, Federal Aviation Administration, 800 Independence Ave., SW., Washington, DC 20591.

(3) A petition for reconsideration, if filed within the 30-day period, suspends the effectiveness of the determination by the NSPM that the FSTD is no longer qualified unless the NSPM has found, under paragraph (c) of this section, that an emergency exists requiring immediate action with respect to safety in air commerce.

(c) If the NSPM find that an emergency exists requiring immediate action with respect to safety in air commerce that makes the procedures set out in this section impracticable or contrary to the public interest:

(1) The NSPM withdraws qualification of some or all of the FSTD and makes the withdrawal of qualification effective on the day the sponsor receives notice of it.

(2) In the notice to the sponsor, the NSPM articulates the reasons for its finding that an emergency exists requiring immediate action with respect to safety in air transportation or air commerce or that makes it impracticable or contrary to the public interest to stay the effectiveness of the finding.

(d) FSTD qualification lost under paragraph (a) or (c) of this section may be restored when either of the following provisions are met:

(1) The FSTD successfully passes an evaluation for initial qualification, in accordance with §§ 60.15 and 60.17(c)

in those circumstances where the NSPM has determined that a full evaluation for initial qualification is necessary; or

(2) The FSTD successfully passes an evaluation for those elements of an initial qualification evaluation, in accordance with §§ 60.15 and 60.17(c), as determined to be necessary by the NSPM.

(e) In making the determinations described in paragraph (d) of this section, the NSPM considers factors including the reason for the loss of qualification, any repairs or replacements that may have to have been completed, the number of continuing qualification evaluations missed, the number of sponsor-conducted quarterly inspections missed, and the care that had been taken of the device since the loss of qualification.

§ 60.31 Recordkeeping and reporting.

(a) The FSTD sponsor must maintain the following records for each FSTD it sponsors:

(1) The MQTG and each amendment thereto.

(2) A record of all FSTD modifications affected under § 60.23 since the issuance of the original Statement of Qualification.

(3) A copy of all of the following:

(i) Results of the qualification evaluations (initial and each upgrade) since the issuance of the original Statement of Qualification.

(ii) Results of the objective tests conducted in accordance with § 60.19(a) for a period of 2 years.

(iii) Results of the previous three continuing qualification evaluations, or the continuing qualification evaluations from the previous 2 years, whichever covers a longer period.

(iv) Comments obtained in accordance with § 60.9(b) for a period of at least 90 days.

(4) A record of all discrepancies entered in the discrepancy log over the previous 2 years, including the following:

(i) A list of the components or equipment that were or are missing, malfunctioning, or inoperative.

(ii) The action taken to correct the discrepancy.

(iii) The date the corrective action was taken.

(iv) The identity of the person determining that the discrepancy has been corrected.

(b) The records specified in this section must be maintained in plain language form or in coded form if the coded form provides for the preservation and retrieval of information in a manner acceptable to the NSPM.

§ 60.33 Applications, logbooks, reports, and records: Fraud, falsification, or incorrect statements.

(a) No person may make, or cause to be made, any of the following:

(1) A fraudulent or intentionally false statement in any application or any amendment thereto, or any other report or test result required by this part.

(2) A fraudulent or intentionally false statement in or a known omission from any record or report that is kept, made, or used to show compliance with this part, or to exercise any privileges under this chapter.

(3) Any reproduction or alteration, for fraudulent purpose, of any report, record, or test result required under this part.

(b) The commission by any person of any act prohibited under paragraph (a) of this section is a basis for any one or any combination of the following:

(1) A civil penalty.

(2) Suspension or revocation of any certificate held by that person that was issued under this chapter.

(3) The removal of FSTD qualification and approval for use in a training program.

(c) The following may serve as a basis for removal of qualification of an FSTD including the withdrawal of approval for use of an FSTD; or denying an application for a qualification:

(1) An incorrect statement, upon which the FAA relied or could have relied, made in support of an application for a qualification or a request for approval for use.

(2) An incorrect entry, upon which the FAA relied or could have relied, made in any logbook, record, or report that is kept, made, or used to show compliance with any requirement for an FSTD qualification or an approval for use.

§ 60.35 Specific full flight simulator compliance requirements.

(a) No device will be eligible for initial or upgrade qualification to a FFS at Level C or Level D under this part unless it includes the equipment and appliances installed and operating to the extent necessary for the issuance of an airman certificate or rating.

(b) No device will be eligible for initial or upgrade qualification to a FFS at Level A or Level B under this part unless it includes the equipment and appliances installed and operating to the extent necessary for the training, testing, and/or checking that comprise the simulation portion of the requirements for issuance of an airman certificate or rating.

§ 60.37 FSTD qualification on the basis of a Bilateral Aviation Safety Agreement (BASA).

(a) The evaluation and qualification of an FSTD by a contracting State to the Convention on International Civil Aviation for the sponsor of an FSTD located in that contracting State may be used as the basis for issuing a U.S. statement of qualification (see applicable QPS, attachment 4, figure 4) by the NSPM to the sponsor of that FSTD in accordance with—

(1) A BASA between the United States and the Contracting State that issued the original qualification; and

(2) A Simulator Implementation Procedure (SIP) established under the BASA.

(b) The SIP must contain any conditions and limitations on validation and issuance of such qualification by the U.S.

Appendix A to Part 60—Qualification Performance Standards for Airplane Full Flight Simulators

Begin Information

This appendix establishes the standards for Airplane Full Flight Simulator (FFS) evaluation and qualification. The Flight Standards Service, National Simulator Program Manager (NSPM), is responsible for the development, application, and implementation of the standards contained within this appendix. The procedures and criteria specified in this appendix will be used by the NSPM, or a person assigned by the NSPM, when conducting airplane FFS evaluations.

Table of Contents

18. Operations with Missing, Malfunctioning, or Inoperative Components (§ 60.25).
19. Automatic Loss of Qualification and Procedures for Restoration of Qualification (§ 60.27).
20. Other Losses of Qualification and Procedures for Restoration of Qualification (§ 60.29).
21. Record keeping and Reporting (§ 60.31).
22. Applications, Logbooks, Reports, and Records: Fraud, Falsification, or Incorrect Statements (§ 60.33).
23. Specific Full Flight Simulator Compliance Requirements (§ 60.35).
24. [Reserved]
25. FSTD Qualification on the Basis of a Bilateral Aviation Safety Agreement (BASA) (§ 60.37).
Attachment 1 to Appendix A to Part 60—General Simulator Requirements.
Attachment 2 to Appendix A to Part 60—Full Flight Simulator (FFS) Objective Test.
Attachment 3 to Appendix A to Part 60—Simulator Subjective Evaluation.
Attachment 4 to Appendix A to Part 60—Sample Documents.
Attachment 5 to Appendix A to Part 60—Simulator Qualification Requirements for Windshear Training Program Use.

End Information

---

1. Introduction

Begin Information

a. This appendix contains background information as well as regulatory and informative material as described later in this section. To assist the reader in determining what areas are required and what areas are permissive, the text in this appendix is divided into two sections: ''QPS Requirements'' and ''Information.'' The QPS Requirements sections contain details regarding compliance with the part 60 rule language. These details are regulatory, but are found only in this appendix. The Information sections contain material that is advisory in nature, and designed to give the user general information about the regulation.

b. Related Reading References.
(1) 14 CFR part 60.
(2) 14 CFR part 61.
(3) 14 CFR part 63.
(4) 14 CFR part 119.
(5) 14 CFR part 121.
(6) 14 CFR part 125.
(7) 14 CFR part 135.
(8) 14 CFR part 141.
(9) 14 CFR part 142.
(10) Advisory Circular (AC) 120–28C, Criteria for Approval of Category III Landing Weather Minima.
(11) AC 120–29, Criteria for Approving Category I and Category II Landing Minima for part 121 operators.
(12) AC 120–35B, Line Operational Simulations: Line-Oriented Flight Training, Special Purpose Operational Training, Line Operational Evaluation.
(13) AC 120–41, Criteria for Operational Approval of Airborne Wind Shear Alerting and Flight Guidance Systems.
(14) AC 120–57A, Surface Movement Guidance and Control System (SMGS).
(15) AC 150/5300–13, Airport Design.
(16) AC 150/5340–1G, Standards for Airport Markings.
(17) AC 150/5340–4C, Installation Details for Runway Centerline Touchdown Zone Lighting Systems.
(18) AC 150/5340–19, Taxiway Centerline Lighting System.
(19) AC 150/5340–24, Runway and Taxiway Edge Lighting System.
(20) AC 150/5345–28D, Precision Approach Path Indicator (PAPI) Systems
(21) International Air Transport Association document, ''Flight Simulator Design and Performance Data Requirements,'' as amended.
(22) AC 25–7, as amended, Flight Test Guide for Certification of Transport Category Airplanes.
(23) AC 23–8A, as amended, Flight Test Guide for Certification of Part 23 Airplanes.
(24) International Civil Aviation Organization (ICAO) Manual of Criteria for the Qualification of Flight Simulators, as amended.
(25) Airplane Flight Simulator Evaluation Handbook, Volume I, as amended and Volume II, as amended, The Royal Aeronautical Society, London, UK.
(26) FAA Publication FAA–S–8081 series (Practical Test Standards for Airline Transport Pilot Certificate, Type Ratings, Commercial Pilot, and Instrument Ratings).
(27) The FAA Aeronautical Information Manual (AIM). An electronic version of the AIM is on the internet at *http://www.faa.gov/atpubs.*

End Information

---

2. Applicability (§§ 60.1 & 60.2)

Begin Information

There is no additional regulatory or informational material that applies to § 60.1, Applicability, or to § 60.2, Applicability of sponsor rules to persons who are not sponsors and who are engaged in certain unauthorized activities.

End Information

---

3. Definitions (§ 60.3)

Begin Information

See appendix F for a list of definitions and abbreviations from part 1 and part 60, including the appropriate appendices of part 60.

End Information

---

4. Qualification Performance Standards (§ 60.4)

Begin Information

There is no additional regulatory or informational material that applies to § 60.4, Qualification Performance Standards.

End Information

---

5. Quality Management System (§ 60.5)

Begin Information

See appendix E for additional regulatory and informational material regarding Quality Management Systems.

End Information

---

6. Sponsor Qualification Requirements (§ 60.7)

Begin Information

a. The intent of the language in § 60.7(b) is to have a specific FFS, identified by the sponsor, used at least once in an FAA-approved flight training program for the airplane simulated during the 12-month period described. The identification of the specific FFS may change from one 12-month period to the next 12-month period as long as that sponsor sponsors and uses at least one FFS at least once during the prescribed period. There is no minimum number of hours or minimum FFS periods required.

b. The following examples describe acceptable operational practices:
(1) Example One.
(a) A sponsor is sponsoring a single, specific FFS for its own use, in its own facility or elsewhere—this single FFS forms the basis for the sponsorship. The sponsor uses that FFS at least once in each 12-month period in that sponsor's FAA-approved flight training program for the airplane simulated. This 12-month period is established according to the following schedule:
(i) If the FFS was qualified prior to October 30, 2007 the 12-month period begins on the date of the first continuing qualification evaluation conducted in accordance with § 60.19 after October 30, 2007 and continues for each subsequent 12-month period;
(ii) A device qualified on or after October 30, 2007 will be required to undergo an initial or upgrade evaluation in accordance with § 60.15. Once the initial or upgrade evaluation is complete, the first continuing qualification evaluation will be conducted within 6 months. The 12 month continuing qualification evaluation cycle begins on that date and continues for each subsequent 12-month period.
(b) There is no minimum number of hours of FFS use required.
(c) The identification of the specific FFS may change from one 12-month period to the next 12-month period as long as that sponsor sponsors and uses at least one FFS at least once during the prescribed period.
(2) Example Two.
(a) A sponsor sponsors an additional number of FFSs, in its facility or elsewhere. Each additionally sponsored FFS must be—
(i) Used by the sponsor in the sponsor's FAA-approved flight training program for the airplane simulated (as described in § 60.7(d)(1));
OR
(ii) Used by another FAA certificate holder in that other certificate holder's FAA-

approved flight training program for the airplane simulated (as described in § 60.7(d)(1)). This 12-month period is established in the same manner as in example one.

OR

(iii) Provided a statement each year from a qualified pilot, (after having flown the airplane, not the subject FFS or another FFS, during the preceding 12-month period) stating that the subject FFSs performance and handling qualities represent the airplane (as described in § 60.7(d)(2)). This statement is provided at least once in each 12-month period established in the same manner as in example one.

(b) There is no minimum number of hours of FFS use required.

(3) Example Three.

(a) A sponsor in New York (in this example, a Part 142 certificate holder) establishes ''satellite'' training centers in Chicago and Moscow.

(b) The satellite function means that the Chicago and Moscow centers must operate under the New York center's certificate (in accordance with all of the New York center's practices, procedures, and policies; *e.g.*, instructor and/or technician training/checking requirements, record keeping, QMS program).

(c) All of the FFSs in the Chicago and Moscow centers could be dry-leased (i.e., the certificate holder does not have and use FAA-approved flight training programs for the FFSs in the Chicago and Moscow centers) because—

(i) Each FFS in the Chicago center and each FFS in the Moscow center is used at least once each 12-month period by another FAA certificate holder in that other certificate holder's FAA-approved flight training program for the airplane (as described in § 60.7(d)(1));

OR

(ii) A statement is obtained from a qualified pilot (having flown the airplane, not the subject FFS or another FFS during the preceding 12-month period) stating that the performance and handling qualities of each FFS in the Chicago and Moscow centers represents the airplane (as described in § 60.7(d)(2)).

End Information

---

7. Additional Responsibilities of the Sponsor (§ 60.9)

Begin Information

The phrase ''as soon as practicable'' in § 60.9(a) means without unnecessarily disrupting or delaying beyond a reasonable time the training, evaluation, or experience being conducted in the FSTD.

End Information

---

8. Simulator Use (§ 60.11)

Begin Information

There is no additional regulatory or informational material that applies to § 60.11, Simulator Use.

End Information

---

9. Simulator Objective Data Requirements (§ 60.13)

Begin QPS Requirements

a. Flight test data used to validate FFS performance and handling qualities must have been gathered in accordance with a flight test program containing the following:

(1) A flight test plan consisting of:

(a) The maneuvers and procedures required for aircraft certification and simulation programming and validation

(b) For each maneuver or procedure—

(i) The procedures and control input the flight test pilot and/or engineer used.

(ii) The atmospheric and environmental conditions.

(iii) The initial flight conditions.

(iv) The airplane configuration, including weight and center of gravity.

(v) The data to be gathered.

(vi) All other information necessary to recreate the flight test conditions in the FFS.

(2) Appropriately qualified flight test personnel.

(3) An understanding of the accuracy of the data to be gathered using appropriate alternative data sources, procedures, and instrumentation that is traceable to a recognized standard as described in Attachment 2, Table A2D.

(4) Appropriate and sufficient data acquisition equipment or system(s), including appropriate data reduction and analysis methods and techniques, as would be acceptable to the FAA's Aircraft Certification Service.

b. The data, regardless of source, must be presented:

(1) In a format that supports the FFS validation process;

(2) In a manner that is clearly readable and annotated correctly and completely;

(3) With resolution sufficient to determine compliance with the tolerances set forth in Attachment 2, Table A2A of this appendix.

(4) With any necessary instructions or other details provided, such as yaw damper or throttle position; and

(5) Without alteration, adjustments, or bias; however the data may be re-scaled, digitized, or otherwise manipulated to fit the desired presentation.

c. After completion of any additional flight test, a flight test report must be submitted in support of the validation data. The report must contain sufficient data and rationale to support qualification of the FFS at the level requested.

d. As required by § 60.13(f), the sponsor must notify the NSPM when it becomes aware that an addition to, an amendment to, or a revision of data that may relate to FFS performance or handling characteristics is available. The data referred to in this paragraph are those data that are used to validate the performance, handling qualities, or other characteristics of the aircraft, including data related to any relevant changes occurring after the type certificate was issued. This notification must be made within 10 working days.

End QPS Requirements

Begin Information

e. The FFS sponsor is encouraged to maintain a liaison with the manufacturer of the aircraft being simulated (or with the holder of the aircraft type certificate for the aircraft being simulated if the manufacturer is no longer in business), and, if appropriate, with the person having supplied the aircraft data package for the FFS in order to facilitate the notification required by § 60.13(f).

f. It is the intent of the NSPM that for new aircraft entering service, at a point well in advance of preparation of the Qualification Test Guide (QTG), the sponsor should submit to the NSPM for approval, a descriptive document (a validation data roadmap) containing the plan for acquiring the validation data, including data sources. This document should clearly identify sources of data for all required tests, a description of the validity of these data for a specific engine type and thrust rating configuration, and the revision levels of all avionics affecting the performance or flying qualities of the aircraft. Additionally, this document should provide other information, such as the rationale or explanation for cases where data or data parameters are missing, instances where engineering simulation data are used or where flight test methods require further explanations. It should also provide a brief narrative describing the cause and effect of any deviation from data requirements. The aircraft manufacturer may provide this document.

g. There is no requirement for any flight test data supplier to submit a flight test plan or program prior to gathering flight test data. However, the NSPM notes that inexperienced data gatherers often provide data that is irrelevant, improperly marked, or lacking adequate justification for selection. Other problems include inadequate information regarding initial conditions or test maneuvers. The NSPM has been forced to refuse these data submissions as validation data for an FFS evaluation. It is for this reason that the NSPM recommends that any data supplier not previously experienced in this area review the data necessary for programming and for validating the performance of the FFS, and discuss the flight test plan anticipated for acquiring such data with the NSPM well in advance of commencing the flight tests.

h. In those cases where the objective test results authorize a ''snapshot test'' or a ''series of snapshot test'' results in lieu of a time-history result, Attachment 2 requires the sponsor or other data provider to ensure that a steady state condition exists at the instant of time captured by the ''snapshot.'' This is often verified by showing that a steady state condition existed from some period of time during which the snap shot is taken. The time period most frequently used is 5 seconds prior through 2 seconds following the instant of time captured by the snap shot. This paragraph is primarily addressing the source data and the method by which the data provider ensures that the steady state condition for the snap shot is representative.

i. The NSPM will consider, on a case-by-case basis, whether or not to approve supplemental validation data derived from flight data recording systems such as a Quick Access Recorder or Flight Data Recorder.

End Information

---

10. Special Equipment and Personnel Requirements for Qualification of the Simulator (§ 60.14)

Begin Information

a. In the event that the NSPM determines that special equipment or specifically qualified persons will be required to conduct an evaluation, the NSPM will make every attempt to notify the sponsor at least one (1) week, but in no case less than 72 hours, in advance of the evaluation. Examples of special equipment include spot photometers, flight control measurement devices, and sound analyzers. Examples of specially qualified personnel include individuals specifically qualified to install or use any special equipment when its use is required.

b. Examples of a special evaluation include an evaluation conducted after an FFS is moved, at the request of the TPAA, or as a result of comments received from FFS that raise questions regarding the continued qualification or use of the FFS.

End Information

---

11. Initial (and Upgrade) Qualification Requirements (§ 60.15)

Begin QPS Requirements

a. In order to be qualified at a particular qualification level, the FFS must:

(1) Meet the general requirements listed in Attachment 1;

(2) Meet the objective testing requirements listed in Attachment 2; and

(3) Satisfactorily accomplish the subjective tests listed in Attachment 3.

b. The request described in § 60.15(a) must include all of the following:

(1) A statement that the FFS meets all of the applicable provisions of this part and all applicable provisions of the QPS.

(2) A confirmation that the sponsor will forward to the NSPM the statement described in § 60.15(b) in such time as to be received no later than 5 business days prior to the scheduled evaluation and may be forwarded to the NSPM via traditional or electronic means.

(3) A qualification test guide (QTG), acceptable to the NSPM, that includes all of the following:

(i) Objective data obtained from aircraft testing or another approved source.

(ii) Correlating objective test results obtained from the performance of the FFS as prescribed in the applicable QPS.

(iii) The result of FFS subjective tests prescribed in the applicable QPS.

(iv) A description of the equipment necessary to perform the evaluation for initial qualification and the continuing qualification evaluations.

c. The QTG described in paragraph (a)(3) of this section, must provide the documented proof of compliance with the simulator objective tests in Attachment 2, Table A2A of this appendix.

d. The QTG is prepared and submitted by the sponsor, or the sponsor's agent on behalf of the sponsor, to the NSPM for review and approval, and must include, for each objective test:

(1) Parameters, tolerances, and flight conditions;

(2) Pertinent and complete instructions for the conduct of automatic and manual tests;

(3) A means of comparing the FFS test results to the objective data;

(4) Any other information as necessary, to assist in the evaluation of the test results;

(5) Other information appropriate to the qualification level of the FFS.

e. The QTG described in paragraphs (a)(3) and (b) of this section, must include the following:

(1) A QTG cover page with sponsor and FAA approval signature blocks (see Attachment 4, Figure A4C, for a sample QTG cover page).

(2) A continuing qualification evaluation requirements page. This page will be used by the NSPM to establish and record the frequency with which continuing qualification evaluations must be conducted and any subsequent changes that may be determined by the NSPM in accordance with § 60.19. See Attachment 4, Figure A4G, for a sample Continuing Qualification Evaluation Requirements page.

(3) A FFS information page that provides the information listed in this paragraph (see Attachment 4, Figure A4B, for a sample FFS information page). For convertible FFSs, the sponsor must submit a separate page for each configuration of the FFS.

(a) The sponsor's FFS identification number or code.

(b) The airplane model and series being simulated.

(c) The aerodynamic data revision number or reference.

(d) The engine model(s) and its data revision number or reference.

(e) The flight control data revision number or reference.

(f) The flight management system identification and revision level.

(g) The FFS model and manufacturer.

(h) The date of FFS manufacture.

(i) The FFS computer identification.

(j) The visual system model and manufacturer, including display type.

(k) The motion system type and manufacturer, including degrees of freedom.

(4) A Table of Contents.

(5) A log of revisions and a list of effective pages.

(6) List of all relevant data references.

(7) A glossary of terms and symbols used (including sign conventions and units).

(8) Statements of compliance and capability (SOCs) with certain requirements. SOCs must provide references to the sources of information that show the capability of the FFS to comply with the requirements. SOCs must also provide a rationale explaining how the referenced material is used, the mathematical equations and parameter values used, and the conclusions reached. Refer to the ''Additional Details'' column in Attachment 1, Table A1A, ''Simulator Standards,'' or in the ''Test Details'' column in Attachment 2, Table A2A, ''Simulator Objective Tests,'' to see when SOCs are required.

(9) Recording procedures or equipment required to accomplish the objective tests.

(10) The following information for each objective test designated in Attachment 2, Table A2A, as applicable to the qualification level sought:

(a) Name of the test.

(b) Objective of the test.

(c) Initial conditions.

(d) Manual test procedures.

(e) Automatic test procedures (if applicable).

(f) Method for evaluating FFS objective test results.

(g) List of all relevant parameters driven or constrained during the automatically conducted test(s).

(h) List of all relevant parameters driven or constrained during the manually conducted test(s).

(i) Tolerances for relevant parameters.

(j) Source of Validation Data (document and page number).

(k) Copy of the Validation Data (if located in a separate binder, a cross reference for the identification and page number for pertinent data location must be provided).

(l) Simulator Objective Test Results as obtained by the sponsor. Each test result must reflect the date completed and must be clearly labeled as a product of the device being tested.

f. A convertible FFS is addressed as a separate FFS for each model and series airplane to which it will be converted and for the FAA qualification level sought. If a sponsor seeks qualification for two or more models of an airplane type using a convertible FFS, the sponsor must submit a QTG for each airplane model, or a supplemented QTG for each airplane model. The NSPM will conduct evaluations for each airplane model.

g. Form and manner of presentation of objective test results in the QTG:

(1) The sponsor's FFS test results must be recorded in a manner acceptable to the NSPM, that allows easy comparison of the FFS test results to the validation data (*e.g.*, use of a multi-channel recorder, line printer, cross plotting, overlays, transparencies).

(2) FFS results must be labeled using terminology common to airplane parameters as opposed to computer software identifications.

(3) Validation data documents included in a QTG may be photographically reduced only if such reduction will not alter the graphic scaling or cause difficulties in scale interpretation or resolution.

(4) Scaling on graphical presentations must provide the resolution necessary to evaluate the parameters shown in Attachment 2, Table A2A of this appendix.

(5) Tests involving time histories, data sheets (or transparencies thereof) and FFS test results must be clearly marked with appropriate reference points to ensure an accurate comparison between the FFS and the airplane with respect to time. Time histories recorded via a line printer are to be

clearly identified for cross plotting on the airplane data. Over-plots must not obscure the reference data.

h. The sponsor may elect to complete the QTG objective and subjective tests at the manufacturer's facility or at the sponsor's training facility. If the tests are conducted at the manufacturer's facility, the sponsor must repeat at least one-third of the tests at the sponsor's training facility in order to substantiate FFS performance. The QTG must be clearly annotated to indicate when and where each test was accomplished. Tests conducted at the manufacturer's facility and at the sponsor's training facility must be conducted after the FFS is assembled with systems and sub-systems functional and operating in an interactive manner. The test results must be submitted to the NSPM.

i. The sponsor must maintain a copy of the MQTG at the FFS location.

j. All FFSs for which the initial qualification is conducted after October 30, 2013 must have an electronic MQTG (eMQTG) including all objective data obtained from airplane testing, or another approved source (reformatted or digitized), together with correlating objective test results obtained from the performance of the FFS (reformatted or digitized) as prescribed in this appendix. The eMQTG must also contain the general FFS performance or demonstration results (reformatted or digitized) prescribed in this appendix, and a description of the equipment necessary to perform the initial qualification evaluation and the continuing qualification evaluations. The eMQTG must include the original validation data used to validate FFS performance and handling qualities in either the original digitized format from the data supplier or an electronic scan of the original time-history plots that were provided by the data supplier. A copy of the eMQTG must be provided to the NSPM.

k. All other FFSs not covered in subparagraph ''j'' must have an electronic copy of the MQTG by October 30, 2013. A copy of the eMQTG must be provided to the NSPM. This may be provided by an electronic scan presented in a Portable Document File (PDF), or similar format acceptable to the NSPM.

End QPS Requirements

Begin Information

l. Only those FFSs that are sponsored by a certificate holder as defined in appendix F will be evaluated by the NSPM. However, other FFS evaluations may be conducted on a case-by-case basis as the Administrator deems appropriate, but only in accordance with applicable agreements.

m. The NSPM will conduct an evaluation for each configuration, and each FFS must be evaluated as completely as possible. To ensure a thorough and uniform evaluation, each FFS is subjected to the general simulator requirements in Attachment 1, the objective tests listed in Attachment 2, and the subjective tests listed in Attachment 3 of this appendix. The evaluations described herein will include, but not necessarily be limited to the following:

(1) Airplane responses, including longitudinal and lateral-directional control responses (see Attachment 2 of this appendix);

(2) Performance in authorized portions of the simulated airplane's operating envelope, to include tasks evaluated by the NSPM in the areas of surface operations, takeoff, climb, cruise, descent, approach, and landing as well as abnormal and emergency operations (see Attachment 2 of this appendix);

(3) Control checks (see Attachment 1 and Attachment 2 of this appendix);

(4) Cockpit configuration (see Attachment 1 of this appendix);

(5) Pilot, flight engineer, and instructor station functions checks (see Attachment 1 and Attachment 3 of this appendix);

(6) Airplane systems and sub-systems (as appropriate) as compared to the airplane simulated (see Attachment 1 and Attachment 3 of this appendix);

(7) FFS systems and sub-systems, including force cueing (motion), visual, and aural (sound) systems, as appropriate (see Attachment 1 and Attachment 2 of this appendix); and

(8) Certain additional requirements, depending upon the qualification level sought, including equipment or circumstances that may become hazardous to the occupants. The sponsor may be subject to Occupational Safety and Health Administration requirements.

n. The NSPM administers the objective and subjective tests, which includes an examination of functions. The tests include a qualitative assessment of the FFS by an NSP pilot. The NSP evaluation team leader may assign other qualified personnel to assist in accomplishing the functions examination and/or the objective and subjective tests performed during an evaluation when required.

(1) Objective tests provide a basis for measuring and evaluating FFS performance and determining compliance with the requirements of this part.

(2) Subjective tests provide a basis for:

(a) Evaluating the capability of the FFS to perform over a typical utilization period;

(b) Determining that the FFS satisfactorily simulates each required task;

(c) Verifying correct operation of the FFS controls, instruments, and systems; and

(d) Demonstrating compliance with the requirements of this part.

o. The tolerances for the test parameters listed in Attachment 2 of this appendix reflect the range of tolerances acceptable to the NSPM for FFS validation and are not to be confused with design tolerances specified for FFS manufacture. In making decisions regarding tests and test results, the NSPM relies on the use of operational and engineering judgment in the application of data (including consideration of the way in which the flight test was flown and way the data was gathered and applied) data presentations, and the applicable tolerances for each test.

p. In addition to the scheduled continuing qualification evaluation, each FFS is subject to evaluations conducted by the NSPM at any time without prior notification to the sponsor. Such evaluations would be accomplished in a normal manner (i.e., requiring exclusive use of the FFS for the conduct of objective and subjective tests and an examination of functions) if the FFS is not being used for flight crewmember training, testing, or checking. However, if the FFS were being used, the evaluation would be conducted in a non-exclusive manner. This non-exclusive evaluation will be conducted by the FFS evaluator accompanying the check airman, instructor, Aircrew Program Designee (APD), or FAA inspector aboard the FFS along with the student(s) and observing the operation of the FFS during the training, testing, or checking activities.

q. Problems with objective test results are handled as follows:

(1) If a problem with an objective test result is detected by the NSP evaluation team during an evaluation, the test may be repeated or the QTG may be amended.

(2) If it is determined that the results of an objective test do not support the level requested but do support a lower level, the NSPM may qualify the FFS at that lower level. For example, if a Level D evaluation is requested and the FFS fails to meet sound test tolerances, it could be qualified at Level C.

r. After an FFS is successfully evaluated, the NSPM issues a statement of qualification (SOQ) to the sponsor. The NSPM recommends the FFS to the TPAA, who will approve the FFS for use in a flight training program. The SOQ will be issued at the satisfactory conclusion of the initial or continuing qualification. However, it is the sponsor's responsibility to obtain TPAA approval prior to using the FSTD in an FAA-approved flight training program.

s. Under normal circumstances, the NSPM establishes a date for the initial or upgrade evaluation within ten (10) working days after determining that a complete QTG is acceptable. Unusual circumstances may warrant establishing an evaluation date before this determination is made. A sponsor may schedule an evaluation date as early as 6 months in advance. However, there may be a delay of 45 days or more in rescheduling and completing the evaluation if the sponsor is unable to meet the scheduled date. See Attachment 4, Figure A4A, Sample Request for Initial, Upgrade, or Reinstatement Evaluation.

t. The numbering system used for objective test results in the QTG should closely follow the numbering system set out in Attachment 2, FFS Objective Tests, Table A2A.

u. Contact the NSPM or visit the NSPM Web site for additional information regarding the preferred qualifications of pilots used to meet the requirements of § 60.15(d).

v. Examples of the exclusions for which the FFS might not have been subjectively tested by the sponsor or the NSPM and for which qualification might not be sought or granted, as described in § 60.15(g)(6), include windshear training and circling approaches.

End Information

---

12. Additional Qualifications for a Currently Qualified Simulator (§ 60.16)

There is no additional regulatory or informational material that applies to § 60.16, Additional Qualifications for a Currently Qualified FFS.

13. Previously Qualified Simulators (§ 60.17)

Begin QPS Requirements

a. In instances where a sponsor plans to remove a FFS from active status for a period of less than two years, the following procedures apply:

(1) The NSPM must be notified in writing and the notification must include an estimate of the period that the FFS will be inactive;

(2) Continuing Qualification evaluations will not be scheduled during the inactive period;

(3) The NSPM will remove the FFS from the list of qualified FSTDs on a mutually established date not later than the date on which the first missed continuing qualification evaluation would have been scheduled;

(4) Before the FFS is restored to qualified status, it must be evaluated by the NSPM. The evaluation content and the time required to accomplish the evaluation is based on the number of continuing qualification evaluations and sponsor-conducted quarterly inspections missed during the period of inactivity.

(5) The sponsor must notify the NSPM of any changes to the original scheduled time out of service;

b. Simulators qualified prior to October 30, 2007, are not required to meet the general simulation requirements, the objective test requirements, and the subjective test requirements of attachments 1, 2, and 3, respectively, of this appendix.

c. [Reserved]

End QPS Requirements

Begin Information

d. Other certificate holders or persons desiring to use an FFS may contract with FFS sponsors to use FFSs previously qualified at a particular level for an airplane type and approved for use within an FAA-approved flight training program. Such FFSs are not required to undergo an additional qualification process, except as described in § 60.16.

e. Each FFS user must obtain approval from the appropriate TPAA to use any FFS in an FAA-approved flight training program.

f. The intent of the requirement listed in § 60.17(b), for each FFS to have a Statement of Qualification within 6 years, is to have the availability of that statement (including the configuration list and the limitations to authorizations) to provide a complete picture of the FFS inventory regulated by the FAA. The issuance of the statement will not require any additional evaluation or require any adjustment to the evaluation basis for the FFS.

g. Downgrading of an FFS is a permanent change in qualification level and will necessitate the issuance of a revised Statement of Qualification to reflect the revised qualification level, as appropriate. If a temporary restriction is placed on an FFS because of a missing, malfunctioning, or inoperative component or on-going repairs, the restriction is not a permanent change in qualification level. Instead, the restriction is temporary and is removed when the reason for the restriction has been resolved.

h. It is not the intent of the NSPM to discourage the improvement of existing simulation (*e.g.,* the ‘‘updating’’ of a visual system to a newer model, or the replacement of the IOS with a more capable unit) by requiring the ‘‘updated’’ device to meet the qualification standards current at the time of the update. Depending on the extent of the update, the NSPM may require that the updated device be evaluated and may require that an evaluation include all or a portion of the elements of an initial evaluation. However, the standards against which the device would be evaluated are those that are found in the MQTG for that device.

i. The NSPM will determine the evaluation criteria for an FSTD that has been removed from active status. The criteria will be based on the number of continuing qualification evaluations and quarterly inspections missed during the period of inactivity. For example, if the FFS were out of service for a 1 year period, it would be necessary to complete the entire QTG, since all of the quarterly evaluations would have been missed. The NSPM will also consider how the FFS was stored, whether parts were removed from the FFS and whether the FFS was disassembled.

j. The FFS will normally be requalified using the FAA-approved MQTG and the criteria that was in effect prior to its removal from qualification. However, inactive periods of 2 years or more will require requalification under the standards in effect and current at the time of requalification.

End Information

---

14. Inspection, Continuing Qualification Evaluation, and Maintenance Requirements (§ 60.19)

Begin QPS Requirements

a. The sponsor must conduct a minimum of four evenly spaced inspections throughout the year. The objective test sequence and content of each inspection must be developed by the sponsor and must be acceptable to the NSPM.

b. The description of the functional preflight inspection must be contained in the sponsor's QMS.

c. Record ‘‘functional preflight’’ in the FFS discrepancy log book or other acceptable location, including any item found to be missing, malfunctioning, or inoperative.

End QPS Requirements

Begin Information

d. The sponsor's test sequence and the content of each quarterly inspection required in § 60.19(a)(1) should include a balance and a mix from the objective test requirement areas listed as follows:

(1) Performance.

(2) Handling qualities.

(3) Motion system (where appropriate).

(4) Visual system (where appropriate).

(5) Sound system (where appropriate).

(6) Other FFS systems.

e. If the NSP evaluator plans to accomplish specific tests during a normal continuing qualification evaluation that requires the use of special equipment or technicians, the sponsor will be notified as far in advance of the evaluation as practical; but not less than 72 hours. Examples of such tests include latencies, control dynamics, sounds and vibrations, motion, and/or some visual system tests.

f. The continuing qualification evaluations, described in § 60.19(b), will normally require 4 hours of FFS time. However, flexibility is necessary to address abnormal situations or situations involving aircraft with additional levels of complexity (*e.g.,* computer controlled aircraft). The sponsor should anticipate that some tests may require additional time. The continuing qualification evaluations will consist of the following:

(1) Review of the results of the quarterly inspections conducted by the sponsor since the last scheduled continuing qualification evaluation.

(2) A selection of approximately 8 to 15 objective tests from the MQTG that provide an adequate opportunity to evaluate the performance of the FFS. The tests chosen will be performed either automatically or manually and should be able to be conducted within approximately one-third (1⁄3) of the allotted FFS time.

(3) A subjective evaluation of the FFS to perform a representative sampling of the tasks set out in attachment 3 of this appendix. This portion of the evaluation should take approximately two-thirds (2⁄3) of the allotted FFS time.

(4) An examination of the functions of the FFS may include the motion system, visual system, sound system, instructor operating station, and the normal functions and simulated malfunctions of the airplane systems. This examination is normally accomplished simultaneously with the subjective evaluation requirements.

g. The requirement established in § 60.19(b)(4) regarding the frequency of NSPM-conducted continuing qualification evaluations for each FFS is typically 12 months. However, the establishment and satisfactory implementation of an approved QMS for a sponsor will provide a basis for adjusting the frequency of evaluations to exceed 12-month intervals.

End Information

---

15. Logging Simulator Discrepancies (§ 60.20)

There is no additional regulatory or informational material that applies to § 60.20. Logging FFS Discrepancies.

16. Interim Qualification of Simulators for New Airplane Types or Models (§ 60.21)

There is no additional regulatory or informational material that applies to § 60.21, Interim Qualification of FFSs for New Airplane Types or Models.

17. Modifications to Simulators (§ 60.23)

Begin QPS Requirements

a. The notification described in § 60.23(c)(2) must include a complete description of the planned modification, with a description of the operational and engineering effect the proposed modification will have on the operation of the FFS and the results that are expected with the modification incorporated.

b. Prior to using the modified FFS:

(1) All the applicable objective tests completed with the modification incorporated, including any necessary updates to the MQTG (*e.g.*, accomplishment of FSTD Directives) must be acceptable to the NSPM; and

(2) The sponsor must provide the NSPM with a statement signed by the MR that the factors listed in § 60.15(b) are addressed by the appropriate personnel as described in that section.

End QPS Requirements

Begin Information

FSTD Directives are considered modifications of an FFS. See Attachment 4 for a sample index of effective FSTD Directives.

End Information

---

18. Operation With Missing, Malfunctioning, or Inoperative Components (§ 60.25)

Begin Information

a. The sponsor's responsibility with respect to § 60.25(a) is satisfied when the sponsor fairly and accurately advises the user of the current status of an FFS, including any missing, malfunctioning, or inoperative (MMI) component(s).

b. If the 29th or 30th day of the 30-day period described in § 60.25(b) is on a Saturday, a Sunday, or a holiday, the FAA will extend the deadline until the next business day.

c. In accordance with the authorization described in § 60.25(b), the sponsor may develop a discrepancy prioritizing system to accomplish repairs based on the level of impact on the capability of the FFS. Repairs having a larger impact on FFS capability to provide the required training, evaluation, or flight experience will have a higher priority for repair or replacement.

End Information

---

19. Automatic Loss of Qualification and Procedures for Restoration of Qualification (§ 60.27)

Begin Information

If the sponsor provides a plan for how the FFS will be maintained during its out-of-service period (*e.g.*, periodic exercise of mechanical, hydraulic, and electrical systems; routine replacement of hydraulic fluid; control of the environmental factors in which the FFS is to be maintained) there is a greater likelihood that the NSPM will be able to determine the amount of testing required for requalification.

End Information

---

20. Other Losses of Qualification and Procedures for Restoration of Qualification (§ 60.29)

Begin Information

If the sponsor provides a plan for how the FFS will be maintained during its out-of-service period (*e.g.*, periodic exercise of mechanical, hydraulic, and electrical systems; routine replacement of hydraulic fluid; control of the environmental factors in which the FFS is to be maintained) there is a greater likelihood that the NSPM will be able to determine the amount of testing required for requalification.

End Information

---

21. Recordkeeping and Reporting (§ 60.31)

Begin QPS Requirements

a. FSTD modifications can include hardware or software changes. For FSTD modifications involving software programming changes, the record required by § 60.31(a)(2) must consist of the name of the aircraft system software, aerodynamic model, or engine model change, the date of the change, a summary of the change, and the reason for the change.

b. If a coded form for record keeping is used, it must provide for the preservation and retrieval of information with appropriate security or controls to prevent the inappropriate alteration of such records after the fact.

End QPS Requirements

---

22. Applications, Logbooks, Reports, and Records: Fraud, Falsification, or Incorrect Statements (§ 60.33)

There are no additional QPS requirements or informational material that apply to § 60.33, Applications, Logbooks, Reports, and Records: Fraud, Falsification, or Incorrect Statements.

23. Specific Full Flight Simulator Compliance Requirements (§ 60.35)

There are no additional QPS requirements or informational material that apply to § 60.35, Specific FFS Compliance Requirements.

24. [Reserved]

25. FSTD Qualification on the Basis of a Bilateral Aviation Safety Agreement (BASA) (§ 60.37)

There are no additional QPS requirements or informational material that apply to § 60.37, FSTD Qualification on the Basis of a Bilateral Aviation Safety Agreement (BASA).

Attachment 1 to Appendix A to Part 60—General Simulator Requirements

---

Begin QPS Requirements

1. Requirements

a. Certain requirements included in this appendix must be supported with a Statement of Compliance and Capability (SOC), which may include objective and subjective tests. The SOC will confirm that the requirement was satisfied, and describe how the requirement was met, such as gear modeling approach or coefficient of friction sources. The requirements for SOCs and tests are indicated in the ''General Simulator Requirements'' column in Table A1A of this appendix.

b. Table A1A describes the requirements for the indicated level of FFS. Many devices include operational systems or functions that exceed the requirements outlined in this section. However, all systems will be tested and evaluated in accordance with this appendix to ensure proper operation.

End QPS Requirements

Begin Information

2. Discussion

a. This attachment describes the general simulator requirements for qualifying an airplane FFS. The sponsor should also consult the objective tests in attachment 2 and the examination of functions and subjective tests listed in attachment 3 to determine the complete requirements for a specific level simulator.

b. The material contained in this attachment is divided into the following categories:

(1) General cockpit configuration.
(2) Simulator programming.
(3) Equipment operation.
(4) Equipment and facilities for instructor/evaluator functions.
(5) Motion system.
(6) Visual system.
(7) Sound system.

c. Table A1A provides the standards for the General Simulator Requirements.

End Information

TABLE A1A.—MINIMUM SIMULATOR REQUIREMENTS

<<<QPS requirements>>>		Simulator levels				<Information>
No.	General simulator requirements	A	B	C	D	notes
1. General Cockpit Configuration						
1.a	The simulator must have a cockpit that is a replica of the airplane simulated with controls, equipment, observable cockpit indicators, circuit breakers, and bulkheads properly located, functionally accurate and replicating the airplane. The direction of movement of controls and switches must be identical to the airplane. Pilot seats must allow the occupant to achieve the design "eye position" established for the airplane being simulated. Equipment for the operation of the cockpit windows must be included, but the actual windows need not be operable. Additional equipment such as fire axes, extinguishers, and spare light bulbs must be available in the FFS but may be relocated to a suitable location as near as practical to the original position. Fire axes, landing gear pins, and any similar purpose instruments need only be represented in silhouette. An SOC is required.	X	X	X	X	For simulator purposes, the cockpit consists of all that space forward of a cross section of the flight deck at the most extreme aft setting of the pilots' seats, including additional required crewmember duty stations and those required bulkheads aft of the pilot seats. For clarification, bulkheads containing only items such as landing gear pin storage compartments, fire axes or extinguishers, spare light bulbs, and aircraft document pouches are not considered essential and may be omitted.
1.b	Those circuit breakers that affect procedures or result in observable cockpit indications must be properly located and functionally accurate. An SOC is required.	X	X	X	X	
2. Programming						
2.a	A flight dynamics model that accounts for various combinations of drag and thrust normally encountered in flight must correspond to actual flight conditions, including the effect of change in airplane attitude, thrust, drag, altitude, temperature, gross weight, moments of inertia, center of gravity location, and configuration.	X	X	X	X	
2.b	The simulator must have the computer capacity, accuracy, resolution, and dynamic response needed to meet the qualification level sought. An SOC is required.	X	X	X	X	
2.c	Surface operations must be represented to the extent that allows turns within the confines of the runway and adequate controls on the landing and roll-out from a crosswind approach to a landing.	X				
	A subjective test is required.					
2.d	Ground handling and aerodynamic programming must include the following: An SOC is required.					
2.d.1	Ground effect		X	X	X	Ground effect includes modeling that accounts for roundout, flare, touchdown, lift, drag, pitching moment, trim, and power while in ground effect.
2.d.2	Ground reaction		X	X	X	Ground reaction includes modeling that accounts for strut deflections, tire friction, and side forces. This is the reaction of the airplane upon contact with the runway during landing, and may differ with changes in factors such as gross weight, airspeed, or rate of descent on touchdown.
2.d.3	Ground handling characteristics, including aerodynamic and ground reaction modeling including steering inputs, operations with crosswind, braking, thrust reversing, deceleration, and turning radius.		X	X	X	

TABLE A1A.—MINIMUM SIMULATOR REQUIREMENTS—Continued

<<<QPS requirements>>>		Simulator levels				<Information>
No.	General simulator requirements	A	B	C	D	notes
2.e	The simulator must employ windshear models that provide training for recognition of windshear phenomena and the execution of recovery procedures. Models must be available to the instructor/evaluator for the following critical phases of flight: (1) Prior to takeoff rotation. (2) At liftoff. (3) During initial climb. (4) On final approach, below 500 ft AGL. The QTG must reference the FAA Windshear Training Aid or present alternate airplane related data, including the implementation method(s) used. If the alternate method is selected, wind models from the Royal Windshear Training Aerospace Establishment (RAE), the Joint Airport Weather Studies (JAWS) Project and other recognized sources may be implemented, but must be supported and properly referenced in the QTG. Only those simulators meeting these requirements may be used to satisfy the training requirements of part 121 pertaining to a certificate holder's approved low-altitude windshear flight training program as described in § 121.409. Objective tests are required for qualification; see Attachment 2 and Attachment 5 of this appendix.			X	X	If desired, Level A and B simulators may qualify for windshear training by meeting these standards; see Attachment 5 of this appendix. Windshear models may consist of independent variable winds in multiple simultaneous components. The FAA Windshear Training Aid presents one acceptable means of compliance with simulator wind model requirements.
2.f	The simulator must provide for automatic testing of simulator hardware and software programming to determine compliance with simulator objective tests as prescribed in Attachment 2. An SOC is required.			X	X	Automatic "flagging" of out-of-tolerance situations is encouraged.
2.g	Relative responses of the motion system, visual system, and cockpit instruments, measured by latency tests or transport delay tests. Motion onset should occur before the start of the visual scene change (the start of the scan of the first video field containing different information) but must occur before the end of the scan of that video field. Instrument response may not occur prior to motion onset. Test results must be within the following limits:					The intent is to verify that the simulator provides instrument, motion, and visual cues that are, within the stated time delays, like the airplane responses. For airplane response, acceleration in the appropriate, corresponding rotational axis is preferred.
2.g.1	300 milliseconds of the airplane response Objective Tests are required.	X	X			
2.g.2	150 milliseconds of the airplane response Objective Tests are required.			X	X	
2.h	The simulator must accurately reproduce the following runway conditions: (1) Dry. (2) Wet. (3) Icy. (4) Patchy Wet. (5) Patchy Icy. (6) Wet on Rubber Residue in Touchdown Zone. An SOC is required. Objective tests are required only for dry, wet, and icy runway conditions; see Attachment 2.			X	X	
2.i	The simulator must simulate: (1) brake and tire failure dynamics, including anti-skid failure. (2) decreased brake efficiency due to high brake temperatures, if applicable. An SOC is required.			X	X	Simulator pitch, side loading, and directional control characteristics should be representative of the airplane.
2.j	The simulator must replicate the effects of airframe icing. A Subjective Test is required.			X	X	

TABLE A1A.—MINIMUM SIMULATOR REQUIREMENTS—Continued

<<<QPS requirements>>>		Simulator levels				<Information>
No.	General simulator requirements	A	B	C	D	notes
2.k	The aerodynamic modeling in the simulator must include: (1) Low-altitude level-flight ground effect; (2) Mach effect at high altitude; (3) Normal and reverse dynamic thrust effect on control surfaces; (4) Aeroelastic representations; and (5) Nonlinearities due to sideslip. An SOC is required and must include references to computations of aeroelastic representations and of nonlinearities due to sideslip.				X	See Attachment 2, paragraph 4, for further information on ground effect.
2.l	The simulator must have aerodynamic and ground reaction modeling for the effects of reverse thrust on directional control, if applicable. An SOC is required.		X	X	X	
3. Equipment Operation						
3.a	All relevant instrument indications involved in the simulation of the airplane must automatically respond to control movement or external disturbances to the simulated airplane; e.g., turbulence or windshear. Numerical values must be presented in the appropriate units. A subjective test is required.	X	X	X	X	
3.b	Communications, navigation, caution, and warning equipment must be installed and operate within the tolerances applicable for the airplane. A subjective test is required.	X	X	X	X	See Attachment 3 for further information regarding long-range navigation equipment.
3.c	Simulator systems must operate as the airplane systems operate under normal, abnormal, and emergency operating conditions on the ground and in flight. A subjective test is required.	X	X	X	X	
3.d	The simulator must provide pilot controls with control forces and control travel that correspond to the simulated airplane. The simulator must also react in the same manner as in the airplane under the same flight conditions. A objective test is required.	X	X	X	X	
4. Instructor or Evaluator Facilities						
4.a	In addition to the flight crewmember stations, the simulator must have at least two suitable seats for the instructor/check airman and FAA inspector. These seats must provide adequate vision to the pilot's panel and forward windows. All seats other than flight crew seats need not represent those found in the airplane, but must be adequately secured to the floor and equipped with similar positive restraint devices. A subjective test is required.	X	X	X	X	The NSPM will consider alternatives to this standard for additional seats based on unique cockpit configurations.
4.b	The simulator must have controls that enable the instructor/evaluator to control all required system variables and insert all abnormal or emergency conditions into the simulated airplane systems as described in the sponsor's FAA-approved training program; or as described in the relevant operating manual as appropriate. A subjective test is required.	X	X	X	X	
4.c	The simulator must have instructor controls for environmental conditions including wind speed and direction. A subjective test is required.	X	X	X	X	

TABLE A1A.—MINIMUM SIMULATOR REQUIREMENTS—Continued

<<<QPS requirements>>>		Simulator levels				<Information>
No.	General simulator requirements	A	B	C	D	notes
4.d	The simulator must provide the instructor or evaluator the ability to present ground and air hazards. A subjective test is required.			X	X	For example, another airplane crossing the active runway or converging airborne traffic.
5. Motion System						
5.a	The simulator must have motion (force) cues perceptible to the pilot that are representative of the motion in an airplane. A subjective test is required.	X	X	X	X	For example, touchdown cues should be a function of the rate of descent (RoD) of the simulated airplane.
5.b	The simulator must have a motion (force cueing) system with a minimum of three degrees of freedom (at least pitch, roll, and heave). An SOC is required.	X	X			
5.c	The simulator must have a motion (force cueing) system that produces cues at least equivalent to those of a six-degrees-of-freedom, synergistic platform motion system (i.e., pitch, roll, yaw, heave, sway, and surge). An SOC is required.			X	X	
5.d	The simulator must provide for the recording of the motion system response time. An SOC is required.	X	X	X	X	
5.e	The simulator must provide motion effects programming to include: (1) Thrust effect with brakes set. (2) Runway rumble, oleo deflections, effects of ground speed, uneven runway, centerline lights, and taxiway characteristics. (3) Buffets on the ground due to spoiler/speedbrake extension and thrust reversal. (4) Bumps associated with the landing gear. (5) Buffet during extension and retraction of landing gear. (6) Buffet in the air due to flap and spoiler/speedbrake extension. (7) Approach-to-Stall buffet. (8) Representative touchdown cues for main and nose gear. (9) Nosewheel scuffing, if applicable. (10) Mach and maneuver buffet. A subjective test is required.		X	X	X	
5.f	The simulator must provide characteristic motion vibrations that result from operation of the airplane if the vibration marks an event or airplane state that can be sensed in the cockpit. A objective test is required.				X	The simulator should be programmed and instrumented in such a manner that the characteristic buffet modes can be measured and compared to airplane data.
6. Visual System						
6.a	The simulator must have a visual system providing an out-of-the-cockpit view. A subjective test is required.	X	X	X	X	
6.b	The simulator must have operational landing lights for night scenes. Where used, dusk (or twilight) scenes require operational landing lights. A subjective test is required.	X	X	X	X	
6.c	The simulator must have instructor controls for the following: (1) Cloudbase. (2) Visibility in statute miles (km) and runway visual range (RVR) in ft. (m). (3) Airport selection. (4) Airport lighting.	X	X	X	X	

TABLE A1A.—MINIMUM SIMULATOR REQUIREMENTS—Continued

<<<QPS requirements>>>		Simulator levels				<Information>
No.	General simulator requirements	A	B	C	D	notes
	A subjective test is required.					
6.d	Each airport scene displayed must include the following: (1) Airport runways and taxiways. (2) Runway definition. (i) Runway surface and markings. (ii) Lighting for the runway in use, including runway threshold, edge, centerline, touchdown zone, VASI or PAPI, and approach lighting of appropriate colors, as appropriate. (iii) Taxiway lights. A subjective test is required.	X	X	X	X	
6.e	The distances at which runway features are visible, as measured from runway threshold to an airplane aligned with the runway on an extended 3° glide slope must not be less than listed below: (1) Runway definition, strobe lights, approach lights, runway edge white lights VASI or PAPI system lights from 5 statute miles (8 kilometers (km)) of the runway threshold. (2) Runway centerline lights and taxiway definition from 3 statute miles (4.8 km). (3) Threshold lights and touchdown zone lights from 2 statute miles (3.2 km). (4) Runway markings within range of landing lights for night scenes and as required by three (3) arc-minutes resolution on day scenes. A subjective test is required.	X	X	X	X	
6.f	The simulator must provide visual system compatibility with dynamic response programming. A subjective test is required.	X	X	X	X	
6.g	The simulator must show that the segment of the ground visible from the simulator flight deck is the same as from the airplane flight deck (within established tolerances) when at the correct airspeed, in the landing configuration, at a main wheel height of 100 feet (30 meters) above the touchdown zone, and with visibility of 1,200 ft (350 m) RVR. An SOC is required. An objective test is required.	X	X	X	X	This will show the modeling accuracy of RVR, glideslope, and localizer for a given weight, configuration, and speed within the airplane's operational envelope for a normal approach and landing.
6.h	The simulator must provide visual cues necessary to assess sink rates (provide depth perception) during takeoffs and landings, to include: (1) Surface on runways, taxiways, and ramps. (2) Terrain features. A subjective test is required.		X	X	X	
6.i	The simulator must provide for accurate portrayal of the visual environment relating to the simulator attitude. A subjective test is required.	X	X	X	X	Visual attitude vs. simulator attitude is a comparison of pitch and roll of the horizon as displayed in the visual scene compared to the display on the attitude indicator.
6.j	The simulator must provide for quick confirmation of visual system color, RVR, focus, and intensity. An SOC is required. A subjective test is required.			X	X	
6.k	The simulator must provide a minimum of three airport scenes including: (1) Surfaces on runways, taxiways, and ramps. (2) Lighting of appropriate color for all runways, including runway threshold, edge, centerline, VASI or PAPI, and approach lighting for the runway in use. (3) Airport taxiway lighting.			X	X	

TABLE A1A.—MINIMUM SIMULATOR REQUIREMENTS—Continued

<<<QPS requirements>>>		Simulator levels				<Information>
No.	General simulator requirements	A	B	C	D	notes
	(4) Ramps and buildings that correspond to the sponsor's Line Oriented scenarios, as appropriate. A subjective test is required.					
6.l	The simulator must be capable of producing at least 10 levels of occulting. A subjective test is required.			X	X	
6.m	Night Visual Scenes. When used in training, testing, or checking activities, the simulator must provide night visual scenes with sufficient scene content to recognize the airport, the terrain, and major landmarks around the airport. The scene content must allow a pilot to successfully accomplish a visual landing. Scenes must include a definable horizon and typical terrain characteristics such as fields, roads and bodies of water and surfaces illuminated by airplane landing lights.	X	X	X	X	
6.n	Dusk (or Twilight) Visual Scenes. When used in training, testing, or checking activities, the simulator must provide dusk (or twilight) visual scenes with sufficient scene content to recognize the airport, the terrain, and major landmarks around the airport. The scene content must allow a pilot to successfully accomplish a visual landing. Scenes must include a definable horizon and typical terrain characteristics such as fields, roads and bodies of water and surfaces illuminated by airplane landing lights. An SOC is required. A subjective test is required.			X	X	
6.o	Daylight Visual Scenes. The simulator must have night dusk (twilight), and daylight visual scenes with sufficient scene content to recognize the airport, the terrain, and major landmarks around the airport. The scene content must allow a pilot to successfully accomplish a visual landing. Any ambient lighting must not "washout" the displayed visual scene. Note: These requirements are applicable to any level of simulator equipped with a "daylight" visual system. An SOC is required. A subjective test is required.				X	Brightness capability may be demonstrated with a test pattern of white light using a spot photometer. Daylight visual system is defined as a visual system capable of producing, at a minimum, full color presentations, scene content comparable in detail to that produced by 4,000 edges or 1,000 surfaces for daylight and 4,000 lightpoints for night and dusk scenes, 6 foot-lamberts (20 cd/m^2) of light measured at the pilot's eye position (highlight brightness) and a display which is free of apparent quantization and other distracting visual effects while the simulator is in motion.
6.p	The simulator must provide operational visual scenes that portray physical relationships known to cause landing illusions to pilots. A subjective test is required.				X	For example: short runways, landing approaches over water, uphill or downhill runways, rising terrain on the approach path, unique topographic features.
6.q	The simulator must provide special weather representations of light, medium, and heavy precipitation near a thunderstorm on takeoff and during approach and landing. Representations need only be presented at and below an altitude of 2,000 ft. (610 m) above the airport surface and within 10 miles (16 km) of the airport. A subjective test is required.				X	
6.r	The simulator must present visual scenes of wet and snow-covered runways, including runway lighting reflections for wet conditions, partially obscured lights for snow conditions, or suitable alternative effects. A subjective test is required.				X	
6.s	The simulator must present realistic color and directionality of all airport lighting. A subjective test is required.				X	

TABLE A1A.—MINIMUM SIMULATOR REQUIREMENTS—Continued

<<<QPS requirements>>>		Simulator levels				<Information>
No.	General simulator requirements	A	B	C	D	notes
7. Sound System						
7.a	The simulator must provide cockpit sounds that result from pilot actions that correspond to those that occur in the airplane.	X	X	X	X	
7.b	The simulator must accurately simulate the sound of precipitation, windshield wipers, and other significant airplane noises perceptible to the pilot during normal operations, and include the sound of a crash (when the simulator is landed in an unusual attitude or in excess of the structural gear limitations); normal engine and thrust reversal sounds; and the sounds of flap, gear, and spoiler extension and retraction. An SOC is required. A subjective test is required.			X	X	
7.c	The simulator must provide realistic amplitude and frequency of cockpit noises and sounds. Simulator performance must be recorded, compared to amplitude and frequency of the same sounds recorded in the airplane, and be made a part of the QTG. Objective tests are required.				X	

Table A1B—[Reserved]

Attachment 2 to Appendix A to Part 60—Full Flight Simulator (FFS) Objective Test

Begin Information

1. For the purposes of this attachment, the flight conditions specified in the Flight Conditions Column of Table A2A, are defined as follows:

(a) Ground—on ground, independent of airplane configuration;

(b) Take-off—gear down with flaps/slats in any certified takeoff position;

(c) First segment climb— gear down with flaps/slats in any certified takeoff position (normally not above 50 ft AGL);

(d) Second segment climb—gear up with flaps/slats in any certified takeoff position (normally between 50 ft and 400 ft AGL);

(e) Clean—flaps/slats retracted and gear up;

(f) Cruise—clean configuration at cruise altitude and airspeed;

(g) Approach—gear up or down with flaps/slats at any normal approach position as recommended by the airplane manufacturer; and

(h) Landing—gear down with flaps/slats in any certified landing position.

2. The format for numbering the objective tests in appendix A, Attachment 2, Table A2A, and the objective tests in appendix B, Attachment 2, Table B2A, is identical. However, each test required for FFSs is not necessarily required for FTDs. Also, each test required for FTDs is not necessarily required for FFSs. Therefore, when a test number (or series of numbers) is not required, the term ''Reserved'' is used in the table at that location. Following this numbering format provides a degree of commonality between the two tables and substantially reduces the potential for confusion when referring to objective test numbers for either FFSs or FTDs.

3. The QPS Requirements section imposes a duty on the sponsor or other data provider to ensure that a steady state condition exists at the instant of time captured by the ''snapshot'' for cases where the objective test results authorize a ''snapshot test'' or a ''series of snapshot tests'' results in lieu of a time-history. This is often verified by showing that a steady state condition existed from some period prior to, through some period following, the snap shot. The time period most frequently used is from 5 seconds prior through 2 seconds following the instant of time captured by the snap shot. Other time periods may be acceptable as authorized by the NSPM.

4. The reader is encouraged to review the Airplane Flight Simulator Evaluation Handbook, Volumes I and II, published by the Royal Aeronautical Society, London, UK, and FAA Advisory Circulars (AC) 25–7, as may be amended, Flight Test Guide for Certification of Transport Category Airplanes, and (AC) 23–8, as may be amended, Flight Test Guide for Certification of Part 23 Airplanes, for references and examples regarding flight testing requirements and techniques.

5. If relevant winds are present in the objective data, the wind vector should be clearly noted as part of the data presentation, expressed in conventional terminology, and related to the runway being used for the test.

End Information

Begin QPS Requirements

1. Test Requirements

a. The ground and flight tests required for qualification are listed in Table of A2A, FFS Objective Tests. Computer generated simulator test results must be provided for each test except where an alternative test is specifically authorized by the NSPM. If a flight condition or operating condition is required for the test but does not apply to the airplane being simulated or to the qualification level sought, it may be disregarded (*e.g.*, an engine out missed approach for a single-engine airplane or a maneuver using reverse thrust for an airplane without reverse thrust capability). Each test result is compared against the validation data described in § 60.13 and in this appendix. Although use of a driver program designed to automatically accomplish the tests is encouraged for all simulators and required for Level C and Level D simulators, it must be possible to conduct each test manually while recording all appropriate parameters. The results must be produced on an appropriate recording device acceptable to the NSPM and must include simulator number, date, time, conditions, tolerances, and appropriate dependent variables portrayed in comparison to the validation data. Time histories are required unless otherwise indicated in Table A2A. All results must be labeled using the tolerances and units given.

b. Table A2A in this attachment sets out the test results required, including the parameters, tolerances, and flight conditions for simulator validation. Tolerances are provided for the listed tests because mathematical modeling and acquisition and development of reference data are often inexact. All tolerances listed in the following tables are applied to simulator performance. When two tolerance values are given for a parameter, the less restrictive may be used unless otherwise indicated.

c. Certain tests included in this attachment must be supported with a Statement of Compliance and Capability (SOC). In Table

A2A, requirements for SOCs are indicated in the ''Test Details'' column.

d. When operational or engineering judgment is used in making assessments for flight test data applications for simulator validity, such judgment must not be limited to a single parameter. For example, data that exhibit rapid variations of the measured parameters may require interpolations or a ''best fit'' data selection. All relevant parameters related to a given maneuver or flight condition must be provided to allow overall interpretation. When it is difficult or impossible to match simulator to airplane data throughout a time history, differences must be justified by providing a comparison of other related variables for the condition being assessed.

e. It is not acceptable to program the FFS so that the mathematical modeling is correct only at the validation test points. Unless otherwise noted, simulator tests must represent airplane performance and handling qualities at operating weights and centers of gravity (CG) typical of normal operation. If a test is supported by airplane data at one extreme weight or CG, another test supported by airplane data at mid-conditions or as close as possible to the other extreme must be included, except as may be authorized by the NSPM. Certain tests that are relevant only at one extreme CG or weight condition need not be repeated at the other extreme. Tests of handling qualities must include validation of augmentation devices.

f. When comparing the parameters listed to those of the airplane, sufficient data must also be provided to verify the correct flight condition and airplane configuration changes. For example, to show that control force is within the parameters for a static stability test, data to show the correct airspeed, power, thrust or torque, airplane configuration, altitude, and other appropriate datum identification parameters must also be given. If comparing short period dynamics, normal acceleration may be used to establish a match to the airplane, but airspeed, altitude, control input, airplane configuration, and other appropriate data must also be given. If comparing landing gear change dynamics, pitch, airspeed, and altitude may be used to establish a match to the airplane, but landing gear position must also be provided. All airspeed values must be properly annotated (*e.g.*, indicated versus calibrated). In addition, the same variables must be used for comparison (*e.g.*, compare inches to inches rather than inches to centimeters).

g. The QTG provided by the sponsor must clearly describe how the simulator will be set up and operated for each test. Each simulator subsystem may be tested independently, but overall integrated testing of the simulator must be accomplished to assure that the total simulator system meets the prescribed standards. A manual test procedure with explicit and detailed steps for completing each test must also be provided.

h. In those cases where the objective test results authorize a ''snapshot test'' or ''a series of snapshot test'' results in lieu of a time-history result, the sponsor or other data provider must ensure that a steady state condition exists at the instant of time captured by the ''snapshot.''

i. For previously qualified simulators, the tests and tolerances of this attachment may be used in subsequent continuing qualification evaluations for any given test if the sponsor has submitted a proposed MQTG revision to the NSPM and has received NSPM approval.

j. Simulators are evaluated and qualified with an engine model simulating the airplane data supplier's flight test engine. For qualification of alternative engine models (either variations of the flight test engines or other manufacturer's engines) additional tests with the alternative engine models may be required. This Attachment contains guidelines for alternative engines.

k. For testing Computer Controlled Airplane (CCA) simulators, or other highly augmented airplane simulators, flight test data is required for the Normal (N) and/or Non-normal (NN) control states, as indicated in this Attachment. Where test results are independent of control state, Normal or Non-normal control data may be used. All tests in Table A2A require test results in the Normal control state unless specifically noted otherwise in the Test Details section following the CCA designation. The NSPM will determine what tests are appropriate for airplane simulation data. When making this determination, the NSPM may require other levels of control state degradation for specific airplane tests. Where Non-normal control states are required, test data must be provided for one or more Non-normal control states, and must include the least augmented state. Where applicable, flight test data must record Normal and Non-normal states for:

(1) Pilot controller deflections or electronically generated inputs, including location of input; and

(2) Flight control surface positions unless test results are not affected by, or are independent of, surface positions.

l. Tests of handling qualities must include validation of augmentation devices. FFSs for highly augmented airplanes will be validated both in the unaugmented configuration (or failure state with the maximum permitted degradation in handling qualities) and the augmented configuration. Where various levels of handling qualities result from failure states, validation of the effect of the failure is necessary. Requirements for testing will be mutually agreed to between the sponsor and the NSPM on a case-by-case basis.

m. Some tests will not be required for airplanes using airplane hardware in the simulator cockpit (*e.g.*, ''side stick controller''). These exceptions are noted in Section 2 ''Handling Qualities'' in Table A2A of this attachment. However, in these cases, the sponsor must provide a statement that the airplane hardware meets the appropriate manufacturer's specifications and the sponsor must have supporting information to that fact available for NSPM review.

n. For objective test purposes, ''Near maximum'' gross weight is a weight chosen by the sponsor or data provider that is not less than the basic operating weight (BOW) of the airplane being simulated plus 80% of the difference between the maximum certificated gross weight (either takeoff weight or landing weight, as appropriate for the test) and the BOW. ''Light'' gross weight is a weight chosen by the sponsor or data provider that is not more than 120% of the BOW of the airplane being simulated or as limited by the minimum practical operating weight of the test airplane. ''Medium'' gross weight is a weight chosen by the sponsor or data provider that is approximately ±10% of the average of the numerical values of the BOW and the maximum certificated gross weight. (**Note:** BOW is the empty weight of the aircraft plus the weight of the following: normal oil quantity; lavatory servicing fluid; potable water; required crewmembers and their baggage; and emergency equipment. (References: Advisory Circular 120–27, ''Aircraft Weight and Balance;'' and FAA–H–8083–1, ''Aircraft Weight and Balance Handbook.'').

End QPS Requirements

TABLE A2A.—FULL FLIGHT SIMULATOR (FFS) OBJECTIVE TESTS

<<<QPS REQUIREMENTS>>>									Information notes
Test		Tolerance	Flight Conditions	Test details	Simulator Level				
No.	Title				A	B	C	D	
1. Performance									
1.a.	**Taxi**								

TABLE A2A.—FULL FLIGHT SIMULATOR (FFS) OBJECTIVE TESTS—Continued

<<<QPS REQUIREMENTS>>>										Information notes
Test		Tolerance	Flight Conditions	Test details	Simulator Level					
No.	Title				A	B	C	D		
1.a.1	Minimum Radius Turn	±3 ft (0.9 m) or 20% of airplane turn radius.	Ground	Record both Main and Nose gear turning radius. This test is to be accomplished without the use of brakes and only minimum thrust, except for airplanes requiring asymmetric thrust or braking to turn.		X	X	X		
1.a.2	Rate of Turn vs. Nosewheel Steering Angle (NWA).	±10% or ±2% sec. turn rate	Ground	Record a minimum of two speeds, greater than minimum turning radius speed, with a spread of at least 5 knots groundspeed.		X	X	X		
1.b	Takeoff			All commonly used takeoff flap settings are to be demonstrated at least once in the tests for minimum unstick (1.b.3.), normal takeoff (1.b.4.), critical engine failure on takeoff (1.b.5.), or crosswind takeoff (1.b.6.).						
1.b.1	Ground Acceleration Time andDistance.	±5% time and distance or ±5% time and ±200 ft (61 m) of distance.	Takeoff	Record acceleration time and distance for a minimum of 80% of the time from brake release to V_R. Preliminary aircraft certification data may be used.	X	X	X	X		May be combined with normal takeoff (1.b.4.) or rejected takeoff (1.b.7.). Plotted data should be shown using appropriate scales for each portion of the maneuver.
1.b.2	Minimum Control Speed—ground (V_{mcg}) using aerodynamic controls only (per applicable airworthiness standard or alternative) or engine inoperative test to demonstrate ground control characteristics.	±25% of maximum airplane lateral deviation or ±5 ft (1.5 m). Additionally, for those simulators of airplanes with reversible flight control systems: Rudder pedal force; ±10% or ±5 lb (2.2 daN).	Takeoff	Engine failure speed must be within ±1 knot of airplane engine failure speed. Engine thrust decay must be that resulting from the mathematical model for the engine variant applicable to the full flight simulator under test. If the modeled engine is not the same as the airplane manufacturer's flight test engine, a further test may be run with the same initial conditions using the thrust from the flight test data as the driving parameter.	X	X	X	X		If a V_{mcg} test is not available an acceptable alternative is a flight test snap engine deceleration to idle at a speed between $V_1$1 and V_1—10 knots, followed by control of heading using aerodynamic control only. Recovery should be achieved with the main gear on the ground. To ensure only aerodynamic control is used, nosewheel steering should be disabled (i.e., castored) or the nosewheel held slightly off the ground.

TABLE A2A.—FULL FLIGHT SIMULATOR (FFS) OBJECTIVE TESTS—Continued

<<<QPS REQUIREMENTS>>>									Information notes
Test		Tolerance	Flight Conditions	Test details	Simulator Level				
No.	Title				A	B	C	D	
1.b.3	Minimum Unstick Speed (V_{mu}) or equivalent test to demonstrate early rotation takeoff characteristics.	±3 kts airspeed, ±1.5° pitch angle.	Takeoff	Record main landing gear strut compression or equivalent air/ground signal. Record from 10 kt before start of rotation until at least 5 seconds after the occurrence of main gear lift-off.	X	X	X	X	V_{mu} is defined as the minimum speed at which the last main landing gear leaves the ground. Main landing gear strut compression or equivalent air/ground signal should be recorded. If a V_{mu} test is not available, alternative acceptable flight tests are a constant high-attitude take-off run through main gear lift-off of an early rotation take-off.
1.b.4	Normal Takeoff	±3 kts airspeed, ±1.5° pitch angle, ±1.5° angle of attack, ±20 ft (6 m) height. Additionally, for those simulators of airplanes with reversible flight control systems: Stick/Column Force; ±10% or ± 5 lb (2.2 daN).	Takeoff	Record takeoff profile from brake release to at least 200 ft (61 m) above ground level (AGL). If the airplane has more than one certificated takeoff configuration, a different configuration must be used for each weight. Data are required for a takeoff weight at near maximum takeoff weight with a mid-center of gravity and for a light takeoff weight with an aft center of gravity, as defined in appendix F.	X	X	X	X	This test may be used for ground acceleration time and distance (1.b.1.). Plotted data should be shown using appropriate scales for each portion of the maneuver.
1.b.5	Critical Engine Failure on Takeoff.	±3 kts airspeed, ±1.5° pitch angle, ±1.5° angle of attack, ±20 ft (6 m) height, ±3° heading angle, ±2° bank angle, ±2° sideslip angle. Additionally, for those simulators of airplanes with reversible flight control systems: Stick/Column Force; ±10% or ±5 lb (2.2 daN); Wheel Force; ±10% or ±3 lb (1.3 daN); and Rudder Pedal Force; ±10% or ±5 lb (2.2 daN).	Takeoff	Record takeoff profile at near maximum takeoff weight from prior to engine failure to at least 200 ft (61 m) AGL. Engine failure speed must be within ±3 kts of airplane data.	X	X	X	X	
1.b.6	Crosswind Takeoff	±3 kts airspeed, ±1.5° pitch angle, ±1.5° angle of attack, ±20 ft (6 m) height, ±2° bank angle, ±2° sideslip angle; ±3° heading angle. Additionally, for those simulators of airplanes with reversible flight control systems: Stick/Column Force; ±10% or ±5 lb (2.2 daN) stick/column force, ±10% or ±3 lb (1.3 daN) wheel force, ±10% or ±5 lb (2.2 daN) rudder pedal force.	Takeoff	Record takeoff profile from brake release to at least 200 ft (61 m) AGL. Requires test data, including information on wind profile for a crosswind component of at least 60% of the maximum described in the Airplane Flight Manual (AFM), as measured at 33 ft (10 m) above the runway.	X	X	X	X	In those situations where a maximum crosswind or a maximum demonstrated crosswind is not included in the AFM, contact the NSPM.

TABLE A2A.—FULL FLIGHT SIMULATOR (FFS) OBJECTIVE TESTS—Continued

<<<QPS REQUIREMENTS>>>									Information notes
Test		Tolerance	Flight Conditions	Test details	Simulator Level				
No.	Title				A	B	C	D	
1.b.7	Rejected Takeoff	±5% time or ±1.5 sec, ±7.5% distance or ±250 ft (±76 m).	Takeoff	Record time and distance from brake release to full stop. Speed for initiation of the reject must be at least 80% of V_1 speed. The airplane must be at or near the maximum takeoff gross weight. Use maximum braking effort, auto or manual.	X	X	X	X	Autobrakes will be used where applicable.
1.b.8	Dynamic Engine Failure After Takeoff.	±20% or ±2°/sec body angular rates.	Takeoff	Engine failure speed must be within ±3 kts of airplane data. Record Hands Off from 5 secs. before to at least 5 secs. after engine failure or 30° Bank, whichever occurs first. Engine failure may be a snap deceleration to idle. (**CCA:** Test in Normal and Non-normal control state.).			X	X	For safety considerations, airplane flight test may be performed out of ground effect at a safe altitude, but with correct airplane configuration and airspeed.
1.c.	Climb								
1.c.1	Normal Climb, all engines operating.	±3 kts airspeed, ±5% or ±100 FPM (0.5 m/Sec.) climb rate.	Clean	Flight test data is preferred, however, airplane performance manual data is an acceptable alternative. Record at nominal climb speed and mid-initial climb altitude. Flight simulator performance must be recorded over an interval of at least 1,000 ft. (300m).	X	X	X	X	
1.c.2	One engine Inoperative	±3 kts airspeed, ±5% or ±100 FPM (0.5 m/Sec.) climb rate, but not less than the FAA-Approved Airplane Flight Manual (AFM) values.	For part 23 airplanes, in accordance with part 23. For part 25 airplanes, Second Segment Climb.	Flight test data is preferred, however, airplane performance manual data is an acceptable alternative. Test at weight, altitude, or temperature limiting conditions. Record at nominal climb speed. Flight simulator performance must be recorded over an interval of at least 1,000 ft. (300m).	X	X	X	X	
1.c.3	One Engine Inoperative En route Climb.	±10% time, ±10% distance, ±10% fuel used.	Clean	Record results for at least a 5000 ft (1550 m) climb segment. Flight test data or airplane performance manual data may be used.			X	X	

TABLE A2A.—FULL FLIGHT SIMULATOR (FFS) OBJECTIVE TESTS—Continued

<<<QPS REQUIREMENTS>>>										Information notes
Test		Tolerance	Flight Conditions	Test details	Simulator Level					
No.	Title				A	B	C	D		
1.c.4	One Engine Inoperative Approach Climb (if the approved AFM requires specific performance in icing conditions).	±3 kts airspeed, ±5% or ±100 FPM (0.5 m/Sec.) climb rate, but not less than the climb gradient requirements of 14 CFR parts 23 or 25 climb gradient, as appropriate.	Approach	Record results at near maximum gross landing weight as defined in appendix F. Flight test data or airplane performance manual data may be used. Flight simulator performance must be recorded over an interval of at least 1,000 ft. (300m).	X	X	X	X		The airplane should be configured with all anti-ice and de-ice systems operating normally, with the gear up and go-around flaps set. All icing accountability considerations should be applied in accordance with the AFM for an approach in icing conditions.
1.d	Cruise/Descent									
1.d.1	Level flight acceleration	±5% Time	Cruise	Record results for a minimum of 50 kts speed increase using maximum continuous thrust rating or equivalent.	X	X	X	X		
1.d.2	Level flight deceleration	±5% Time	Cruise	Record results for a minimum of 50 kts speed decrease using idle power.	X	X	X	X		
1.d.3	Cruise performance	±0.05 EPR or ±5% of N_1, or ±5% of Torque, ±5% of fuel flow.	Cruise	May be a single snapshot showing instantaneous fuel flow or a minimum of 2 consecutive snapshots with a spread of at least 3 minutes in steady flight.			X	X		
1.e	Stopping									
1.e.1	Stopping time and distance, using manual application of wheel brakes and no reverse thrust on a dry runway.	±5% of time. For distance up to 4000 ft (1220 m): ±200 ft (61 m) or ±10%, whichever is smaller. For distance greater than 4000 ft (1220 m): ±5% of distance.	Landing	Record time and distance for at least 80% of the total time from touch down to full stop. Data is required for weights at medium and near maximum landing weights. Data for brake system pressure and position of ground spoilers (including method of deployment, if used) must be provided. Engineering data may be used for the medium gross weight condition.	X	X	X	X		

TABLE A2A.—FULL FLIGHT SIMULATOR (FFS) OBJECTIVE TESTS—Continued

<<<QPS REQUIREMENTS>>>										Information notes
Test		Tolerance	Flight Conditions	Test details	Simulator Level					
No.	Title				A	B	C	D		
1.e.2	Stopping time and distance, using reverse thrust and no wheel brakes on a dry runway.	±5% time and the smaller of ±10% or ±200 ft (61 m) of distance.	Landing	Record time and distance for at least 80% of the total time from initiation of reverse thrust to the minimum operating speed with full reverse thrust. Data is required for medium and near maximum landing gross weights. Data on the position of ground spoilers, (including method of deployment, if used) must be provided. Engineering data may be used for the medium gross weight condition.	X	X	X	X		
1.e.3	Stopping distance, using wheel brakes and no reverse thrust on a wet runway.	±10% of distance or ±200 ft (61 m).	Landing	Either flight test data or manufacturer's performance manual data must be used where available. Engineering data based on dry runway flight test stopping distance modified by the effects of contaminated runway braking coefficients are an acceptable alternative.			X	X		
1.e.4	Stopping distance, using wheel brakes and no reverse thrust on an icy runway.	±10% of distance or ±200 ft (61 m).	Landing	Either flight test or manufacturer's performance manual data must be used, where available. Engineering data based on dry runway flight test stopping distance modified by the effects of contaminated runway braking coefficients are an acceptable alternative.			X	X		
1.f	Engines									
1.f.1	Acceleration	±10% T_t and ±10% T_i, or ±0.25 sec.	Approach or landing	Record engine power (N_1, N_2, EPR, Torque) from flight idle to go-around power for a rapid (slam) throttle movement.	X	X	X	X		T_1 is the total time from initial throttle movement until reaching a 10% response of engine power. T_t is the total time from initial throttle movement to reaching 90% of go around power.

TABLE A2A.—FULL FLIGHT SIMULATOR (FFS) OBJECTIVE TESTS—Continued

<<<QPS REQUIREMENTS>>>										Information notes
Test		Tolerance	Flight Conditions	Test details	Simulator Level					
No.	Title				A	B	C	D		
1.f.2	Deceleration	±10% T_t and ±10% T_i, or ±0.25 sec.	Ground	Record engine power (N_1, N_2, EPR, Torque) from Max T/O power to 90% decay of Max T/O power for a rapid (slam) throttle movement.						T_i is the total time from initial throttle movement until reaching a 10% response of engine power. T_t is the total time from initial throttle movement to reaching 90% decay of maximum takeoff power.
2. Handling Qualities										
	For simulators requiring Static or Dynamic tests at the controls (i.e., column, wheel, rudder pedal), special test fixtures will not be required during initial or upgrade evaluations if the sponsor's QTG/MQTG shows both text fixture results *and* the results of an alternative approach, such as computer plots produced concurrently, that provide satisfactory agreement. Repeat of the alternative method during the initial or upgrade evaluation would then satisfy this test requirement. For initial and upgrade evaluations, the control dynamic characteristics must be measured at and recorded directly from the cockpit controls, and must be accomplished in takeoff, cruise, and landing flight conditions and configurations. Testing of position versus force is not applicable if forces are generated solely by use of airplane hardware in the full flight simulator									Contact the NSPM for clarification of any issue regarding airplanes with reversible controls.
2.a	Static Control Tests									
2.a.1.a	Pitch Controller Position vs. Force and Surface Position Calibration.	±2 lb (0.9 daN) breakout, ±10% or ±5 lb (2.2 daN) force, ±2° elevator.	Ground	Record results for an uninterrupted control sweep to the stops.	X	X	X	X		Test results should be validated (where possible) with in-flight data from tests such as longitudinal static stability or stalls. Static and dynamic flight control tests should be accomplished at the same feel or impact pressures.
2.a.1.b	(Reserved)									
2.a.2.a	Roll Controller Position vs. Force Surface Position Calibration.	±2 lb (0.9 daN) breakout, ±10% or ±3 lb (1.3 daN) force, ±2° aileron, ±3° spoiler angle.	Ground	Record results for an uninterrupted control sweep to the stops.	X	X	X	X		Test results should be validated with in-flight data from tests such as engine out trims, steady state or sideslips. Static and dynamic flight control tests should be accomplished at the same feel or impact pressures.
2.a.2.b.	(Reserved).									
2.a.3.a.	Rudder Pedal Position vs. Force and Surface Position Calibration.	±5 lb (2.2 daN) breakout, ±10% or ±5 lb (2.2 daN) force, ±2½ rudder angle.	Ground	Record results for an uninterrupted control sweep to the stops.	X	X	X	X		Test results should be validated with in-flight data from tests such as engine out trims, steady state or sideslips. Static and dynamic flight control tests should be accomplished at the same feel or impact pressures.
2.a.3.b.	(Reserved).									
2.a.4	Nosewheel Steering Controller Force & Position Calibration.	±2 lb (0.9 daN) breakout, ±10% or ±3 lb (1.3 daN) force, ±2½ nosewheel angle.	Ground	Record results for an uninterrupted control sweep to the stops.	X	X	X	X		

TABLE A2A.—FULL FLIGHT SIMULATOR (FFS) OBJECTIVE TESTS—Continued

<<<QPS REQUIREMENTS>>>										Information notes
Test		Tolerance	Flight Conditions	Test details	Simulator Level					
No.	Title				A	B	C	D		
2.a.5	Rudder Pedal Steering Calibration.	±°nosewheel angle	Ground	Record results for an uninterrupted control sweep to the stops.	X	X	X	X		
2.a.6	Pitch Trim Indicator vs. Surface Position Calibration.	±0.5° of computed trim surface angle.	Ground		X	X	X	X		The purpose of the test is to compare full flight simulator against design data or equivalent
2.a.7	(Reserved)	.								
2.a.8	Alignment of Cockpit Throttle Lever vs. Selected Engine Parameter.	±5° of throttle lever angle, or ±3% N1 or ±03 EPR, or ± torque. For propeller-driven airplanes where the propeller control levers do not have angular travel, a tolerance of ±0.8 inch (±2 cm.) applies.	Ground	Requires simultaneous recording for all engines. The tolerances apply against airplane data and between engines. In the case of propeller powered airplanes, if a propeller lever is present, it must also be checked. For airplanes with throttle "detents," all detents must be presented. May be a series of snapshot test results..	X	X	X	X		
2.a.9	Brake Pedal Position vs. Force and Brake System Pressure Calibation.	±5 lb (2.2 daN) or 10% force, ±150 psi (1.0 MPa) or ±10% brake system pressure.	Ground	Hydraulic system pressure must be related to pedal position through a ground static test.	X	X	X	X		Full flight simulator computer output results may be used to show compliance.
2.b	Dynamic Control Tests.									
	(3) Tests 2.b.1., 2.b.2., and 2.b.3 are not applicable if dynamic response is generated solely by use of airplane hardware in the full flight simulator. Power setting is that required for level flight unless otherwise specified.									
2.b.1	Pitch Control	For underdamped systems ±10% of time from 90% of initial displacement (0.9 A_d) to first zero crossing and ±10 (n+1)% of period thereafter ±10% amplitude of first overshoot applied to all overshoots greater than 5% of initial displacement (.05 A_d). ±1 overshoot (first significant overshoot must be matched). For overdamped systems: ±10% of time from 90% of initial displacement (0.9 A_d) to 10% of initial displacement (0.1 A_d)	Takeoff, Cruise, and Landing.	Data must show normal control displacement in both directions. Tolerances apply against the absolute values of each period (considered independently). Normal control displacement for this test is 25% to 50% of the maximum allowable pitch controller deflection for flight conditions limited by the maneuvering load envelope.			X	X		"n" is the sequential period of a full cycle of oscillation. Refer to paragraph 3 of this attachment for more information. Static and dynamic flight control tests should be accomplished at the same feel or impact pressures. For the alternate method (see paragraph 3 of this attachment). The slow sweep is the equivalent to the static test 2.a.1. For the moderate and rapid sweeps: ±2 lb (0.9 daN) or ±10% dynamic increment above the static force.

TABLE A2A.—FULL FLIGHT SIMULATOR (FFS) OBJECTIVE TESTS—Continued

<<<QPS REQUIREMENTS>>>										Information notes
Test		Tolerance	Flight Conditions	Test details	Simulator Level					
No.	Title				A	B	C	D		
2.b.2	Roll Control	For underdamped systems: ±10% of time from 90% of initial displacement (0.9 A_d) to first zero crossing, and ±10 (n+1)% of period thereafter. ±10% amplitude of first overshoot, applied to all overshoots greater than 5% of initial displacement (.05 A_d), ±1 overshoot (first significant overshoot must be matched) For overdamped systems: ±10% of time from 90% of initial displacement (0.9 A_d) to 10% of initial displacement (0.1 A_d)	Takeoff, Cruise, and Landing.	Data must show normal control displacement in both directions. Tolerances apply against the absolute values of each period (considered independently). Normal control displacement for this test is 25% to 50% of maximum allowable roll controller deflection for flight conditions limited by the maneuvering load envelope.			X	X		"n" is the sequential period of a full cycle of oscillation. Refer to paragraph 3 of this attachment for more information. Static and dynamic flight control tests should be accomplished at the same feel or impact pressures. For the alternate method (see paragraph 3 of this attachment). The slow sweep is the equivalent to the static test 2.a.2. For the moderate and rapid sweeps: ±2 lb (0.9 daN) or ±10% dynamic increment above the static force.
2.b.3	Yaw Control	For underdamped systems: ±10% of time from 90% of initial displacement (0.9 A_d) to first zero crossing, and ±10 (n+1)% of period thereafter ±10% amplitude of first overshoot, applied to all overshoots greater than 5% of initial displacement (.05 A_d), ±1 overshoot (first significant overshoot must be matched). For overdamped systems: ±10% of time from 90% of initial displacement (0.9 A_d) to 10% of initial displacement (0.1 A_d)	Takeoff, Cruise, and Landing.	Data must show normal control displacement in both directions. Tolerances apply against the absolute values of each period (considered independently). Normal control displacement for this test is 25% to 50% of full throw.			X	X		"n" is the sequential period of a full cycle of oscillation. Refer to paragraph 3 of this attachment for more information. Static and dynamic flight control tests should be accomplished at the same feel or impact pressures. For the alternate method (see paragraph 3 of this attachment). The slow sweep is the equivalent to the static test 2.a.3. For the moderate and rapid sweeps: ±2 lb (0.9 daN) or ±10% dynamic increment above the static force.
2.b.4	Small Control Inputs—Pitch.	±0.15°/sec body pitch rate or ±20% of peak body pitch rate applied throughout the time history.	Approach or Landing	Control inputs must be typical of minor corrections made while established on an ILS approach course (approximately 0.5°/sec to 2°/sec pitch rate). The test must be in both directions, showing time history data from 5 seconds before until at least 5 seconds after initiation of control input. CCA: Test in normal and non-normal control states.			X	X		

TABLE A2A.—FULL FLIGHT SIMULATOR (FFS) OBJECTIVE TESTS—Continued

<<<QPS REQUIREMENTS>>>									Information notes
Test		Tolerance	Flight Conditions	Test details	Simulator Level				
No.	Title				A	B	C	D	
2.b.5	Small Control Inputs—Roll.	±0.15°/sec body roll rate or ±20% of peak body roll rate applied throughout the time history.	Approach or landing	Control inputs must be typical of minor corrections made while established on an ILS approach course (approximately 0.5°/sec to 2°/sec roll rate). The test must be run in only one direction; however, for airplanes that exhibit non-symmetrical behavior, the test must include both directions. Time history data must be recorded from 5 seconds before until at least 5 seconds after initiation of control input. CCA: Test in normal and non-normal control states.			X	X	
2.b.6	Small Control Inputs—Yaw.	±0.15°/sec body yaw rate or ±20% of peak body yaw rate applied throughout the time history.	Approach or landing	Control inputs must be typical of minor corrections made while established on an ILS approach course (approximately 0.5°/sec to 2°/sec yaw rate). The test must be run in only one direction; however, for airplanes that exhibit non-symmetrical behavior, the test must include both directions. Time history data must be recorded from 5 seconds before until at least 5 seconds after initiation of control input. CCA: Test in normal and non-normal control states.			X	X	
2.c	Longitudinal Control Tests								
	Power setting is that required for level flight unless otherwise specified								

TABLE A2A.—FULL FLIGHT SIMULATOR (FFS) OBJECTIVE TESTS—Continued

<<<QPS REQUIREMENTS>>>									Information notes
Test		Tolerance	Flight Conditions	Test details	Simulator Level				
No.	Title				A	B	C	D	
2.c.1	Power Change Dynamics	±3 kt airspeed, ±100 ft (30 m) altitude, ±20% or ±1.5° pitch angle.	Approach	Power is changed from the thrust setting required for approach or level flight to maximum continuous thrust or go-around power setting. Record the uncontrolled free response from at least 5 seconds before the power change is initiated to 15 seconds after the power change is completed. CCA: Test in normal and non-normal control states.	X	X	X	X	
2.c.2	Flap/Slat Change Dynamics.	±3 kt airspeed, ±100 ft (30 m) altitude, ±20% or ±1.5° angle.	Takeoff through initial flap retraction, and approach to landing.	Record the uncontrolled free response from at least 5 seconds before the configuration change is initiated to 15 seconds after the configuration change is completed. CCA: Test in normal and non-normal control states.	X	X	X	X	
2.c.3	Spoiler/Speedb rake Change Dynamics.	±3 kt airspeed, ±100 ft (30 m) altitude, ±20% or ±1.5° pitch angle.	Cruise	Record the uncontrolled free response from at least 5 seconds before the configuration change is initiated to 15 seconds after the configuration change is completed. Record results for both extension and retraction. CCA: Test in normal and non-normal control states.	X	X	X	X	
2.c.4	Gear Change Dynamics ..	±3 kt airspeed, ±100 ft (30 m) altitude, ±20% or ±1.5° pitch angle.	Takeoff (retraction), and Approach (extension).	Record the time history of uncontrolled free response for a time increment from at least 5 seconds before the configuration change is initiated to 15 seconds after the configuration change is completed. CCA: Test in normal and non-normal control states.	X	X	X	X	

TABLE A2A.—FULL FLIGHT SIMULATOR (FFS) OBJECTIVE TESTS—Continued

<<<QPS REQUIREMENTS>>>									Information notes
Test		Tolerance	Flight Conditions	Test details	Simulator Level				
No.	Title				A	B	C	D	
2.c.5	Longitudinal Trim	±0.5° stabilizer, ±1° elevator, ±1° pitch angle, ±5% net thrust or equivalent.	Cruise, Approach, and Landing.	Record steady-state condition with wings level and thrust set for level flight. May be a series of snapshot tests. CCA: Test in normal and non-normal control states.	X	X	X	X	
2.c.6	Longitudinal Maneuvering Stability (Stick Force/g).	±5 lb (±2.2 daN) or ±10% pitch controller force.. Alternative method: ±1° or ±10% change of elevator	Cruise, Approach, and Landing.	Continuous time history data or a series of snapshot tests may be used. Record results up to approximately 30° of bank for approach and landing configurations. Record results for up to approximately 45° of bank for the cruise configuration. The force tolerance is not applicable if forces are generated solely by the use of airplane hardware in the full flight simulator. The alternative method applies to airplanes that do not exhibit "stick-force-per-g" characteristics. CCA: Test in normal and non-normal control states.	X	X	X	X	
2.c.7	Longitudinal	±5 lb (±2.2 daN) or ±10% pitch controller force.. Alternative method: ±1° or ±10% change of elevator.	Approach	Record results for at least 2 speeds above and 2 speeds below trim speed. May be a series of snapshot test results. The force tolerance is not applicable if forces are generated solely by the use of airplane hardware in the full flight simulator. The alternative method applies to airplanes that do not exhibit speed stability characteristics. CCA: Test in normal and non-normal control states.	X	X	X	X	

TABLE A2A.—FULL FLIGHT SIMULATOR (FFS) OBJECTIVE TESTS—Continued

<<<QPS REQUIREMENTS>>>									Information notes
Test		Tolerance	Flight Conditions	Test details	Simulator Level				
No.	Title				A	B	C	D	
2.c.8	Stall Characteristics	±3 kt airspeed for initial buffet, stall warning, and stall speeds. Additionally, for those simulators with reversible flight control systems: ±10% or ±5 lb (2.2 daN)) Stick/Column force (prior to "g break" only).	Second Segment Climb, and Approach or Landing.	The stall maneuver must be entered with thrust at or near idle power and wings level (1g). Record the stall warning signal and initial buffet, if applicable. Time history data must be recorded for full staff and initiation of recovery. The stall warning signal must occur in the proper relation to buffet/stall. Full flight simulators of airplanes exhibiting a sudden pitch attitude change or "g break" must demonstrate this characteristic. CCA: Test in normal and non-normal control states.	X	X	X	X	
2.c.9	Phugoid Dynamics	±10% period, ±10% of time to ½ or double amplitude or ±.02 of damping ratio.	Cruise	The test must include whichever is less of the following: Three full cycles (six overshoots after the input is completed), or the number of cycles sufficient to determine time to ½ or double amplitude. CCA: Test in Non-normal and non-normal control states.	X	X	X	X	
2.c.10	Short Period Dynamics	±1.5° pitch angle or ±2°/sec pitch rate, ±0.10g acceleration.	Cruise	CCA: Test in Normal and Non-normal control states.		X	X		
2.c.11	(Reserved)	....	....	....					
2.d	Lateral Directional Tests								
	Power setting is that required for level flight unless otherwise specified								
2.d.1	Minimum Control Speed, Air (V_{mca} or V_{mcl}), per Applicable Airworthiness Standard or Low Speed Engine Inoperative Handling Characteristics in the Air.	±3 kt airspeed	Takeoff or Landing (whichever is most critical in the airplane).	Takeoff thrust must be used on the operating engine(s). A time history or a series of snapshot tests may be used. CCA: Test in Normal and Non-normal control states.	X	X	X	X	Low Speed Engine Inoperative Handling may be governed by a performance or control limit that prevents demonstration of V_{mca} in the conventional manner.

TABLE A2A.—FULL FLIGHT SIMULATOR (FFS) OBJECTIVE TESTS—Continued

<<<QPS REQUIREMENTS>>>									Information notes
Test		Tolerance	Flight Conditions	Test details	Simulator Level				
No.	Title				A	B	C	D	
2.d.2	Roll Response (Rate)	±10% or ±2°/sec roll rate. Additionally, for those simulators of airplanes with reversible flight control systems: ±10% or ±3lb (1.3 daN) wheel force.	Cruise, and Approach or Landing.	Record results for normal roll controller deflection (about one-third of maximum roll controller travel). May be combined with step input of flight deck roll controller test (2.d.3).	X	X	X	X	
2.d.3	Roll Response to Cockpit Roll Controller Step Input.	±10% or ±2° bank angle	Approach or Landing	Record from initiation of roll through 10 seconds after control is returned to neutral and released. May be combined with roll response (rate) test (2.d.2). CCA: Test in Normal and Non-normal control states.	X	X	X	X	With wings level, apply a step roll control input using approximately one-third of the roll controller travel. When reaching approximately 20° to 30° of bank, abruptly return the roll controller to neutral and allow approximately 10 seconds of airplane free response.
2.d.4	Spiral Stability	Correct trend and ±2° or ±10% bank angle in 20 seconds. Alternate test requires correct trend and ±2° aileron.	Cruise	Record results for both directions. Airplane data averaged from multiple tests may be used. As an alternate test, demonstrate the lateral control required to maintain a steady turn with a bank angle of approximately 30° CCA: Test in Normal and Non-normal control states.	X	X	X	X	
2.d.5	Engine Inoperative Trim	±1° rudder angle or ±1° tab angle or equivalent pedal, ±2° sideslip angle.	Second Segment Climb, and Approach or Landing.	May be a series of snapshot tests.	X	X	X	X	The test should be performed in a manner similar to that for which a pilot is trained to trim an engine failure condition. Second segment climb test should be at takeoff thrust. Approach or landing test should be at thrust for level flight.
2.d.6	Rudder Response	±2°/sec or ±10% yaw rate	Approach or Landing	Record results for stability augmentation system ON and OFF. A rudder step input of 20%–30% rudder pedal throw is used. CCA: Test in Normal and Non-normal control states.	X	X	X	X	

TABLE A2A.—FULL FLIGHT SIMULATOR (FFS) OBJECTIVE TESTS—Continued

<<<QPS REQUIREMENTS>>>									Information notes
Test		Tolerance	Flight Conditions	Test details	Simulator Level				
No.	Title				A	B	C	D	
2.d.7	Dutch Roll (Yaw Damper OFF).	±0.5 sec or ±10% of period, ±10% of time to ½ or double amplitude or ±.02 of damping ratio. ±20% or ±1 sec of time difference between peaks of bank and sideslip.	Cruise, and Approach or Landing.	Record results for at least 6 complete cycles with stability augmentation OFF. CCA: Test in Normal and Non-normal control states.		X	X	X	
2.d.8	Steady State Sideslip	For given rudder position, ±2° bank angle, ±1° sideslip angle, ±10% or ±2° aileron, ±10% or ±5° spoiler or equivalent roll, controller position or force. Additionally, for those simulators of airplanes with reversible flight control systems: ±10% or ±3 lb (1.3 daN) wheel force ±10% or ±5 lb (2.2 daN) rudder pedal force.	Approach or Landing	May be a series of snapshot test results using at least two rudder positions. Propeller driven airplanes must test in each direction.	X	X	X	X	
2.e	Landings								
2.e.1	Normal Landing	±3 kt airspeed, ±1.5° pitch angle, ±1.5° angle of attack, ±10% or ±10 ft (3 m) height. Additionally, for those simulators of airplanes with reversible flight control systems: ±10% or ±5 lbs (±2.2 daN) stick/column force.	Landing	Record results from a minimum of 200 ft (61 m) AGL to nose-wheel touchdown.. CCA: Test in Normal and Non-normal control states		X	X	X	Tests should be conducted with two normal landing flap settings (if applicable). One should be at or near maximum certificated landing weight. The other should be at light or medium landing weight.
2.e.2	Miminum Flap Landing	±3 kt airspeed, ±1.5° pitch angle, ±1.5° angle of attack, ±10% or ±10 ft (3 m) height. Additionally, for those simulators of airplanes with reversible flight control systems: ±10% or ±5 lbs (2.2 daN) stick/column force.	Minimum Certified Landing Flap Configuration.	Record results from a minimum of 200 ft (61 m) AGL to nosewheel touchdown with airplane at near Maximum Landing Weight.			X	X	
2.e.3	Crosswind Landing	±3 kt airspeed, ±1.5° pitch angle, ±1.5° angle of attack, ±10% or ±10 ft (3 m) height ±2° bank angle, ±2° sideslip angle, ±3° heading angle. Additionally, for those simulators of airplanes with reversible flight control systems: ±10% or ±3 lbs (1.3 daN) wheel force ±10% or ±5 lb (2.2 daN) rudder pedal force.	Landing	Record results from a minimum of 200 ft (61 m) AGL, through nosewheel touchdown, to 50% decrease in main landing gear touchdown speed.		X	X	X	Test data should include information on wind profile, for a crosswind component of 60% of the maximum described in the AFM as measured at 33 ft (10m) above the runway.
2.e.4	One Engine Inoperative Landing.	±3 kt airspeed, ±1.5° pitch angle, ±1.5° angle of attack, ±10% height or ±10 ft (3 m); ±2° bank angle, ±2° sideslip angle, ±3° heading.	Landing	Record results from a minimum of 200 ft (61 m) AGL, through nosewheel touchdown, to 50% decrease in main landing gear touchdown speed or less.		X	X	X	
2.e.5	Autopilot landing (if applicable).	±5 ft (1.5m) flare height, ±0.5 sec T_f, ±140 ft/min (.7 m/sec) rate of descent at touchdown. ±10 ft (3 m) lateral deviation during rollout.	Landing	If autopilot provides rollout guidance, record lateral deviation from touchdown to a 50% decrease in main landing gear touchdown speed or less. Time of autopilot flare mode engage and main gear touchdown must be noted.		X	X	X	T_f = duration of flare

TABLE A2A.—FULL FLIGHT SIMULATOR (FFS) OBJECTIVE TESTS—Continued

<<<QPS REQUIREMENTS>>>									Information notes
Test		Tolerance	Flight Conditions	Test details	Simulator Level				
No.	Title				A	B	C	D	
2.e.6	All engines operating, autopilot, go around.	±3 kt airspeed, ±1.5° pitch angle, ±1.5° angle of attack.	As per AFM	Normal, all-engines-operating, Go Around with the autopilot engaged (if applicable) at medium landing weight. CCA: Test in Normal and Non-normal control states		X	X	X	
2.e.7	One engine inoperative go around.	±3 kt airspeed, ±1.5° pitch angle, ±1.5° angle of attack, ±2° bank angle, ±2° slideslip angle.	As per AFM	The one engine inoperative go around is required at near maximum certificated landing weight with the critical engine inoperative using manual controls. If applicable, an additional engine inoperative go around test must be accomplished with the autopilot engaged. CCA: Test in Normal and Non-normal control states		X	X	X	
2.e.8	Directional control (rudder effectiveness) with symmetric reverse thrust.	±2°/sec yaw rate, ±5 kts airspeed.	Landing	Record results starting from a speed approximating touchdown speed to the minimum thrust reverser operation speed. With full reverse thrust, apply yaw control in both directions until reaching minimum thrust reverser operation speed.		X	X	X	
2.e.9	Directional control (rudder effectiveness) with symmetric reverse thrust.	±5 kt airspeed, ±3° heading angle.	Landing	Maintain heading with yaw control with full reverse thrust on the operating engine(s). Record results starting from a speed approximating touchdown speed to a speed at which control of yaw cannot be maintained or until reaching minimum thrust reverser operation speed, whichever is higher. The tolerance applies to the low speed end of the data recording.		X	X	X	
2.f	Ground Effect.								

TABLE A2A.—FULL FLIGHT SIMULATOR (FFS) OBJECTIVE TESTS—Continued

<<<QPS REQUIREMENTS>>>									Information notes
Test		Tolerance	Flight Conditions	Test details	Simulator Level				
No.	Title				A	B	C	D	
	Test to demonstrate Ground Effect.	±1° elevator or stabilizer angle, ±5% net thrust or equivalent, ±1° angle of attack, ±10% height or ±5 ft (1.5 m), ±3 kt airspeed, ±1° pitch angle.	Landing	The Ground Effect model must be validated by the test selected and a rationale must be provided for selecting the particular test.		X	X	X	See paragraph 4, Ground Effect, in this attachment for additional information.
2.g	Windshear								
	Four tests, two takeoff and two landing, with one of each conducted in still air and the other with windshear active to demonstrate windshear models.	See Attachment 5	Takeoff and Landing	Requires windshear models that provide training in the specific skills needed to recognize windshear phenomena and to execute recovery procedures. See Attachment 5 for tests, tolerances, and procedures.			X	X	See Attachment 5 for information related to Level A and B simulators.
2.h	Flight Maneuver and Envelope Protection Functions								
	The requirements of tests h(1) through (6) of this attachment are applicable to computer controlled airplanes only. Time history results are required for simulator response to control inputs during entry into envelope protection limits including both normal and degraded control states if the function is different. See thrust as required to reach the envelope protection function								
2.h.1	Overspeed	±5 kt airspeed	Cruise			X	X	X	
2.h.2	Minimum Speed	±3 kt airspeed	Takeoff, Cruise, and Approach or Landing.			X	X	X	
2.h.3	Load Factor	±0.1g normal load factor	Takeoff, Cruise			X	X	X	
2.h.4	Pitch Angle	±1.5° pitch angle	Cruise, Approach			X	X	X	
2.h.5	Bank Angle	±2° or ±10% bank angle	Approach			X	X	X	
2.h.6	Angle of Attack	±1.5° angle of attack	Second Segment Climb, and Approach or Landing.			X	X	X	
3. Motion System									
3.a	Frequency response.								
		Based on Simulator Capability	N/A	The test must demonstrate frequency response of the motion system.	X	X	X	X	This test is not required as part of continuing qualification evaluations, and should be part of the MQTG.
3.b	(Reserved)								
3.c	(Reserved)								
3.d	Motion system repeatability								

TABLE A2A.—FULL FLIGHT SIMULATOR (FFS) OBJECTIVE TESTS—Continued

<<<QPS REQUIREMENTS>>>									Information notes
Test		Tolerance	Flight Conditions	Test details	Simulator Level				
No.	Title				A	B	C	D	
		±0.05g actual platform linear acceleration.	None	A demonstration is required and must be made part of the MQTG. The assessment procedures must be designed to ensure that the motion system hardware and software (in normal flight simulator operating mode) continue to perform as originally qualified.	X	X	X	X	
3.e	(Reserved)								
3.f	(Reserved)								
4. Visual System									
4.a	Visual System Response Time: Relative responses of the motion system, visual system, and cockpit instruments must be coupled closely to provide integrated sensory cues. Visual change may start before motion response, but motion acceleration must be initiated before completion of the visual scan of the first video field containing different information								See paragraph 14 of this attachment for additional information.
4.a.1	Latency								
	These systems must respond to abrupt input at the pilot's position.	The response must not be prior to that time when the airplane responds and may respond 300 ms (or less) after the airplane responds under the same conditions.	N/A	Simultaneously record: 1) the output from the pilot's controller(s); 2) the output from an accelerometer attached to the motion system platform located at an acceptable location near the pilots' seats; 3) the output signal to the visual system display (including visual system analog delays); and 4) the output signal to the pilot's attitude indicator or an equivalent test approved by the Administrator.	X	X			The intent is to verify that the simulator provides instrument, motion, and visual cues that are, within the stated time delays, like the airplane responses. For airplane response, acceleration in the appropriate, corresponding rotational axis is preferred. Simulator Latency is measured from the start of a control input to the appropriate perceivable change in flight instrument indication; visual system response; or motion system response (this does not include airplane response time as per the manufacturer's data).

TABLE A2A.—FULL FLIGHT SIMULATOR (FFS) OBJECTIVE TESTS—Continued

<<<QPS REQUIREMENTS>>>									Information notes
Test		Tolerance	Flight Conditions	Test details	Simulator Level				
No.	Title				A	B	C	D	
		The response must not be prior to that time when the airplane responds and may respond 150 ms (or less) after the airplane responds under the same conditions.	N/A	Simultaneously record: 1) the output from the pilot's controller(s); 2) the output from an accelerometer attached to the motion system platform located at an acceptable location near the pilots' seats; 3) the output signal to the visual system display (including visual system analog delays); and 4) the output signal to the pilot's attitude indicator or an equivalent test approved by the Administrator.			X	X	The transport delay is the time between the control input and the individual hardware (i.e., instruments, motion system, visual system) responses. If Transport Delay is the chosen method to demonstrate relative responses, it is expected that, when reviewing those existing tests where latency can be identified (*e.g.*, short period, roll response, rudder response) the sponsor and the NSPM will apply additional scrutiny to ensure proper simulator response.
4.a.2	Transport Delay								
	As an alternative to the Latency requirement a transport delay objective test may be used to demonstrate that the simulator system does not exceed the specified limit. The sponsor must measure all the delay encountered by a step signal migrating from the pilot's control through the control loading electronics and interfacing through all the simulation software modules in the correct order, using a handshaking protocol, finally through the normal output interfaces to the instrument displays, the motion system, and the visual system An SOC is required.			A recordable start time for the test must be provided with the pilot flight control input. The migration of the signal must permit normal computation time to be consumed and must not alter the flow of information through the hardware/software system.					The transport delay is the time between the control input and the individual hardware (*i.e.*, instruments, motion system, visual system) responses. If Transport Delay is the chosen method to demonstrate relative responses, it is expected that, when reviewing those existing tests where latency can be identified (*e.g.*, short period, roll response, rudder response) the sponsor and the NSPM will apply additional scrutiny to ensure proper simulator response.
		The response must not be prior to that time when the airplane responds and may respond 300 ms (or less) after controller movement.	N/A		X	X			
		The response must not be prior to that time when the airplane responds and may respond 150 ms (or less) after controller movement.	N/A				X	X	
		The response must not be prior to that time when the airplane responds and may respond 150 ms (or less) after controller movement.	N/A				X	X	response, rudder response) the sponsor and the NSPM will apply additional scrutiny to ensure proper simulator response.
4.b	Field of View								

TABLE A2A.—FULL FLIGHT SIMULATOR (FFS) OBJECTIVE TESTS—Continued

<<<QPS REQUIREMENTS>>>									Information notes
Test No.	Test Title	Tolerance	Flight Conditions	Test details	Simulator Level A	Simulator Level B	Simulator Level C	Simulator Level D	
4.b.1	Continuous collimated visual field of view.	Minimum continuous collimated field of view providing 45° horizontal and 30° vertical field of view for each pilot seat. Both pilot seat visual systems must be operable simultaneously.	N/A	Required as part of MQTG but not required as part of continuing evaluations.	X	X			A vertical field of view of 30° may be insufficient to meet visual ground segment requirements.
4.b.2.	(Reserved)								
4.b.3.	(Reserved)								
4.c.	(Reserved)								
4.d.	Surface contrast ratio								
		Not less than 5:1	N/A	The ratio is calculated by dividing the brightness level of the center, bright square (providing at least 2 foot-lamberts or 7 cd/m^2) by the brightness level of any adjacent dark square. This requirement is applicable to any level of simulator equipped with a daylight visual system.			X	X	Measurements should be made using a 1° spot photometer and a raster drawn test pattern filling the entire visual scene (all channels) with a test pattern of black and white squares, 5° per square, with a white square in the center of each channel. During contrast ratio testing, simulator aft-cab and flight deck ambient light levels should be zero.
4.e.	Highlight brightness								
		Not less than six (6) foot-lamberts (20 cd/m^2).	N/A	Measure the brightness of a white square while superimposing a highlight on that white square. The use of calligraphic capabilities to enhance the raster brightness is acceptable; however, measuring lightpoints is not acceptable. This requirement is applicable to any level of simulator equipped with a daylight visual system.			X	X	Measurements should be made using a 1° spot photometer and a raster drawn test pattern filling the entire visual scene (all channels) with a test pattern of black and white squares, 5° per square, with a white square in the center of each channel.
4.f	Surface resolution								
		Not greater than three (3) arc minutes.	N/A	An SOC is required and must include the relevant calculations and an explanation of those calculations. This requirement is applicable to any level of simulator equipped with a daylight visual system.			X	X	The eye will subtend two arc minutes when positioned on a 3° glide slope, 6,876 ft slant range from the centrally located threshold of a black runway surface painted with white threshold bars that are 16 ft wide with 4-foot gaps between the bars.

TABLE A2A.—FULL FLIGHT SIMULATOR (FFS) OBJECTIVE TESTS—Continued

<<<QPS REQUIREMENTS>>>										Information notes
Test		Tolerance	Flight Conditions	Test details	Simulator Level					
No.	Title				A	B	C	D		
4.g.	Light point size									
		Not greater than six (6) arc-minutes.	N/A	An SOC is required and must include the relevant calculations and an explanation of those calculations. This requirement is applicable to any level of simulator equipped with a daylight visual system.			X	X		Light point size should be measured using a test pattern consisting of a centrally located single row of light points reduced in length until modulation is just discernible in each visual channel. A row of 48 lights will form a 4° angle or less.
4.h.	Light point contrast ratio									
4.h.1.	(Reserved)									
4.h.2	For Level C and D simulators.	Not less than 25:1.	N/A	An SOC is required and must include the relevant calculations.			X	X		A 1° spot photometer is used to measure a square of at least 1° filled with light points (where light point modulation is just discernible) and compare the results to the measured adjacent background. During contrast ratio testing, simulator aft-cab and flight deck ambient light levels should be zero.
4.i	Visual ground segment									
		The QTG must contain appropriate calculations and a drawing showing the pertinent data used to establish the airplane location and the segment of the ground that is visible considering design eyepoint, the airplane attitude, cockpit cut-off angle, and a visibility of 1200 ft (350 m) RVR. Simulator performance must be measured against the QTG calculations. Sponsors must provide this data for each simulator (regardless of previous qualification standards) to qualify the simulator for all instrument approaches. The data submitted must include at least the following:. (1) Static airplane dimensions as follows: (i) Horizontal and vertical distance from main landing gear (MLG) to glideslope reception antenna. (ii) Horizontal and vertical distance from MLG to pilot's eyepoint. (iii) Static cockpit cutoff angle. (2) Approach data as follows: (i) Identification of runway. (ii) Horizontal distance from runway threshold to glideslope intercept with runway.		The simulator must be verified for visual ground segment and visual scene content for the airplane in landing configuration and a main wheel height of 100 ft (30m) above the touchdown zone, on glide slope with an RVR value set at 1,200 ft (350m).	X	X	X	X		Pre-position for this test is encouraged but may be achieved via manual or autopilot control to the desired position.

TABLE A2A.—FULL FLIGHT SIMULATOR (FFS) OBJECTIVE TESTS—Continued

<<<QPS REQUIREMENTS>>>										Information notes
Test		Tolerance	Flight Conditions	Test details	Simulator Level					
No.	Title				A	B	C	D		
	....	(iii) Glideslope angle. (iv) Airplane pitch angle on approach. (3) Airplane data for manual testing: (i) Gross weight. (ii) airplane configuration. (iii) Approach airspeed.								
5. (Reserved)										

Begin Information

2. General

a. If relevant winds are present in the objective data, the wind vector should be clearly noted as part of the data presentation, expressed in conventional terminology, and related to the runway being used for test near the ground.

b. The reader is encouraged to review the Airplane Flight Simulator Evaluation Handbook, Volumes I and II, published by the Royal Aeronautical Society, London, UK, and FAA Advisory Circulars (AC) 25–7, as may be amended, Flight Test Guide for Certification of Transport Category Airplanes, and (AC) 23–8, as may be amended, Flight Test Guide for Certification of Part 23 Airplanes, for references and examples regarding flight testing requirements and techniques.

End Information

Begin Information

3. Control Dynamics

a. General. The characteristics of an airplane flight control system have a major effect on handling qualities. A significant consideration in pilot acceptability of an airplane is the ''feel'' provided through the flight controls. Considerable effort is expended on airplane feel system design so that pilots will be comfortable and will consider the airplane desirable to fly. In order for a FFS to be representative, it should ''feel'' like the airplane being simulated. Compliance with this requirement is determined by comparing a recording of the control feel dynamics of the FFS to actual airplane measurements in the takeoff, cruise and landing configurations.

(1) Recordings such as free response to an impulse or step function are classically used to estimate the dynamic properties of electromechanical systems. In any case, it is only possible to estimate the dynamic properties as a result of only being able to estimate true inputs and responses. Therefore, it is imperative that the best possible data be collected since close matching of the FFS control loading system to the airplane system is essential. The required dynamic control tests are described in Table A2A of this attachment.

(2) For initial and upgrade evaluations, the QPS requires that control dynamics characteristics be measured and recorded directly from the flight controls (Handling Qualities—Table A2A). This procedure is usually accomplished by measuring the free response of the controls using a step or impulse input to excite the system. The procedure should be accomplished in the takeoff, cruise and landing flight conditions and configurations.

(3) For airplanes with irreversible control systems, measurements may be obtained on the ground if proper pitot-static inputs are provided to represent airspeeds typical of those encountered in flight. Likewise, it may be shown that for some airplanes, takeoff, cruise, and landing configurations have like effects. Thus, one may suffice for another. In either case, engineering validation or airplane manufacturer rationale should be submitted as justification for ground tests or for eliminating a configuration. For FFSs requiring static and dynamic tests at the controls, special test fixtures will not be required during initial and upgrade evaluations if the QTG shows both test fixture results and the results of an alternate approach (*e.g.*, computer plots that were produced concurrently and show satisfactory agreement). Repeat of the alternate method during the initial evaluation would satisfy this test requirement.

b. Control Dynamics Evaluation. The dynamic properties of control systems are often stated in terms of frequency, damping and a number of other classical measurements. In order to establish a consistent means of validating test results for FFS control loading, criteria are needed that will clearly define the measurement interpretation and the applied tolerances. Criteria are needed for underdamped, critically damped and overdamped systems. In the case of an underdamped system with very light damping, the system may be quantified in terms of frequency and damping. In critically damped or overdamped systems, the frequency and damping are not readily measured from a response time history. Therefore, the following suggested measurements may be used:

(1) For Level C and D simulators. Tests to verify that control feel dynamics represent the airplane should show that the dynamic damping cycles (free response of the controls) match those of the airplane within specified tolerances. The NSPM recognizes that several different testing methods may be used to verify the control feel dynamic response. The NSPM will consider the merits of testing methods based on reliability and consistency. One acceptable method of evaluating the response and the tolerance to be applied is described below for the underdamped and critically damped cases. A sponsor using this method to comply with the QPS requirements should perform the tests as follows:

(a) Underdamped response. Two measurements are required for the period, the time to first zero crossing (in case a rate limit is present) and the subsequent frequency of oscillation. It is necessary to measure cycles on an individual basis in case there are non-uniform periods in the response. Each period will be independently compared to the respective period of the airplane control system and, consequently, will enjoy the full tolerance specified for that period. The damping tolerance will be applied to overshoots on an individual basis. Care should be taken when applying the tolerance to small overshoots since the significance of such overshoots becomes questionable. Only those overshoots larger than 5 per cent of the total initial displacement should be considered. The residual band, labeled $T(A_d)$ on Figure A2A is ±5 percent of the initial displacement amplitude A_d from the steady state value of the oscillation. Only oscillations outside the residual band are considered significant. When comparing FFS data to airplane data, the process should begin by overlaying or aligning the FFS and airplane steady state values and then comparing amplitudes of oscillation peaks, the time of the first zero crossing and individual periods of oscillation. The FFS should show the same number of significant overshoots to within one when compared against the airplane data. The procedure for evaluating the response is illustrated in Figure A2A.

(b) Critically damped and overdamped response. Due to the nature of critically damped and overdamped responses (no overshoots), the time to reach 90 percent of the steady state (neutral point) value should be the same as the airplane within ±10 percent. Figure A2B illustrates the procedure.

(c) Special considerations. Control systems that exhibit characteristics other than classical overdamped or underdamped responses should meet specified tolerances. In addition, special consideration should be given to ensure that significant trends are maintained.

(2) Tolerances.

(a) The following table summarizes the tolerances, T, for underdamped systems, and ''n'' is the sequential period of a full cycle of oscillation. See Figure A2A of this attachment for an illustration of the referenced measurements.

$T(P_0)$ ±10% of P_0
$T(P_1)$ ±20% of P_1
$T(P_2)$ ±30% of P_2
$T(P_n)$ ±10(n+1)% of P_n
$T(A_n)$ ±10% of A_1
$T(A_d)$ ±5% of A_d = residual band
Significant overshoots First overshoot and ±1 subsequent overshoots

(b) The following tolerance applies to critically damped and overdamped systems only. See Figure A2B for an illustration of the reference measurements:

$T(P_0)$ ±10% of P_0

c. Alternate method for Control Dynamics Evaluation. Another acceptable method of evaluating the response and the tolerance to be applied for airplanes with hydraulically powered flight controls and artificial feel systems is described below. Instead of free response measurements, the system is validated by measurements of control force and rate of movement. A sponsor using this alternate method to comply with the QPS requirements should perform the tests as follows:

(1) For each axis of pitch, roll and yaw, the control should be forced to its maximum extreme position for the following distinct rates. These tests would be conducted at typical taxi, takeoff, cruise and landing conditions.

(a) Static test. Slowly move the control such that approximately 100 seconds are required to achieve a full sweep. A full sweep is defined as movement of the controller from neutral to the stop (usually aft or right stop), then to the opposite stop, then to the neutral position.

(b) Slow dynamic test. Achieve a full sweep in approximately 10 seconds.

(c) Fast dynamic test. Achieve a full sweep in approximately 4 seconds.

(**Note:** Dynamic sweeps may be limited to forces not exceeding 100 lb (44.5 daN).

(2) *Tolerances.*

(a) Static test. Same as tests 2.a.1., 2.a.2., and 2.a.3. in Table A2A in this attachment.

(b) Dynamic test. ±2 lb (±0.9 daN)or ±10 per cent on dynamic increment above static test.

(c) The NSPM are open to alternative means such as the one described above. Such alternatives, however, would have to be justified and appropriate to the application. For example, the method described here may not apply to all manufacturers' systems and certainly not to airplanes with reversible control systems. Hence, each case shall be considered on its own merit on an ad hoc basis. If the NSPM finds that alternative methods do not result in satisfactory performance, then more conventionally accepted methods must be used.

End Information

BILLING CODE 4910–73–P

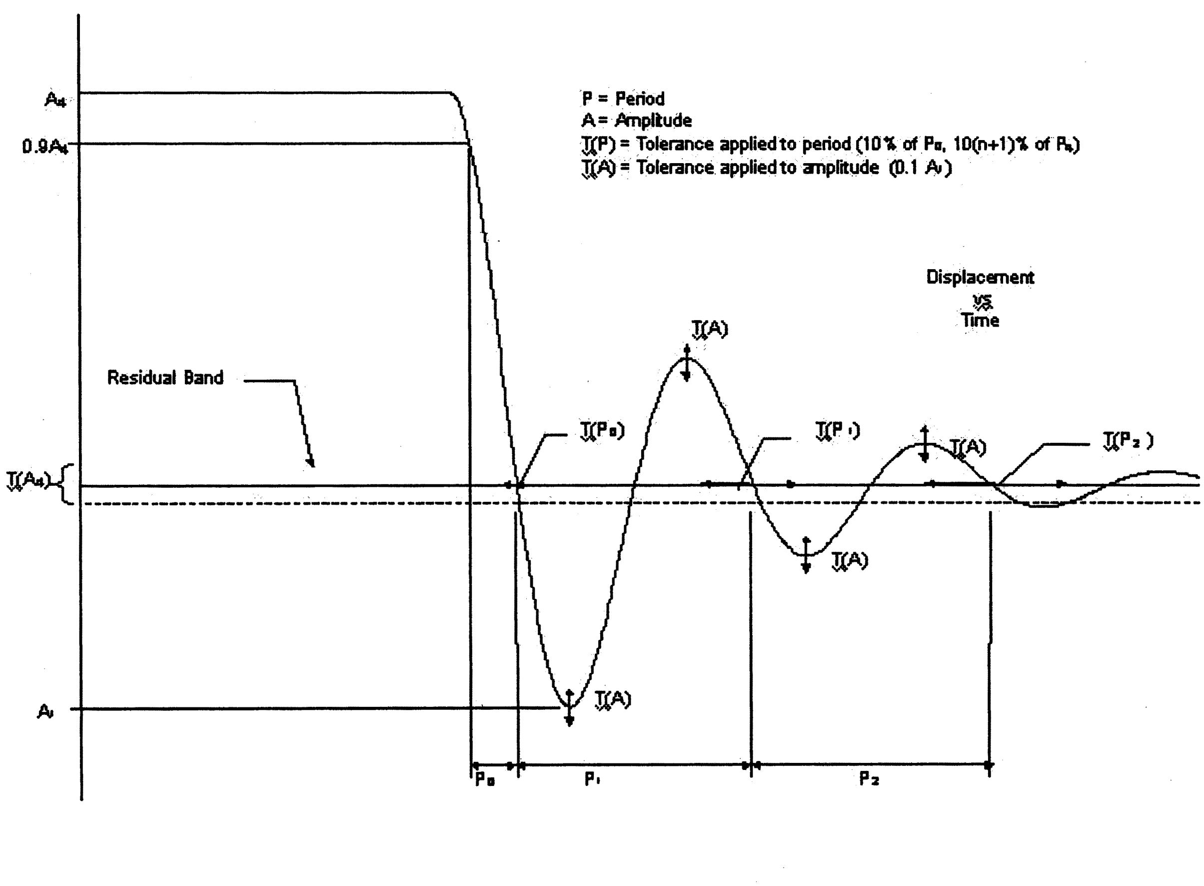


Figure A2A
Underdamped Step Response

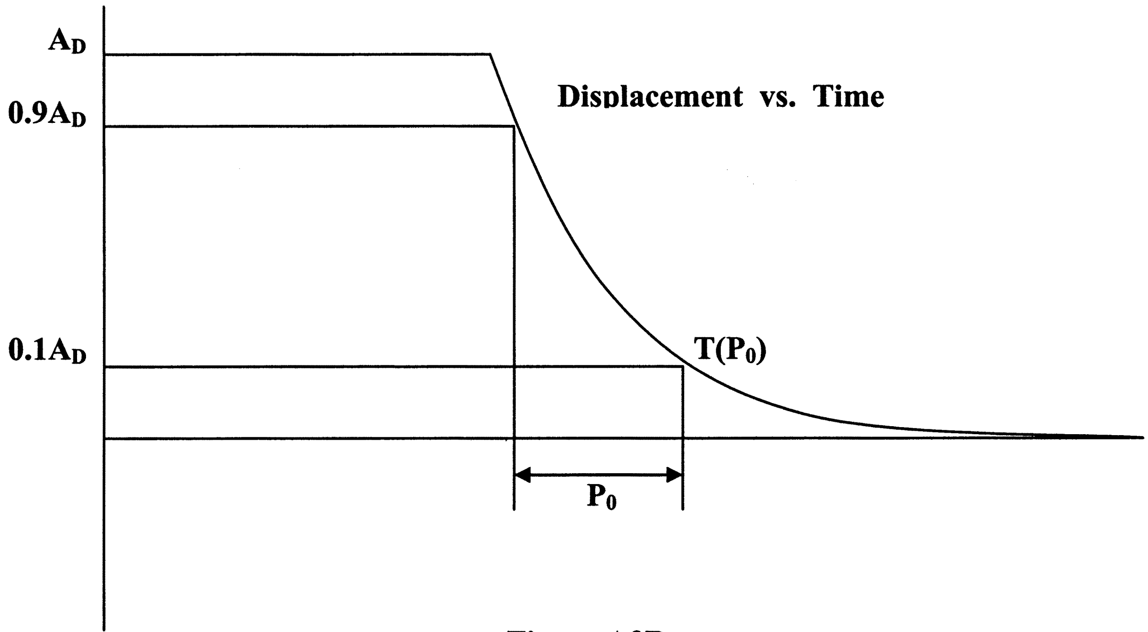


Figure A2B
Critically and Overdamped Step Response

Begin Information

4. Ground Effect

a. For an FFS to be used for take-off and landing (not applicable to Level A simulators in that the landing maneuver may not be credited in a Level A simulator) it should reproduce the aerodynamic changes that occur in ground effect. The parameters chosen for FFS validation should indicate these changes.

(1) A dedicated test should be provided that will validate the aerodynamic ground effect characteristics.

(2) The organization performing the flight tests may select appropriate test methods and procedures to validate ground effect. However, the flight tests should be performed with enough duration near the ground to sufficiently validate the ground-effect model.

b. The NSPM will consider the merits of testing methods based on reliability and consistency. Acceptable methods of validating ground effect are described below. If other methods are proposed, rationale should be provided to conclude that the tests performed validate the ground-effect model. A sponsor using the methods described below to comply with the QPS requirements should perform the tests as follows:

(1) Level fly-bys. The level fly-bys should be conducted at a minimum of three altitudes within the ground effect, including one at no more than 10% of the wingspan above the ground, one each at approximately 30% and 50% of the wingspan where height refers to main gear tire above the ground. In addition, one level-flight trim condition should be conducted out of ground effect (*e.g.*, at 150% of wingspan).

(2) Shallow approach landing. The shallow approach landing should be performed at a glide slope of approximately one degree with negligible pilot activity until flare.

c. The lateral-directional characteristics are also altered by ground effect. For example, because of changes in lift, roll damping is affected. The change in roll damping will affect other dynamic modes usually evaluated for FFS validation. In fact, Dutch roll dynamics, spiral stability, and roll-rate for a given lateral control input are altered by ground effect. Steady heading sideslips will also be affected. These effects should be accounted for in the FFS modeling. Several tests such as crosswind landing, one engine inoperative landing, and engine failure on take-off serve to validate lateral-directional ground effect since portions of these tests are accomplished as the aircraft is descending through heights above the runway at which ground effect is an important factor.

5. [Reserved]

6. [Reserved]

7. [Reserved]

8. [Reserved]

9. [Reserved]

10. [Reserved]

11. [Reserved]

12. [Reserved]

13. [Reserved]

14. [Reserved]

15. [Reserved]

End Information

Begin Information

16. Alternative Data Sources, Procedures, and Instrumentation: Level A and Level B Simulators Only

a. In recent years, considerable progress has been made in the improvement of aerodynamic modeling techniques. Additionally, those who have demonstrated success in combining these modeling techniques with minimal flight testing have incorporated the use of highly mature flight controls models and have had extensive experience in comparing the output of their effort with actual flight test data.

b. It has become standard practice for experienced simulator manufacturers to use modeling techniques to establish databases for new simulator configurations while awaiting the availability of actual flight test data. The data generated from the aerodynamic modeling techniques is then compared to the flight test data when it becomes available. The results of such comparisons have become increasingly consistent, indicating that these techniques, applied with the appropriate experience, are dependable and accurate for the development of aerodynamic models for use in Level A and Level B simulators.

c. Based on this history of successful comparisons, the NSPM has concluded that those who are experienced in the development of aerodynamic models may use modeling techniques to alter the method for acquiring flight test data for Level A or Level B simulators.

d. The information in Table A2E (Alternative Data Sources, Procedures, and Instrumentation) is presented to describe an acceptable alternative to data sources for simulator modeling and validation and an acceptable alternative to the procedures and instrumentation traditionally used to gather such modeling and validation data.

(1) Alternative data sources that may be used for part or all of a data requirement are the Airplane Maintenance Manual, the Airplane Flight Manual (AFM), Airplane Design Data, the Type Inspection Report (TIR), Certification Data or acceptable supplemental flight test data.

(2) The sponsor should coordinate with the NSPM prior to using alternative data sources in a flight test or data gathering effort.

e. The NSPM position regarding the use of these alternative data sources, procedures, and instrumentation is based on the following presumptions:

(1) Data gathered through the alternative means does not require angle of attack (AOA) measurements or control surface position measurements for any flight test. However, AOA can be sufficiently derived if the flight test program ensures the collection of acceptable level, unaccelerated, trimmed flight data. All of the simulator time history tests that begin in level, unaccelerated, and trimmed flight, including the three basic trim tests and ''fly-by'' trims, can be a successful validation of angle of attack by comparison with flight test pitch angle. (**Note:** Due to the criticality of angle of attack in the development of the ground effects model, particularly critical for normal landings and landings involving cross-control input applicable to Level B simulators, stable ''fly-by'' trim data will be the acceptable norm for normal and cross-control input landing objective data for these applications.)

(2) The use of a rigorously defined and fully mature simulation controls system model that includes accurate gearing and cable stretch characteristics (where applicable), determined from actual aircraft measurements. Such a model does not require control surface position measurements in the flight test objective data in these limited applications.

(3) The authorized uses of Level A and Level B simulators (as listed in the appropriate Commercial, Instrument, or Airline Transport Pilot and/or Type Rating Practical Test Standards) for ''initial,'' ''transition,'' or ''upgrade'' training, still requires additional flight training and/or flight testing/checking in the airplane or in a Level C or Level D simulator.

f. The sponsor is urged to contact the NSPM for clarification of any issue regarding airplanes with reversible control systems. Table A2E is not applicable to Computer Controlled Aircraft full flight simulators.

g. Utilization of these alternate data sources, procedures, and instrumentation does not relieve the sponsor from compliance with the balance of the information contained in this document relative to Level A or Level B FFSs.

h. The term ''inertial measurement system'' is used in the following table to include the use of a functional global positioning system (GPS).

End Information

TABLE A2E.—ALTERNATIVE DATA SOURCES, PROCEDURES, AND INSTRUMENTATION

Information

Table of objective tests	Sim level		Alternative data sources, procedures, and instrumentation	Notes and reminders
Test reference number and title	A	B		
1.a.1. Performance. Taxi. Minimum Radius turn.	X	X	TIR, AFM, or Design data may be used.	
1.a.2. Performance. Taxi. Rate of Turn vs. Nosewheel Steering Angle.		X	Data may be acquired by using a constant tiller position, measured with a protractor or full rudder pedal application for steady state turn, and synchronized video of heading indicator. If less than full rudder pedal is used, pedal position must be recorded.	A single procedure may not be adequate for all airplane steering systems, therefore appropriate measurement procedures must be devised and proposed for NSPM concurrence.
1.b.1. Performance. Takeoff. Ground Acceleration Time and Distance.	X	X	Preliminary certification data may be used. Data may be acquired by using a stopwatch, calibrated airspeed, and runway markers during a takeoff with power set before brake release. Power settings may be hand recorded. If an inertial measurement system is installed, speed and distance may be derived from acceleration measurements.	
1.b.2. Performance. Takeoff. Minimum Control Speed—ground (V_{mcg}) using aerodynamic controls only (per applicable airworthiness standard) or low speed, engine inoperative ground control characteristics.	X	X	Data may be acquired by using an inertial measurement system and a synchronized video of: The calibrated airplane instruments and the force/position measurements of cockpit controls..	Rapid throttle reductions at speeds near V_{mcg} may be used while recording appropriate parameters. The nose wheel must be free to caster, or equivalently freed of sideforce generation.
1.b.3. Performance. Takeoff. Minimum Unstick Speed (V_{mu}) or equivalent test to demonstrate early rotation takeoff characteristics.	X	X	Data may be acquired by using an inertial measurement system and a synchronized video of: The calibrated airplane instruments and the force/position measurements of cockpit controls.	
1.b.4. Performance. Takeoff. Normal Takeoff.	X	X	Data may be acquired by using an inertial measurement system and a synchronized video of: The calibrated airplane instruments and the force/position measurements of cockpit controls. AOA can be calculated from pitch attitude and flight path.	

TABLE A2E.—ALTERNATIVE DATA SOURCES, PROCEDURES, AND INSTRUMENTATION—Continued

Information				
Table of objective tests	Sim level		Alternative data sources, procedures, and instrumentation	Notes and reminders
Test reference number and title	A	B		
1.b.5. Performance. Takeoff. Critical Engine Failure during Takeoff.	X	X	Data may be acquired by using an inertial measurement system and a synchronized video of: The calibrated airplane instruments and the force/position measurements of cockpit controls.	Record airplane dynamic response to engine failure and control inputs required to correct flight path.
1.b.6. Performance. Takeoff. Crosswind Takeoff.	X	X	Data may be acquired by using an inertial measurement system and a synchronized video of: The calibrated airplane instruments and the force/position measurements of cockpit controls.	The "1:7 law" to 100 feet (30 meters) is an acceptable wind profile.
1.b.7. Performance. Takeoff. Rejected Takeoff.	X	X	Data may be acquired with a synchronized video of: Calibrated airplane instruments, thrust lever position, engine parameters, and distance (e.g., runway markers). A stopwatch is required.	
1.b.8. Dynamic Engine Failure After Takeoff.	N/A	N/A	Applicable only to Level C or Level D FSTDs.	
1.c.1. Performance. Climb. Normal Climb all engines operating..	X	X	Data may be acquired with a synchronized video of: Calibrated airplane instruments and engine power throughout the climb range.	
1.c.2. Performance. Climb. One engine Inoperative Climb.	X	X	Data may be acquired with a synchronized video of: Calibrated airplane instruments and engine power throughout the climb range.	
1.c.3. One Engine Inoperative—Enroute Climb.	N/A	N/A	Applicable only to Level C or Level D FSTDs.	
1.c.4. Performance. Climb. One Engine Inoperative Approach Climb (if approved AFM requires specific performance in icing conditions).	X	X	Data may be acquired with a synchronized video of calibrated airplane instruments and engine power throughout the climb range.	
1.d.1. Cruise/Descent. Level flight acceleration..	X	X	Data may be acquired with a synchronized video of: calibrated airplane instruments, thrust lever position, engine parameters, and elapsed time.	
1.d.2. Cruise/Descent. Level flight deceleration.	X	X	Data may be acquired with a synchronized video of: Calibrated airplane instruments, thrust lever position, engine parameters, and elapsed time.	
1.d.3. Cruise Performance	N/A	N/A	Applicable only to Level C or Level D FSTDs.	
1.d.4. Cruise/Descent. Idle descent ..	X	X	Data may be acquired with a synchronized video of: calibrated airplane instruments, thrust lever position, engine parameters, and elapsed time.	
1.d.5. Cruise/Descent. Emergency Descent.	X	X	Data may be acquired with a synchronized video of: calibrated airplane instruments, thrust lever position, engine parameters, and elapsed time.	
1.e.1. Performance. Stopping. Deceleration time and distance, using manual application of wheel brakes and no reverse thrust on a dry runway.	X	X	Data may be acquired during landing tests using a stopwatch, runway markers, and a synchronized video of: Calibrated airplane instruments, thrust lever position and the pertinent parameters of engine power.	
1.e.2. Performance. Ground. Deceleration Time and Distance, using reverse thrust and no wheel brakes.	X	X	Data may be acquired during landing tests using a stop watch, runway markers, and a synchronized video of: Calibrated airplane instruments, thrust lever position and the pertinent parameters of engine power.	

TABLE A2E.—ALTERNATIVE DATA SOURCES, PROCEDURES, AND INSTRUMENTATION—Continued

Information				
Table of objective tests	Sim level		Alternative data sources, procedures, and instrumentation	Notes and reminders
Test reference number and title	A	B		
1.e.3. Stopping Distance—wheel brakes, and no reverse thrust on a wet runway.	N/A	N/A	Applicable only to Level C and Level D FSTDs.	
1.e.4. Stopping Distance—wheel brakes, and no reverse thrust on an icy runway.	N/A	N/A	Applicable only to Level C and Level D FSTDs.	
1.f.1. Performance. Engines. Acceleration.	X	X	Data may be acquired with a synchronized video recording of: engine instruments and throttle position.	
1.f.2. Performance. Engines. Deceleration.	X	X	Data may be acquired with a synchronized video recording of: Engine instruments and throttle position.	
2.a.1.a. Handling Qualities. Static Control Checks. Pitch Controller Position vs. Force and Surface Position Calibration.	X	X	Surface position data may be acquired from flight data recorder (FDR) sensor or, if no FDR sensor, at selected, significant column positions (encompassing significant column position data points), acceptable to the NSPM, using a control surface protractor on the ground (for airplanes with reversible control systems, this function should be accomplished with winds less than 5 kts.). Force data may be acquired by using a hand-held force gauge at the same column position data points.	
2.a.2.a. Handling Qualities. Static Control Checks. Roll Controller Position vs. Force and Surface Position Calibration.	X	X	Surface position data may be acquired from flight data recorder (FDR) sensor or, if no FDR sensor, at selected, significant wheel positions (encompassing significant wheel position data points), acceptable to the NSPM, using a control surface protractor on the ground (for airplanes with reversible control systems, this function should be accomplished with winds less than 5 kts.). Force data may be acquired by using a hand-held force gauge at the same wheel position data points.	
2.a.3.a. Handling Qualities. Static Control Checks. Rudder Pedal Position vs. Force and Surface Position Calibration.	X	X	Surface position data may be acquired from flight data recorder (FDR) sensor or, if no FDR sensor, at selected, significant rudder pedal positions (encompassing significant rudder pedal position data points), acceptable to the NSPM, using a control surface protractor on the ground (for airplanes with reversible control systems, this function should be accomplished with winds less than 5 kts.). Force data may be acquired by using a hand-held force gauge at the same rudder pedal position data points.	
2.a.4. Handling Qualities. Static Control Checks. Nosewheel Steering Controller Force & Position.	X	X	Breakout data may be acquired with a hand-held force gauge. The remainder of the force to the stops may be calculated if the force gauge and a protractor are used to measure force after breakout for at least 25% of the total displacement capability.	
2.a.5. Handling Qualities. Static Control Checks. Rudder Pedal Steering Calibration.	X	X	Data may be acquired through the use of force pads on the rudder pedals and a pedal position measurement device, together with design data for nose wheel position.	

TABLE A2E.—ALTERNATIVE DATA SOURCES, PROCEDURES, AND INSTRUMENTATION—Continued

Information				
Table of objective tests	Sim level		Alternative data sources, procedures, and instrumentation	Notes and reminders
Test reference number and title	A	B		
2.a.6. Handling Qualities. Static Control Checks. Pitch Trim Indicator vs. Surface Position Calibration.	X	X	Data may be acquired through calculations.	
2.a.7. Handling qualities. Static control tests. Pitch trim rate..	X	X	Data may be acquired by using a synchronized video of pitch trim indication and elapsed time through range of trim indication.	
2.a.8. Handling Qualities. Static Control tests. Alignment of Cockpit Throttle Lever Angle vs. Selected engine parameter.	X	X	Data may be acquired through the use of a temporary throttle quadrant scale to document throttle position. Use a synchronized video to record steady state instrument readings or hand-record steady state engine performance readings.	
2.a.9. Handling qualities. Static control tests. Brake pedal position vs. force and brake system pressure calibration.	X	X	Use of design or predicted data is acceptable. Data may be acquired by measuring deflection at "zero" and "maximum" and calculating deflections between the extremes using the airplane design data curve.	
2.c.1. Handling qualities. Longitudinal control tests. Power change dynamics.	X	X	Data may be acquired by using an inertial measurement system and a synchronized video of: The calibrated airplane instruments and throttle position.	
2.c.2. Handling qualities. Longitudinal control tests. Flap/slat change dynamics.	X	X	Data may be acquired by using an inertial measurement system and a synchronized video of: Calibrated airplane instruments and flap/slat position.	
2.c.3. Handling qualities. Longitudinal control tests. Spoiler/speedbrake change dynamics.	X	X	Data may be acquired by using an inertial measurement system and a synchronized video of: The calibrated airplane instruments and spoiler/speedbrake position.	
2.c.4. Handling qualities. Longitudinal control tests. Gear change dynamics.	X	X	Data may be acquired by using an inertial measurement system and a synchronized video of: The calibrated airplane instruments and gear position.	
2.c.5. Handling qualities. Longitudinal control tests. Longitudinal trim.	X	X	Data may be acquired through use of an inertial measurement system and a synchronized video of: The cockpit controls position (previously calibrated to show related surface position) and the engine instrument readings.	
2.c.6. Handling qualities. Longitudinal control tests. Longitudinal maneuvering stability (stick force/g).	X	X	Data may be acquired through the use of an inertial measurement system and a synchronized video of: The calibrated airplane instruments; a temporary, high resolution bank angle scale affixed to the attitude indicator; and a wheel and column force measurement indication.	
2.c.7. Handling qualities. Longitudinal control tests. Longitudinal static stability.	X	X	Data may be acquired through the use of a synchronized video of: the airplane flight instruments and a hand-held force gauge.	
2.c.8. Handling qualities. Longitudinal control tests. Stall characteristics.	X	X	Data may be acquired through a synchronized video recording of: A stopwatch and the calibrated airplane airspeed indicator. Hand-record the flight conditions and airplane configuration.	Airspeeds may be cross-checked with those in the TIR and AFM.

TABLE A2E.—ALTERNATIVE DATA SOURCES, PROCEDURES, AND INSTRUMENTATION—Continued

Information				
Table of objective tests	Sim level		Alternative data sources, procedures, and instrumentation	Notes and reminders
Test reference number and title	A	B		
2.c.9. Handling qualities. Longitudinal control tests. Phugoid dynamics.	X	X	Data may be acquired by using an inertial measurement system and a synchronized video of: The calibrated airplane instruments and the force/position measurements of cockpit controls.	
2.c.10. Handling qualities. Longitudinal control tests. Short period dynamics.		X	Data may be acquired by using an inertial measurement system and a synchronized video of: The calibrated airplane instruments and the force/position measurements of cockpit controls.	
2.d.1. Handling qualities. Lateral directional tests. Minimum control speed, air (V_{mca} or V_{mci}), per applicable airworthiness standard or Low speed engine inoperative handling characteristics in the air.	X	X	Data may be acquired by using an inertial measurement system and a synchronized video of: The calibrated airplane instruments and the force/position measurements of cockpit controls.	
2.d.2. Handling qualities. Lateral directional tests. Roll response (rate).	X	X	Data may be acquired by using an inertial measurement system and a synchronized video of: The calibrated airplane instruments and the force/position measurements of cockpit lateral controls.	May be combined with step input of cockpit roll controller test, 2.d.3
2.d.3. Handling qualities. Lateral directional tests. Roll response to cockpit roll controller step input.	X	X	Data may be acquired by using an inertial measurement system and a synchronized video of: The calibrated airplane instruments and the force/position measurements of cockpit lateral controls..	
2.d.4. Handling qualities. Lateral directional tests. Spiral stability.	X	X	Data may be acquired by using an inertial measurement system and a synchronized video of: The calibrated airplane instruments; the force/position measurements of cockpit controls; and a stopwatch.	
2.d.5. Handling qualities. Lateral directional tests. Engine inoperative trim.	X	X	Data may be hand recorded in-flight using high resolution scales affixed to trim controls that have been calibrated on the ground using protractors on the control/trim surfaces with winds less than 5 kts.. OR Data may be acquired during second segment climb (with proper pilot control input for an engine-out condition) by using a synchronized video of: The calibrated airplane instruments; and the force/position measurements of cockpit controls	Trimming during second segment climb is not a certification task and should not be conducted until a safe altitude is reached.
2.d.6. Handling qualities. Lateral directional tests. Rudder response.	X	X	Data may be acquired by using an inertial measurement system and a synchronized video of: The calibrated airplane instruments; the force/position measurements of rudder pedals.	
2.d.7. Handling qualities. Lateral directional tests. Dutch roll, (yaw damper OFF).	X	X	Data may be acquired by using an inertial measurement system and a synchronized video of: The calibrated airplane instruments; the force/position measurements of cockpit controls.	
2.d.8. Handling qualities. Lateral directional tests. Steady state sideslip.		X	Data may be acquired by using an inertial measurement system and a synchronized video of: The calibrated airplane instruments; the force/position measurements of cockpit controls. Ground track and wind corrected heading may be used for sideslip angle..	

TABLE A2E.—ALTERNATIVE DATA SOURCES, PROCEDURES, AND INSTRUMENTATION—Continued

Information

Table of objective tests	Sim level		Alternative data sources, procedures, and instrumentation	Notes and reminders
Test reference number and title	A	B		
2.e.1. Handling qualities. Landings. Normal landing.		X	Data may be acquired by using an inertial measurement system and a synchronized video of: The calibrated airplane instruments; the force/position measurements of cockpit controls.	
2.e.3. Handling qualities. Landings. Crosswind landing.		X	Data may be acquired by using an inertial measurement system and a synchronized video of: The calibrated airplane instruments; the force/position measurements of cockpit controls.	
2.e.4. Handling qualities. Landings. One engine inoperative landing.		X	Data may be acquired by using an inertial measurement system and a synchronized video of: The calibrated airplane instruments; the force/position measurements of cockpit controls. Normal and lateral accelerations may be recorded in lieu of AOA and sideslip.	
2.e.5. Handling qualities. Landings. Autopilot landing (if applicable).		X	Data may be acquired by using an inertial measurement system and a synchronized video of: the calibrated airplane instruments; the force/position measurements of cockpit controls. Normal and lateral accelerations may be recorded in lieu of AOA and sideslip.	
2.e.6. Handling qualities. Landings. All engines operating, autopilot, go around.		X	Data may be acquired by using an inertial measurement system and a synchronized video of: The calibrated airplane instruments; the force/position measurements of cockpit controls. Normal and lateral accelerations may be recorded in lieu of AOA and sideslip.	
2.e.7. Handling qualities. Landings. One engine inoperative go around.		X	Data may be acquired by using an inertial measurement system and a synchronized video of: The calibrated airplane instruments; the force/position measurements of cockpit controls. Normal and lateral accelerations may be recorded in lieu of AOA and sideslip.	
2.e.8. Handling qualities. Landings. Directional control (rudder effectiveness with symmetric thrust).		X	Data may be acquired by using an inertial measurement system and a synchronized video of: The calibrated airplane instruments; the force/position measurements of cockpit controls. Normal and lateral accelerations may be recorded in lieu of AOA and sideslip.	
2.e.9. Handling qualities. Landings. Directional control (rudder effectiveness with asymmetric reverse thrust).			Data may be acquired by using an inertial measurement system and a synchronized video of: The calibrated airplane instruments; the force/position measurements of cockpit controls. Normal and lateral accelerations may be recorded in lieu of AOA and sideslip.	
2.f. Handling qualities. Ground effect. Test to demonstrate ground effect.		X	Data may be acquired by using calibrated airplane instruments, an inertial measurement system, and a synchronized video of: The calibrated airplane instruments; the force/position measurements of cockpit controls.	

Attachment 3 to Appendix A to Part 60—Simulator Subjective Evaluation

1. Discussion

Begin Information

a. The subjective tests provide a basis for evaluating the capability of the simulator to perform over a typical utilization period; determining that the simulator accurately simulates each required maneuver, procedure, or task; and verifying correct operation of the simulator controls, instruments, and systems. The items listed in the following Tables are for simulator evaluation purposes only. They must not be used to limit or exceed the authorizations for use of a given level of simulator as described on the Statement of Qualification or as may be approved by the TPAA.

b. The tests in Table A3A, Operations Tasks, in this attachment, address pilot functions, including maneuvers and procedures (called flight tasks), and is divided by flight phases. The performance of these tasks by the NSPM includes an operational examination of the visual system and special effects. There are flight tasks included to address some features of advanced technology airplanes and innovative training programs. For example, ''high angle-of-attack maneuvering'' is included to provide a required alternative to ''approach to stalls'' for airplanes employing flight envelope protection functions.

c. The tests in Table A3A, Operations Tasks, and Table A3G, Instructor Operating Station of this attachment, address the overall function and control of the simulator including the various simulated environmental conditions; simulated airplane system operations (normal, abnormal, and emergency); visual system displays; and special effects necessary to meet flight crew training, evaluation, or flight experience requirements.

d. All simulated airplane systems functions will be assessed for normal and, where appropriate, alternate operations. Normal, abnormal, and emergency operations associated with a flight phase will be assessed during the evaluation of flight tasks or events within that flight phase. Simulated airplane systems are listed separately under ''Any Flight Phase'' to ensure appropriate attention to systems checks. Operational navigation systems (including inertial navigation systems, global positioning systems, or other long-range systems) and the associated electronic display systems will be evaluated if installed. The NSP pilot will include in his report to the TPAA, the effect of the system operation and any system limitation.

e. Simulators demonstrating a satisfactory circling approach will be qualified for the circling approach maneuver and may be approved for such use by the TPAA in the sponsor's FAA-approved flight training program. To be considered satisfactory, the circling approach will be flown at maximum gross weight for landing, with minimum visibility for the airplane approach category, and must allow proper alignment with a landing runway at least 90° different from the instrument approach course while allowing the pilot to keep an identifiable portion of the airport in sight throughout the maneuver (reference—14 CFR 91.175(e)).

f. At the request of the TPAA, the NSPM may assess a device to determine if it is capable of simulating certain training activities in a sponsor's training program, such as a portion of a Line Oriented Flight Training (LOFT) scenario. Unless directly related to a requirement for the qualification level, the results of such an evaluation would not affect the qualification level of the simulator. However, if the NSPM determines that the simulator does not accurately simulate that training activity, the simulator would not be approved for that training activity.

g. Previously qualified simulators with certain early generation Computer Generated Image (CGI) visual systems, are limited by either the capability of the Image Generator or the display system used. These systems are:

(1) Early CGI visual systems that are excepted from the requirement of including runway numbers as a part of the specific runway marking requirements are:

(a) Link NVS and DNVS.

(b) Novoview 2500 and 6000.

(c) FlightSafety VITAL series up to, and including, VITAL III, but not beyond.

(d) Redifusion SP1, SP1T, and SP2.

(2) Some early CGI visual systems are excepted from the requirement of including runway numbers, unless the runways are used for LOFT training sessions. These LOFT airport models require runway numbers but only for the specific runway end (one direction) used in the LOFT session. The systems required to display runway numbers only for LOFT scenes are:

(a) FlightSafety VITAL IV.

(b) Redifusion SP3 and SP3T.

(c) Link-Miles Image II.

(3) The following list of previously qualified CGI and display systems are incapable of generating blue lights. These systems are not required to have accurate taxi-way edge lighting:

(a) Redifusion SP1.

(b) FlightSafety Vital IV.

(c) Link-Miles Image II and Image IIT.

(d) XKD displays (even though the XKD image generator is capable of generating blue colored lights, the display cannot accommodate that color).

The NSPM will evaluate each device to determine the appropriate qualification level based on the limitations of the visual system.

End Information

TABLE A3A.—FUNCTIONS AND SUBJECTIVE TESTS

<<< QPS requirements >>>					
Item No.	Operations tasks	Simulator level			
		A	B	C	D
	Tasks in this table are subjecgt to evaluation if appropriate for the airplane simulated as indicated in the SOQ Configuration List and/or the level of simulator qualification involved. Items not installed or not functional on the simulator and, therefore, not appearing on the SOQ Configuration List, are not required to be listed as exceptions on the SOQ.				
1.	Preparation For Flight. Preflight. Accomplish a functions check of all switches, indicators, systems, and equipment at all crewmembers' and instructors' stations and determine that the flight deck design and functions are identical to that of the airplane simulated.	X	X	X	X
2.	Surface Operations (Pre-Take-Off).				
2.a.	Engine Start.				
2.a.1.	Normal start	X	X	X	X
2.a.2.	Alternate start procedures	X	X	X	X
2.a.3.	Abnormal starts and shutdowns (e.g., hot/hung start, tail pipe fire)	X	X	X	X
2.b.	Pushback/Powerback		X	X	X
2.c.	Taxi.				
2.c.1.	Thrust response	X	X	X	X
2.c.2.	Power lever friction	X	X	X	X

TABLE A3A.—FUNCTIONS AND SUBJECTIVE TESTS—Continued

<<< QPS requirements >>>

Item No.	Operations tasks	Simulator level			
		A	B	C	D
2.c.3.	Ground handling	X	X	X	X
2.c.4.	Nose wheel scuffing			X	X
2.c.5.	Brake operation (normal and alternate/emergency)	X	X	X	X
2.c.6.	Brake fade (if applicable)	X	X	X	X
3.	Take-off.				
3.a.	Normal.				
3.a.1.	Airplane/engine parameter relationships	X	X	X	X
3.a.2.	Acceleration characteristics (motion)	X	X	X	X
3.a.3.	Nose wheel and rudder steering	X	X	X	X
3.a.4.	Crosswind (maximum demonstrated)	X	X	X	X
3.a.5.	Special performance (e.g., reduced V_1, max de-rate, short field operations)	X	X	X	X
3.a.6.	Low visibility take-off	X	X	X	X
3.a.7.	Landing gear, wing flap leading edge device operation	X	X	X	X
3.a.8.	Contaminated runway operation			X	X
3.b.	Abnormal/emergency				
3.b.1.	Rejected Take-off	X	X	X	X
3.b.2.	Rejected special performance (e.g., reduced V_1, max de-rate, short field operations)	X	X	X	X
3.b.3.	With failure of most critical engine at most critical point, continued take-off	X	X	X	X
3.b.4.	With wind shear	X	X	X	X
3.b.5.	Flight control system failures, reconfiguration modes, manual reversion and associated handling	X	X	X	X
3.b.6.	Rejected takeoff with brake fade			X	X
3.b.7.	Rejected, contaminated runway			X	X
	(i).				
4.	Climb.				
4.a.	Normal.	X	X	X	X
4.b.	One or more engines inoperative	X	X	X	X
5.	Cruise.				
5.a.	Performance characteristics (speed vs. power)	X	X	X	X
5.b.	High altitude handling	X	X	X	X
5.c.	High Mach number handling (Mach tuck, Mach buffet) and recovery (trim change)	X	X	X	X
5.d.	Overspeed warning (in excess of V_{mo} or M_{mo})	X	X	X	X
5.e.	High IAS handling	X	X	X	X
6.	Maneuvers.				
6.a.	High angle of attack, approach to stalls, stall warning, buffet, and g-break (take-off, cruise, approach, and landing configuration).	X	X	X	X
6.b.	Flight envelope protection (high angle of attack, bank limit, overspeed, etc)	X	X	X	X

TABLE A3A.—FUNCTIONS AND SUBJECTIVE TESTS—Continued

<<< QPS requirements >>>					
Item No.	Operations tasks	Simulator level			
		A	B	C	D
6.c.	Turns with/without speedbrake/spoilers deployed	X	X	X	X
6.d.	Normal and steep turns	X	X	X	X
6.e.	In flight engine shutdown and restart (assisted and windmill)	X	X	X	X
6.f.	Maneuvering with one or more engines inoperative, as appropriate	X	X	X	X
6.g.	Specific flight characteristics (e.g., direct lift control)	X	X	X	X
6.h.	Flight control system failures, reconfiguration modes, manual reversion and associated handling	X	X	X	X
7.	Descent.				
7.a.	Normal	X	X	X	X
7.b.	Maximum rate (clean and with speedbrake, etc)	X	X	X	X
7.c.	With autopilot	X	X	X	X
7.d.	Flight control system failures, reconfiguration modes, manual reversion and associated handling	X	X	X	X
8.	Instrument Approaches and Landing.				
	Those instrument approach and landing tests relevant to the simulated airplane type are selected from the following list. Some tests are made with limiting wind velocities, under windshear conditions, and with relevant system failures, including the failure of the Flight Director. If Standard Operating Procedures allow use autopilot for non-precision approaches, evaluation of the autopilot will be included. Level A simulators are not authorized to credit the landing maneuver.				
8.a.	Precision.				
8.a.1.	PAR	X	X	X	X
8.a.2.	CAT I/GBAS (ILS/MLS) published approaches	X	X	X	X
	(i) Manual approach with/without flight director including landing	X	X	X	X
	(ii) Autopilot/autothrottle coupled approach and manual landing	X	X	X	X
	(iii) Manual approach to DH and go-around all engines.	X	X	X	X
	(iv) Manual one engine out approach to DH and go-around	X	X	X	X
	(v) Manual approach controlled with and without flight director to 30 m (100 ft) below CAT I minima. A. With cross-wind (maximum demonstrated) B. With windshear	 X X	 X X	 X X	 X X
	(vi) Autopilot/autothrottle coupled approach, one engine out to DH and go-around approach, one engine out to DH and go-around.	X	X	X	X
	(vii) Approach and landing with minimum/standby electrical power	X	X	X	X
8.a.3.	CAT II/GBAS (ILS/MLS) published approaches.	X	X	X	X
	(i) Autopilot/autothrottle coupled approach to DH and landing	X	X	X	X
	(ii) Autopilot/autothrottle coupled approach to DH and go-around	X	X	X	X
	(iii) Autocoupled approach to DH and manual go-around	X	X	X	X
	(iv) Category II published approach (auto-coupled, autothrottle)	X	X	X	X
8.a.4.	CAT III/GBAS (ILS/MLS) published approaches	X	X	X	X
	(i) Autopilot/autothrottle coupled approach to land and rollout	X	X	X	X
	(ii) Autopilot/autothrottle coupled approach to DH/Alert Height and go-around	X	X	X	X

TABLE A3A.—FUNCTIONS AND SUBJECTIVE TESTS—Continued

<<< QPS requirements >>>

Item No.	Operations tasks	Simulator level			
		A	B	C	D
	(iii) Autopilot/autothrottle coupled approach to land and rollout with one engine out	X	X	X	X
	(iv) Autopilot/autothrottle coupled approach to DH/Alert Height and go-around with one engine out	X	X	X	X
	(v) Autopilot/autothrottle coupled approach (to land or to go around) A. With generator failure B. With 10 knot tail wind C. With 10 knot crosswind	X X X X X	X X X X X	X X X X X	X X X X X
8.b.	Non-precision.				
8.b.1.	NDB	X	X	X	X
8.b.2.	VOR, VOR/DME, VOR/TAC	X	X	X	X
8.b.3.	RNAV (GNSS/GPS)	X	X	X	X
8.b.4.	ILS LLZ (LOC), LLZ(LOC)/BC	X	X	X	X
8.b.5.	ILS offset localizer	X	X	X	X
8.b.6.	Direction finding facility (ADF/SDF)	X	X	X	X
8.b.7.	Airport surveillance radar (ASR)	X	X	X	X
9.	Visual Approaches (Visual Segment) And Landings				
	Flight simulators with visual systems, which permit completing a special approach procedure in accordance with applicable regulations, may be approved for that particular approach procedure				
9.a.	Maneuvering, normal approach and landing, all engines operating with and without visual approach aid guidance.	X	X	X	X
9.b.	Approach and landing with one or more engines inoperative	X	X	X	X
9.c.	Operation of landing gear, flap/slats and speedbrakes (normal and abnormal)	X	X	X	X
9.d.	Approach and landing with crosswind (max. demonstrated)	X	X	X	X
9.e.	Approach to land with windshear on approach	X	X	X	X
9.f.	Approach and landing with flight control system failures, reconfiguration modes, manual reversion and associated handling (most significant degradation which is probable).	X	X	X	X
9.g.	Approach and landing with trim malfunctions	X	X	X	X
9.g.1.	Longitudinal trim malfunction	X	X	X	X
9.g.2.	Lateral-directional trim malfunction	X	X	X	X
9.h.	Approach and landing with standby (minimum) electrical/hydraulic power	X	X	X	X
9.i.	Approach and landing from circling conditions (circling approach)	X	X	X	X
9.j.	Approach and landing from visual traffic pattern	X	X	X	X
9.k.	Approach and landing from non-precision approach	X	X	X	X
9.l.	Approach and landing from precision approach	X	X	X	X
9.m.	Approach procedures with vertical guidance (APV), e.g., SBAS.	X	X	X	X
10.	Missed Approach.				
10.a.	All engines	X	X	X	X
10.b.	One or more engine(s) out	X	X	X	X

TABLE A3A.—FUNCTIONS AND SUBJECTIVE TESTS—Continued

<<< QPS requirements >>>					
Item No.	Operations tasks	Simulator level			
		A	B	C	D
10.c.	With flight control system failures, reconfiguration modes, manual reversion and associated handling	X	X	X	X
11.	Surface Operations (Landing roll and taxi).				
11.a.	Spoiler operation	X	X	X	X
11.b.	Reverse thrust operation	X	X	X	X
11.c.	Directional control and ground handling, both with and without reverse thrust		X	X	X
11.d.	Reduction of rudder effectiveness with increased reverse thrust (rear pod-mounted engines)		X	X	X
11.e.	Brake and anti-skid operation with dry, wet, and icy conditions			X	X
11.f.	Brake operation, to include auto-braking system where applicable	X	X	X	X
12.	Any Flight Phase.				
12.a.	Airplane and engine systems operation.				
12.a.1.	Air conditioning and pressurization (ECS)	X	X	X	X
12.a.2.	De-icing/anti-icing	X	X	X	X
12.a.3.	Auxiliary power unit (APU)	X	X	X	X
12.a.4.	Communications	X	X	X	X
12.a.5.	Electrical	X	X	X	X
12.a.6.	Fire and smoke detection and suppression	X	X	X	X
12.a.7.	Flight controls (primary and secondary)	X	X	X	X
12.a.8.	Fuel and oil, hydraulic and pneumatic	X	X	X	X
12.a.9.	Landing gear	X	X	X	X
12.a.10.	Oxygen	X	X	X	X
12.a.11.	Engine	X	X	X	X
12.a.12.	Airborne radar	X	X	X	X
12.a.13.	Autopilot and Flight Director	X	X	X	X
12.a.14.	Collision avoidance systems. (e.g., (E)GPWS, TCAS)	X	X	X	X
12.a.15.	Flight control computers including stability and control augmentation	X	X	X	X
12.a.16.	Flight display systems	X	X	X	X
12.a.17.	Flight management computers	X	X	X	X
12.a.18.	Head-up guidance, head-up displays	X	X	X	X
12.a.19.	Navigation systems	X	X	X	X
12.a.20.	Stall warning/avoidance	X	X	X	X
12.a.21.	Wind shear avoidance equipment	X	X	X	X
12.a.22.	Automatic landing aids	X	X	X	X
12.b.	Airborne procedures				
12.b.1.	Holding	X	X	X	X
12.b.2.	Air hazard avoidance (Traffic, Weather)			X	X

TABLE A3A.—FUNCTIONS AND SUBJECTIVE TESTS—Continued

<<< QPS requirements >>>					
Item No.	Operations tasks	Simulator level			
		A	B	C	D
12.b.3.	Windshear.			X	X
12.b.4.	Effects of airframe ice			X	X
12.c.	Engine shutdown and parking.				
12.c.1.	Engine and systems operation	X	X	X	X
12.c.2.	Parking brake operation	X	X	X	X

Table A3B [Reserved]

Table A3C [Reserved]

Table A3D [Reserved]

Table A3E [Reserved]

Table A3F [Reserved]

TABLE A3G.— FUNCTIONS AND SUBJECTIVE TESTS

<<< QPS requirements >>>					
Item number	Operations tasks	Simulator level			
		A	B	C	D
	Functions in this table are subject to evaluation only if appropriate for the airplane and/or the system is installed on the specific simular.				
1.	Simulator Power Switch(es)	X	X	X	X
2.	Airplane conditions.				
2.a.	Gross weight, center of gravity, fuel loading and allocation	X	X	X	X
2.b.	Airplane systems status	X	X	X	X
2.c.	Ground crew functions (e.g., ext. power, push back)	X	X	X	X
3.	Airports.				
3.a.	Number and selection	X	X	X	X
3.b.	Runway selection	X	X	X	X
3.c.	Runway surface condition (e.g., rough, smooth, icy, wet)			X	X
3.d.	Preset positions (e.g., ramp, gate, #1 for takeoff, takeoff position, over FAF)	X	X	X	X
3.e.	Lighting controls	X	X	X	X
4.	Environmental controls.				
4.a	Visibility (statute miles (kilometers))	X	X	X	X
4.b.	Runway visual range (in feet (meters))	X	X	X	X
4.c.	Temperature	X	X	X	X
4.d.	Climate conditions (e.g., ice, snow, rain)	X	X	X	X
4.e.	Wind speed and direction	X	X	X	X
4.f.	Windshear			X	X
4.g.	Clouds (base and tops)	X	X	X	X
5.	Airplane system malfunctions (Inserting and deleting malfunctions into the simulator)	X	X	X	X
6.	Locks, Freezes, and Repositioning				
6.a.	Problem (all) freeze / release	X	X	X	X

TABLE A3G.— FUNCTIONS AND SUBJECTIVE TESTS—Continued

<<< QPS requirements >>>

Item number	Operations tasks	Simulator level			
		A	B	C	D
6.b.	Position (geographic) freeze/release	X	X	X	X
6.c.	Repositioning (locations, freezes, and releases).	X	X	X	X
6.d.	Ground speed control	X	X	X	X
7.	Remote IOS	X	X	X	X
8.	Sound Controls On/ off/ adjustment	X	X	X	X
9.	Motion / Control Loading System.				
9.a.	On / off / emergency stop	X	X	X	X
9.b.	Crosstalk (motion response in a given degree of freedom not perceptible in other degrees of freedom)	X	X	X	X
9.c.	Smoothness (no perceptible "turn-around bump" as the direction of motion reverses with the simulator being "flown" normally).	X	X	X	X
10.	Observer Seats / Stations. Position / Adjustment / Positive restraint system.	X	X	X	X

Begin Information

1. Introduction

a. The following is an example test schedule for an Initial/Upgrade evaluation that covers the majority of the requirements set out in the Functions and Subjective test requirements. It is not intended that the schedule be followed line by line, rather, the example should be used as a guide for preparing a schedule that is tailored to the airplane, sponsor, and training task.

b. Functions and subjective tests should be planned. This information has been organized as a reference document with the considerations, methods, and evaluation notes for each individual aspect of the simulator task presented as an individual item. In this way the evaluator can design their own test plan, using the appropriate sections to provide guidance on method and evaluation criteria. Two aspects should be present in any test plan structure:

(1) An evaluation of the simulator to determine that it replicates the aircraft and performs reliably for an uninterrupted period equivalent to the length of a typical training session.

(2) The simulator should be capable of operating reliably after the use of training device functions such as repositions or malfunctions.

c. A detailed understanding of the training task will naturally lead to a list of objectives that the simulator should meet. This list will form the basis of the test plan. Additionally, once the test plan has been formulated, the initial conditions and the evaluation criteria should be established. The evaluator should consider all factors that may have an influence on the characteristics observed during particular training tasks in order to make the test plan successful.

2. Events

a. Initial Conditions.
(1) Airport;
(2) QNH;
(3) Temperature;
(4) Wind/Crosswind;
(5) Zero Fuel Weight/Fuel/Gross Weight/Center of Gravity
b. Initial Checks.
(1) Documentation of Simulator.
(a) Simulator Acceptance Test Manuals.
(b) Simulator Approval Test Guide.
(c) Technical Logbook Open Item List.
(d) Daily Functional Pre-flight Check.
(2) Documentation of User/Carrier Flight Logs.
(a) Simulator Operating/Instructor Manual.
(b) Difference List (Aircraft/Simulator).
(c) Flight Crew Operating Manuals.
(d) Performance Data for Different Fields.
(e) Crew Training Manual.
(f) Normal/Abnormal/Emergency Checklists.
(3) Simulator External Checks.
(a) Appearance and Cleanliness.
(b) Stairway/Access Bridge.
(c) Emergency Rope Ladders.
(d) "Motion On"/"Flight in Progress" Lights.
(4) Simulator Internal Checks.
(a) Cleaning/Disinfecting Towels (for cleaning oxygen masks).
(b) Cockpit Layout (compare with difference list).
(5) Equipment.
(a) Quick Donning Oxygen Masks.
(b) Head Sets.
(c) Smoke Goggles.
(d) Sun Visors.
(e) Escape Rope.
(f) Chart Holders.
(g) Flashlights.
(h) Fire Extinguisher (inspection date).
(i) Crash Axe.
(j) Gear Pins.
c. Power Supply and APU Start Checks.
(1) Batteries and Static Inverter.
(2) APU Start with Battery.
(3) APU Shutdown using Fire Handle.
(4) External Power Connection.
(5) APU Start with External Power.
(6) Abnormal APU Start/Operation.
d. Cockpit Checks.
(1) Cockpit Preparation Checks.
(2) FMC Programming.
(3) Communications and Navigational Aids Checks.
e. Engine Start.
(1) Before Start Checks.
(2) Battery Start with Ground Air Supply Unit.
(3) Engine Crossbleed Start.
(4) Normal Engine Start.
(5) Abnormal Engine Starts.
(6) Engine Idle Readings.
(7) After Start Checks.
f. Taxi Checks.
(1) Pushback/Powerback.
(2) Taxi Checks.
(3) Ground Handling Check:
(a) Power required to initiate ground roll.
(b) Thrust response.
(c) Nose Wheel and Pedal Steering.
(d) Nosewheel Scuffing.
(e) Perform 180 degree turns.
(f) Brakes Response and Differential Braking using Normal, Alternate and Emergency.
(g) Brake Systems.
(h) Eye height and fore/aft position.
(4) Runway Roughness.
g. Visual Scene—Ground Assessment.
(Select 3 different visual models and perform the following checks with Day, Dusk and Night selected, as appropriate):
(1) Visual Controls.
(a) Daylight, Dusk, Night Scene Controls.
(b) Cockpit "Daylight" ambient lighting.
(c) Environment Light Controls.
(d) Runway Light Controls.
(e) Taxiway Light Controls.
(2) Scene Content.

(a) Ramp area for buildings, gates, airbridges, maintenance ground equipment, parked aircraft.
(b) Daylight shadows, night time light pools.
(c) Taxiways for correct markings, taxiway/runway, marker boards, CAT I & II/III hold points, taxiway shape/grass areas, taxiway light (positions and colors).
(d) Runways for correct markings, lead-off lights, boards, runway slope, runway light positions, and colors, directionality of runway lights.
(e) Airport environment for correct terrain and, significant features.
(f) Visual scene aliasing, color, and occulting levels.
(3) Ground Traffic Selection.
(4) Environment Effects.
(a) Low cloud scene.
(i) Rain:
(A) Runway surface scene.
(B) Windshield wiper—operation and sound.
(ii) Hail:
(A) Runway surface scene.
(B) Windshield wiper—operation and sound.
(b) Lightning/thunder.
(c) Snow/ice runway surface scene.
(d) Fog.
h. Takeoff.
(Select one or several of the following test cases):
(1) T/O Configuration Warnings.
(2) Engine Takeoff Readings.
(3) Rejected Takeoff (Dry/Wet/Icy Runway) and check the following:
(a) Autobrake function.
(b) Anti-skid operation.
(c) Motion/visual effects during deceleration.
(d) Record stopping distance (use runway plot or runway lights remaining).
(Continue taxiing along the runway while applying brakes and check the following).
(e) Center line lights alternating red/white for 2000 feet/600 meters.
(f) Center line lights all red for 1000 feet/300 m.
(g) Runway end, red stop bars.
(h) Braking fade effect.
(i) Brake temperature indications.
(4) Engine Failure between VI and V2.
(5) Normal Takeoff:
(a) During ground roll check the following:
(i) Runway rumble.
(ii) Acceleration cues.
(iii) Groundspeed effects.
(iv) Engine sounds.
(v) Nosewheel and rudder pedal steering.
(b) During and after rotation, check the following:
(i) Rotation characteristics.
(ii) Column force during rotation.
(iii) Gear uplock sounds/bumps.
(iv) Effect of slat/flap retraction during climbout.
(6) Crosswind Takeoff (check the following):
(a) Tendency to turn into or out of the wind.
(b) Tendency to lift upwind wing as airspeed increases.
(7) Windshear during Takeoff (check the following):
(a) Controllable during windshear encounter.
(b) Performance adequate when using correct techniques.
(c) Windshear Indications satisfactory.
(d) Motion cues satisfactory (particularly turbulence).
(8) Normal Takeoff with Control Malfunction.
(9) Low Visibility T/O (check the following):
(a) Visual cues.
(b) Flying by reference to instruments.
(c) SID Guidance on LNAV.
i. Climb Performance.
Select one or several of the following test cases:
(1) Normal Climb—Climb while maintaining recommended speed profile and note fuel, distance and time.
(2) Single Engine Climb—Trim aircraft in a zero wheel climb at V2.

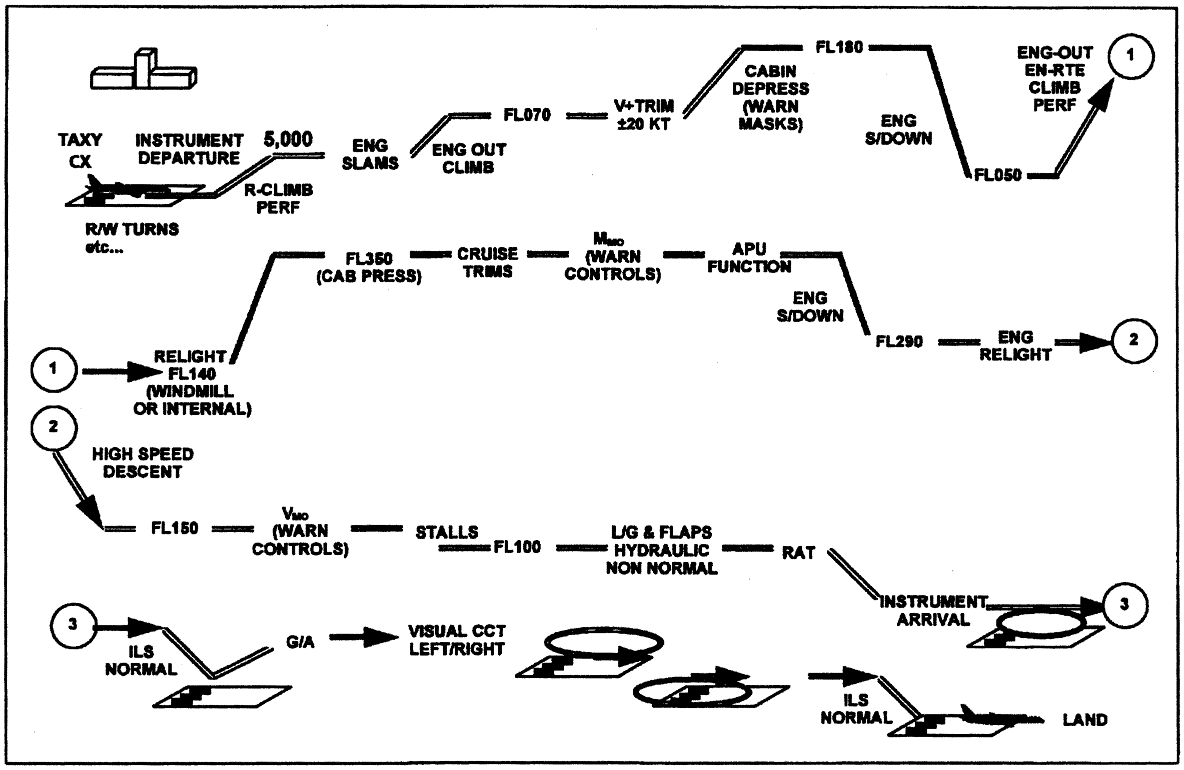
Note: Up to 5° bank towards the operating engine(s) is permissible. Climb for 3 minutes and note fuel, distance, and time. Increase speed toward en route climb speed and retract flaps. Climb for 3 minutes and note fuel, distance, and time.

j. Systems Operation During Climb.
Check normal operation and malfunctions as appropriate for the following systems:
(1) Air conditioning/Pressurization/Ventilation.
(2) Autoflight.
(3) Communications.
(4) Electrical.
(5) Fuel.
(6) Icing Systems.
(7) Indicating and Recording systems.
(8) Navigation/FMS.
(9) Pneumatics.
k. Cruise Checks.
(Select one or several of the following test cases):
(1) Cruise Performance.
(2) High Speed/High Altitude Handling (check the following):
(a) Overspeed warning.
(b) High Speed buffet.
(c) Aircraft control satisfactory.
(d) Envelope limiting functions on Computer Controlled Airplanes.
(Reduce airspeed to below level flight buffet onset speed, start a turn, and check the following:)
(e) High Speed buffet increases with G loading.
(Reduce throttles to idle and start descent, deploy the speedbrake, and check the following:)
(f) Speedbrake indications.
(g) Symmetrical deployment.
(h) Airframe buffet.
(i) Aircraft response hands off.
(3) Yaw Damper Operation.
(Switch off yaw dampers and autopilot. Initiate a Dutch roll and check the following:)
(a) Aircraft dynamics.
(b) Simulator motion effects.
(Switch on yaw dampers, re-initiate a Dutch roll and check the following:)
(c) Damped aircraft dynamics.
(4) APU Operation.
(5) Engine Gravity Feed.
(6) Engine Shutdown and Driftdown Check: FMC operation Aircraft performance.
(7) Engine Relight.
l. Descent.
Select one of the following test cases:
(1) Normal Descent Descend while maintaining recommended speed profile and note fuel, distance and time.
(2) Cabin Depressurization/Emergency Descent
m. Medium Altitude Checks.
(Select one or several of the following test cases)
(1) High Angle of Attack/Stall. Trim the aircraft at 1.4 Vs, establish 1 kt/sec^2 deceleration rate, and check the following—
(a) System displays/operation satisfactory.
(b) Handling characteristics satisfactory.
(c) Stall and Stick shaker speed.
(d) Buffet characteristics and onset speed.
(e) Envelope limiting functions on Computer Controlled Airplanes.
(Recover to straight and level flight and check the following:)
(f) Handling characteristics satisfactory.
(2) Turning Flight.
(Roll aircraft to left, establish a 30° to 45° bank angle, and check the following:)
(a) Stick force required, satisfactory.
(b) Wheel requirement to maintain bank angle.
(c) Slip ball response, satisfactory.
(d) Time to turn 180°.
(Roll aircraft from 45° bank one way to 45° bank the opposite direction while maintaining altitude and airspeed—check the following:)
(e) Controllability during maneuver.
(3) Degraded flight controls.
(4) Holding Procedure (check the following:)
(a) FMC operation.
(b) Auto pilot auto thrust performance.
(5) Storm Selection (check the following:)
(a) Weather radar controls.
(b) Weather radar operation.
(c) Visual scene corresponds with WXR pattern.
(Fly through storm center, and check the following:)
(d) Aircraft enters cloud.
(e) Aircraft encounters representative turbulence.
(f) Rain/hail sound effects evident.
(As aircraft leaves storm area, check the following:)
(g) Storm effects disappear.
(6) TCAS (check the following:)
(a) Traffic appears on visual display.
(b) Traffic appears on TCAS display(s).
(As conflicting traffic approaches, take relevant avoiding action, and check the following:)
(c) Visual and TCAS system displays.
n. Approach And Landing.
Select one or several of the following test cases while monitoring flight control and hydraulic systems for normal operation and with malfunctions selected:
(1) Flaps/Gear Normal Operation (Check the following:)
(a) Time for extension/retraction.
(b) Buffet characteristics.
(2) Normal Visual Approach and Landing.
Fly a normal visual approach and landing—check the following:
(a) Aircraft handling.
(b) Spoiler operation.

(c) Reverse thrust operation.
(d) Directional control on the ground.
(e) Touchdown cues for main and nose wheel.
(f) Visual cues.
(g) Motion cues.
(h) Sound cues.
(i) Brake and Anti-skid operation.
(3) Flaps/Gear Abnormal Operation or with hydraulic malfunctions.
(4) Abnormal Wing Flaps/Slats Landing.
(5) Manual Landing with Control Malfunction.
(a) Aircraft handling.
(b) Aircraft handling.
(c) Radio Aids and instruments.
(d) Visual scene content and cues.
(e) Motion cues.
(f) Sound cues.
(6) Non-precision Approach—All Engines Operating.
(a) Aircraft handling.
(b) Aircraft handling.
(c) Radio Aids and instruments.
(d) Visual scene content and cues.
(e) Motion cues.
(f) Sound cues.
(7) Circling Approach.
(a) Aircraft handling.
(b) Aircraft handling.
(c) Radio Aids and instruments.
(d) Visual scene content and cues.
(e) Motion cues.
(f) Sound cues.
(8) Non-precision Approach—One Engine Inoperative.
(a) Aircraft handling.
(b) Aircraft handling.
(c) Radio Aids and instruments.
(d) Visual scene content and cues.
(e) Motion cues.
(f) Sound cues.
(9) One Engine Inoperative Go-around.
(a) Aircraft handling.
(b) Aircraft handling.
(c) Radio Aids and instruments.
(d) Visual scene content and cues.
(e) Motion cues.
(f) Sound cues.
(10) CAT I Approach and Landing with raw-data ILS.
(a) Aircraft handling.
(b) Aircraft handling.
(c) Radio Aids and instruments.
(d) Visual scene content and cues.
(e) Motion cues.
(f) Sound cues.
(11) CAT I Approach and Landing with Limiting Crosswind.
(a) Aircraft handling.
(b) Aircraft handling.
(c) Radio Aids and instruments.
(d) Visual scene content and cues.
(e) Motion cues.
(f) Sound cues.
(12) CAT I Approach with Windshear. Check the following:
(a) Controllable during windshear encounter.
(b) Performance adequate when using correct techniques.
(c) Windshear indications/warnings.
(d) Motion cues (particularly turbulence).
(13) CAT II Approach and Automatic Go-Around.
(14) CAT III Approach and Landing—System Malfunctions.
(15) CAT III Approach and Landing—1 Engine Inoperative.
(16) GPWS evaluation.
o. Visual Scene—In-Flight Assessment.
Select three (3) different visual models and perform the following checks with ''day,'' ''dusk,'' and ''night'' (as appropriate) selected. Reposition the aircraft at or below 2000 feet within 10 nm of the airfield. Fly the aircraft around the airport environment and assess control of the visual system and evaluate the visual scene content as described below:
(1) Visual Controls.
(a) Daylight, Dusk, Night Scene Controls.
(b) Cockpit ambient lighting during ''daylight'' conditions.
(c) Environment Light Controls.
(d) Runway Light Controls.
(e) Taxiway Light Controls.
(f) Approach Light Controls.
(2) Scene Content.
(a) Airport environment for correct terrain and significant features.
(b) Runways for correct markings, runway slope, directionality of runway lights.
(c) Visual scene for aliasing, colour, and occulting.
Reposition the aircraft to a long, final approach for an ''ILS runway.'' Select flight freeze when the aircraft is 5-statute miles (sm)/8-kilometers (km) out and on the glide slope.
Check the following:
(3) Scene content.
(a) Airfield features.
(b) Approach lights.
(c) Runway definition.
(d) Runway definition.
(e) Runway edge lights and VASI lights.
(f) Strobe lights.
Release flight freeze. Continue flying the approach with NP engaged. Select flight freeze when aircraft is 3 sm/5 km out and on the glide slope. Check the following:
(4) Scene Content.
(a) Runway centerline light.
(b) Taxiway definition and lights.
Release flight freeze and continue flying the approach with A/P engaged. Select flight freeze when aircraft is 2 sm/3 km out and on the glide slope. Check the following:
(5) Scene content.
(a) Runway threshold lights.
(b) Touchdown zone lights. At 200 ft radio altitude and still on glide slope, select Flight Freeze. Check the following:
(6) Scene content.
(a) Runway markings.
Set the weather to Category I conditions and check the following:
(7) Scene content.
(a) Visual ground segment.
Set the weather to Category II conditions, release Flight Freeze, re-select Flight Freeze at 100 feet radio altitude, and check the following:
(8) Scene content.
(a) Visual ground segment.
Select night/dusk (twilight) conditions and check the following:
(9) Scene content.
(a) Runway markings visible within landing light lobes.
Set the weather to Category III conditions, release Flight Freeze, re-select Flight Freeze at 50 feet radio altitude and check the following:
(10) Scene content.
(a) Visual ground segment.
Set WX to ''missed approach'' conditions, release Flight Freeze, re-select Flight Freeze at 15 feet radio altitude, and check the following:
(11) Scene content.
(a) Visual ground segment.
When on the ground, stop the aircraft. Set 0 feet RVR, ensure strobe/beacon lights are switched on and check the following:
(12) Scene content.
(a) Visual effect of strobe and beacon.
Reposition to final approach, set weather to ''Clear,'' continue approach for an automatic landing, and check the following:
(13) Scene content.
(a) Visual cues during flare to assess sink rate.
(b) Visual cues during flare to assess Depth perception.
(c) Cockpit height above ground.
p. After Landing Operations.
(1) After Landing Checks.
(2) Taxi back to gate (Check the following:)
(a) Visual model satisfactory.
(b) Parking brake operation satisfactory.
(3) Shutdown Checks.
q. Crash Function.
(1) Gear-up Crash.
(2) Excessive rate of descent Crash.
(3) Excessive bank angle Crash.

BILLING CODE 491073–P

Typical Subjective Continuing Qualification Evaluation Profile (2 hours)



End Information

Attachment 4 to Appendix A to Part 60—Sample Documents

Table of Contents

Title of Sample

BILLING CODE 4910–73–P

ATTACHMENT 4 TO APPENDIX A TO PART 60—
Figure A4A – Sample Letter , Request for Initial, Upgrade, or Reinstatement Evaluation
INFORMATION

Date _______

Edward D. Cook, Ph.D.
Manager, National Simulator Program
Federal Aviation Administration
100 Hartsfield Centre Parkway
Suite 400
Atlanta, GA 30354

Dear Dr. Cook:

RE: Request for Initial/Upgrade Evaluation Date

This is to advise you of our intent to request an (initial or upgrade) evaluation of our (FSTD Manufacturer), (Aircraft Type/Level) Flight Simulation Training Device (FSTD), (FAA ID Number, if previously qualified), located in (City, State) at the (Facility) on (Proposed Evaluation Date). (The proposed evaluation date shall not be more than 180 days following the date of this letter.) The FSTD will be sponsored by (Name of Training Center/Air Carrier), FAA Designator (4 Letter Code). The FSTD will be sponsored under the following options: (Select One)

☐ The FSTD will be used within the sponsor's FAA approved training program and placed on the sponsor's Training/Operations Specifications; or

☐ The FSTD will be used for dry lease only in accordance with Paragraph 3b, FSTD Guidance Bulletin 03-08.

We agree to provide the formal request for the evaluation (*Ref: Appendix 4, AC 120-40B*) to your staff as follows: (check one)

☐ For QTG tests run at the factory, not later, than 45 days prior to the proposed evaluation date with the additional "1/3 on-site" tests provided not later than 14 days prior to the proposed evaluation date.

☐ For QTG tests run on-site, not later than 30 days prior to the proposed evaluation date.

We understand that the formal request will contain the following documents:

1. Sponsor's Letter of Request (*Company Compliance Letter*).
2. Principal Operations Inspector (POI) or Training Center Program Manager's (TCPM) endorsement.
3. Complete QTG.

If we are unable to meet the above requirements, we understand this may result in a significant delay, perhaps 45 days or more, in rescheduling and completing the evaluation.

(The sponsor should add additional comments as necessary).

Please contact (Name Telephone and Fax Number of Sponsor's Contact) to confirm the date for this initial evaluation. We understand a member of your National Simulator Program staff will respond to this request within 14 days.

A copy of this letter of intent has been provided to (Name), the Principal Operations Inspector (POI) and/or Training Center Program Manager (TCPM).

Sincerely,

Attachment: FSTD Information Form
cc: POI/TCPM

ATTACHMENT 4 TO APPENDIX A TO PART 60—
Figure A4B – Sample Letter , Request for Initial, Upgrade, or Reinstatement Evaluation
Attachment: FSTD Information Form
INFORMATION

Date: _____			
Section 1. FSTD Information and Characteristics			
Sponsor Name:	_____	**FSTD Location:**	
Address:	_____ _____	**Physical Address:**	_____ _____
City:	_____	**City:**	_____
State:	_____	**State:**	_____
Country:	_____	**Country:**	_____
ZIP:	_____	**ZIP:**	_____
Manager	_____		
Sponsor ID No: *(Four Letter FAA Designator)*	_____	**Nearest Airport:** *(Airport Designator)*	_____

Type of Evaluation Requested:			☐ **Initial** ☐ **Upgrade** ☐ **Recurrent** ☐ **Special** ☐ **Reinstatement**		
Qualification Basis: _____	☐ **A**	☐ **B**	☐ **Interim C**	☐ **C**	☐ **D**
	☐ **6**	☐ **7**	☐ **Provisional Status**		

Initial Qualification: (If Applicable)	**Date:** _____ **Level** _____	**Manufacturer's Identification/Serial No:**	_____
Upgrade Qualification: (If Applicable)	**Date:** _____ **Level** _____ MM/DD/YYYY	☐ **eQTG**	
Other Technical Information:			
FAA FSTD ID No: (If Applicable)	_____	**FSTD Manufacturer:**	_____
Convertible FSTD:	☐**Yes:**	**Date of Manufacture:**	_____ MM/DD/YYYY
Related FAA ID No. (If Applicable)	_____ _____ _____	**Sponsor FSTD ID No:** _____	

Airplane model/series: _____	**Source of aerodynamic model:** _____
Engine model(s) and data revision: _____	**Source of aerodynamic coefficient data:** _____
FMS identification and revision level: _____	**Aerodynamic data revision number:** _____
Visual system manufacturer/model: _____	**Visual system display:** _____
Flight control data revision: _____	**FSTD computer(s) identification:** _____
Motion system manufacturer/type: _____	

National Aviation Authority (NAA): (If Applicable)	_____		_____

ATTACHMENT 4 TO APPENDIX A TO PART 60—

Figure A4B – Sample Letter , Request for Initial, Upgrade, or Reinstatement Evaluation

Attachment: FSTD Information Form

INFORMATION

Visual System Manufacturer and Type:	_____	**Motion System Manufacturer and Type:**	_____
Aircraft Make/Model/Series:	_____	**FSTD Seats Available:**	_____

Aircraft Equipment	**ENGINE TYPE(S):** _____	**Flight Instrumentation:** ☐ **EFIS** ☐ **HUD** ☐ **HGS** ☐ **EFVS** ☐ **TCAS** ☐ **GPWS** ☐ **Plain View** ☐ **GPS** ☐ **FMS Type:** _____ ☐ **WX Radar** ☐ **Other:** _____	Engine Instrumentation: ☐ **EICAS** ☐ **FADEC** ☐ **Other:** _____

Airport Models:	3.6.1 _____ *Airport Designator*	3.6.2_____ *Airport Designator*	3.6.3 _____ *Airport Designator*
Circle to Land:	3. 7.1 _____ *Airport Designator*	3. 7.2_____ *Approach*	3. 7.3 _____ *Landing Runway*
Visual Ground Segment	3.8.1 _____ *Airport Designator*	3.8 .2_____ *Approach*	3. 8.3 _____ *Landing Runway*

Section 2. Supplementary Information

FAA Training Program Approval Authority:		☐ **POI** ☐ **TCPM** ☐ **Other:** ______	
Name:	_____	**Office:**	_____
Tel:	_____	**Fax:**	_____
Email:	_____		

FSTD Scheduling Person:			
Name:	_____		
Address 1:	_____	**Address 2**	_____
City:	_____	**State:**	_____
ZIP:	_____	**Email:**	_____
Tel:	_____	**Fax:**	_____

FSTD Technical Contact:			
Name:	_____		
Address 1:	_____	**Address 2**	_____
City:	_____	**State:**	_____
ZIP:	_____	**Email:**	_____
Tel:	_____	**Fax:**	_____

Section 3. Training, Testing and Checking Considerations

Area/Function/Maneuver	**Requested**	**Remarks**
Private Pilot - Training / Checks: (142)	☐	_____
Commercial Pilot - Training /Checks:(142)	☐	_____
Multi-Engine Rating - Training / Checks (142)	☐	_____
Instrument Rating -Training / Checks (142)	☐	_____
Type Rating - Training / Checks (135/121/142)	☐	_____
Proficiency Checks (135/121/142)	☐	_____

ATTACHMENT 4 TO APPENDIX A TO PART 60—

Figure A4B – Sample Letter , Request for Initial, Upgrade, or Reinstatement Evaluation

Attachment: FSTD Information Form

INFORMATION

Section 3. Training, Testing and Checking Considerations		
Area/Function/Maneuver	**Requested**	**Remarks**
Private Pilot - Training / Checks: (142)	☐	____
Commercial Pilot - Training /Checks:(142)	☐	____
Multi-Engine Rating - Training / Checks (142)	☐	____
Instrument Rating -Training / Checks (142)	☐	____
Type Rating - Training / Checks (135/121/142)	☐	____
Proficiency Checks (135/121/142)	☐	____
CAT I: (RVR 2400/1800 ft. DH200 ft)	☐	____
CAT II: (RVR 1200 ft. DH 100 ft)	☐	____
CAT III * (lowest minimum) _____ RVR _____ ft. ** State CAT III (≤ 700 ft.), CAT IIIb (≤ 150 ft.), or CAT IIIc (0 ft.)*	☐	____
Circling Approach	☐	____
Windshear Training: (FSTD GB 03-05)	☐	____
Windshear Training IAW 121.409d (121 Turbojets Only) (FSTD GB 03-05)	☐	____
Generic Unusual Attitudes and Recoveries within the Normal Flight Envelope (FSTD GB 04-03)	☐	____
Specific Unusual Attitudes Recoveries (HBAT 95-10) (FSTD GB 04-03)	☐	____
Auto-coupled Approach/Auto Go Around	☐	____
Auto-land / Roll Out Guidance	☐	____
TCAS/ACAS I / II	☐	____
WX-Radar	☐	____
HUD (FSTD GB 03-02)	☐	____
HGS (FSTD GB 03-02)	☐	
EFVS (FSTD GB 03-03)	☐	
Future Air Navigation Systems (HBAT 98-16A)	☐	____
GPWS / EGPWS	☐	____
ETOPS Capability	☐	____
GPS	☐	____
SMGCS	☐	____
Helicopter Slope Landings	☐	____
Helicopter External Load Operations	☐	____
Helicopter Pinnacle Approach to Landings	☐	____
Helicopter Night Vision Maneuvers	☐	____
Helicopter Category A Takeoffs	☐	____

ATTACHMENT 4 TO APPENDIX A TO PART 60—

Figure A4C – Sample Qualification Test Guide Cover Page
INFORMATION

SPONSOR NAME

SPONSOR ADDRESS

FAA QUALIFICATION TEST GUIDE

(SPECIFIC AIRPLANE MODEL)
for example
Stratos BA797-320A

(Type of Simulator)

(Simulator Identification Including Manufacturer, Serial Number, Visual System Used)

(Simulator Level)

(Qualification Performance Standard Used)

(Simulator Location)

FAA Initial Evaluation

Date: ____________

________________________ Date: __________
(Sponsor)

________________________ Date: __________
Manager, National
Simulator Program, FAA

ATTACHMENT 1 TO APPENDIX A TO PART 60—

Figure A4D – Sample Statement of Qualification - Certificate

INFORMATION

Federal Aviation Administration
National Simulator Program

Statement of Qualification

This is to certify that representatives of the National Simulator Program
Completed an evaluation of the

Go-Fast Airlines
Farnsworth Z-100 Full Flight Simulator
FAA Identification Number 999

And found it to meet the standards set forth in
AC 120-40B

The Master Qualification Test Guide and the attached
Configuration List and Restrictions List
Provide the Qualification Basis for this device to operate at

Level D
Until January 31, 2009

Unless sooner rescinded or extended by the National Simulator Program Manager

December 15, 2007	*I. B. Cheekin, Jr.*
(date)	(for the NSPM)

ATTACHMENT 4 TO APPENDIX A TO PART 60—

Figure A4E – Sample Statement of Qualification; Configuration List

INFORMATION

STATEMENT of QUALIFICATION
CONFIGURATION LIST

Date: _____			
Section 1. FSTD Information and Characteristics			
Sponsor Name:	_____	**FSTD Location:**	
Address:	_____ _____	**Physical Address:**	_____ _____
City:	_____	**City:**	_____
State:	_____	**State:**	_____
Country:	_____	**Country:**	_____
ZIP:	_____	**ZIP:**	_____
Manager	_____		
Sponsor ID No: *(Four Letter FAA Designator)*	_____	**Nearest Airport:** *(Airport Designator)*	_____

Type of Evaluation Requested:			☐ Initial ☐ Upgrade ☐ Recurrent ☐ Special ☐ Reinstatement		
Qualification Basis: _____	☐ A	☐ B	☐ Interim C	☐ C	☐ D
	☐ 6	☐ 7	☐ Provisional Status		

Initial Qualification: (If Applicable)	**Date:** _____ **Level** _____	**Manufacturer's Identification/Serial No:**	_____
Upgrade Qualification: (If Applicable)	**Date:** _____ **Level** _____ MM/DD/YYYY	☐ **eQTG**	

Other Technical Information:			
FAA FSTD ID No: (If Applicable)	_____	**FSTD Manufacturer:**	_____
Convertible FSTD:	☐**Yes:**	**Date of Manufacture:**	_____ MM/DD/YYYY
Related FAA ID No. (If Applicable)	_____ _____ _____	**Sponsor FSTD ID No:** _____	
Aircraft model/series: _____		**Source of aerodynamic model:** _____	
Engine model(s) and data revision: _____		**Source of aerodynamic coefficient data:** _____	
FMS identification and revision level: _____		**Aerodynamic data revision number:** _____	
Visual system manufacturer/model: _____		**Visual system display:** _____	
Flight control data revision: _____		**FSTD computer(s) identification:** _____	
Motion system manufacturer/type: _____			

ATTACHMENT 4 TO APPENDIX A TO PART 60—

Figure A4E – Sample Statement of Qualification; Configuration List

INFORMATION

NAA Qualification Basis:	_____		
Visual System Manufacturer and Type:	_____	**Motion System Manufacturer and Type:**	_____
Aircraft Make/Model/Series:	_____	**FSTD Seats Available:**	_____
Aircraft Equipment	**ENGINE TYPE(S):** _____	**Flight Instrumentation:** ☐ **EFIS** ☐ **HUD** ☐ **HGS** ☐ **EFVS** ☐ **TCAS** ☐ **GPWS** ☐ **Plain View** ☐ **GPS** ☐ **FMS Type:** _____ ☐ **WX Radar** ☐ **Other:** _____	Engine Instrumentation: ☐ **EICAS** ☐ **FADEC** ☐ **Other:**
Airport Models:	3.6.1 _____ *Airport Designator*	3.6.2_____ *Airport Designator*	3.6.3 _____ *Airport Designator*
Circle to Land:	3. 7.1 _____ *Airport Designator*	3. 7.2_____ *Approach*	3. 7.3 _____ *Landing Runway*
Visual Ground Segment	3.8.1 _____ *Airport Designator*	3.8 .2_____ *Approach*	3. 8.3 _____ *Landing Runway*

Section 2. Supplementary Information

FAA Training Program Approval Authority:		☐ **POI** ☐ **TCPM** ☐ **Other:** ______	
Name:	_____	**Office:**	_____
Tel:	_____	**Fax:**	_____
Email:	_____		
FSTD Scheduling Person:			
Name:	_____		
Address 1:	_____	**Address 2**	_____
City:	_____	**State:**	_____
ZIP:	_____	**Email:**	_____
Tel:	_____	**Fax:**	_____
FSTD Technical Contact:			
Name:	_____		
Address 1:	_____	**Address 2**	_____
City:	_____	**State:**	_____
ZIP:	_____	**Email:**	_____
Tel:	_____	**Fax:**	_____

Section 3. Training, Testing and Checking Considerations

Area/Function/Maneuver	**Requested**	**Remarks**
Private Pilot - Training / Checks: (142)	☐	_____
Commercial Pilot - Training /Checks:(142)	☐	_____
Multi-Engine Rating - Training / Checks (142)	☐	_____
Instrument Rating -Training / Checks (142)	☐	_____
Type Rating - Training / Checks (135/121/142)	☐	_____

ATTACHMENT 4 TO APPENDIX A TO PART 60—

Figure A4E – Sample Statement of Qualification; Configuration List

INFORMATION

ZIP:	____	**Email:**	____
Tel:	____	**Fax:**	____

Section 3. Training, Testing and Checking Considerations

Area/Function/Maneuver	Requested	Remarks
Private Pilot - Training / Checks: (142)	☐	____
Commercial Pilot - Training /Checks:(142)	☐	____
Multi-Engine Rating - Training / Checks (142)	☐	____
Instrument Rating -Training / Checks (142)	☐	____
Type Rating - Training / Checks (135/121/142)	☐	____
Proficiency Checks (135/121/142)	☐	____
CAT I: (RVR 2400/1800 ft. DH200 ft)	☐	____
CAT II: (RVR 1200 ft. DH 100 ft)	☐	____
CAT III * (lowest minimum) _____ RVR _____ ft. * *State CAT III (≤ 700 ft.), CAT IIIb (≤ 150 ft.), or CAT IIIc (0 ft.)*	☐	____
Circling Approach	☐	____
Windshear Training: (FSTD GB 03-05)	☐	____
Windshear Training IAW 121.409d (121 Turbojets Only) (FSTD GB 03-05)	☐	____
Generic Unusual Attitudes and Recoveries within the Normal Flight Envelope (FSTD GB 04-03)	☐	____
Specific Unusual Attitudes Recoveries (HBAT 95-10) (FSTD GB 04-03)	☐	____
Auto-coupled Approach/Auto Go Around	☐	____
Auto-land / Roll Out Guidance	☐	____
TCAS/ACAS I / II	☐	____
WX-Radar	☐	____
HUD (FSTD GB 03-02)	☐	____
HGS (FSTD GB 03-02)	☐	
EFVS (FSTD GB 03-03)	☐	
Future Air Navigation Systems (HBAT 98-16A)	☐	____
GPWS / EGPWS	☐	____
ETOPS Capability	☐	____
GPS	☐	____
SMGCS	☐	____
Helicopter Slope Landings	☐	____
Helicopter External Load Operations	☐	____
Helicopter Pinnacle Approach to Landings	☐	____
Helicopter Night Vision Maneuvers	☐	____
Helicopter Category A Takeoffs	☐	____

ATTACHMENT 4 TO APPENDIX A TO PART 60—

Figure A4F – Sample Statement of Qualification – List of Qualified Tasks

INFORMATION

STATEMENT of QUALIFICATION
List of Qualified Tasks

Go Fast Airline Training -- Farnsworth Z-100 -- Level D -- FAA ID# 999

The FSTD is qualified to perform all of the Maneuvers, Procedures, Tasks, and Functions Listed in Appendix A, Attachment 1, Table A1B, Minimum FSTD Requirements In Effect on [mm/dd/yyyy] except for the following listed Tasks or Functions.

Qualified for all tasks in Table A1B, for which the sponsor has requested qualification, except for the following: 3.e(1)(i) NDB approach 3.f. Recovery from Unusual Attitudes 4.3. Circling Approach
Additional tasks for which this FSTD is qualified (i.e., in addition to the list in Table A1B) 1. Enhanced Visual System 2. Windshear Training IAW Section 121.409(d).
The airport visual models evaluated for qualification at this level are: 1. Atlanta Hartsfield International Airport (KATL) 2. Miami International Airport (KMIA) 3. Dallas/Ft.Worth Regional Airport (KDFW)

Attachment 4 to Appendix A to Part 60—
Figure A4G – Sample Continuing Qualification Evaluation Requirements Page
INFORMATION

Recurrent Evaluation Requirements ***Completed at conclusion of Initial Evaluation***	
Recurrent Evaluations to be conducted each _(fill in)__ months Allotting ______ hours of FTD time. Signed: ____________________________ NSPM / Evaluation Team Leader	Recurrent evaluations are due as follows: _(month)__ and __(month)_ and __(month)_ (enter or strike out, as appropriate) ____________________ Date

Revision: Based on (enter reasoning):	
Recurrent Evaluations are to be conducted each _(fill in)__ months. Allotting ______ hours. Signed: ____________________________ NSPM Evaluation Team Leader	Recurrent evaluations are due as follows: _(month)__ and __(month)_ and __(month)_ (enter or strike out, as appropriate) ____________________ Date

Revision: Based on (enter reasoning):	
Recurrent Evaluations are to be conducted each _(fill in)__ months. Allotting ______ hours. Signed: ____________________________ NSPM Evaluation Team Leader	Recurrent evaluations are due as follows: _(month)__ and __(month)_ and __(month)_ (enter or strike out, as appropriate) ____________________ Date

(Repeat as Necessary)

Attachment 4 to Appendix A to Part 60—
Figure A4H –Sample MQTG Index of Effective FSTD Directives
INFORMATION

Index of Effective FSTD Directives Filed in this Section

Notification Number	Received From: (TPAA/NSPM)	Date of Notification	Date of Modification Completion

Continue as Necessary....

BILLING CODE 4910–73–C

Attachment 5 to Appendix A to Part 60—Simulator Qualification Requirements for Windshear Training Program Use

1. Applicability

Begin QPS Requirements

This attachment applies to all simulators, regardless of qualification level, that are used to satisfy the training requirements of an FAA-approved low-altitude windshear flight training program, or any FAA-approved training program that addresses windshear encounters.

End QPS Requirements

---

2. Statement of Compliance and Capability (SOC)

Begin QPS Requirements

a. The sponsor must submit an SOC confirming that the aerodynamic model is based on flight test data supplied by the airplane manufacturer or other approved data provider. The SOC must also confirm that any change to environmental wind parameters, including variances in those parameters for windshear conditions, once inserted for computation, result in the correct simulated performance. This statement must also include examples of environmental wind parameters currently evaluated in the simulator (such as crosswind takeoffs, crosswind approaches, and crosswind landings).

b. For simulators without windshear warning, caution, or guidance hardware in the original equipment, the SOC must also state that the simulation of the added hardware and/or software, including associated cockpit displays and annunciations, replicates the system(s) installed in the airplane. The statement must be accompanied by a block diagram depicting the input and output signal flow, and comparing the signal flow to the equipment installed in the airplane.

End QPS Requirements

---

3. Models

Begin QPS Requirements

The windshear models installed in the simulator software used for the qualification evaluation must do the following:

a. Provide cues necessary for recognizing windshear onset and potential performance degradation requiring a pilot to initiate recovery procedures. The cues must include all of the following, as may be appropriate for the appropriate portion of the flight envelope:

(1) Rapid airspeed change of at least ±15 knots (kts).

(2) Stagnation of airspeed during the takeoff roll.

(3) Rapid vertical speed change of at least ±500 feet per minute (fpm).

(4) Rapid pitch change of at least ±5°.

b. Be adjustable in intensity (or other parameter to achieve an intensity effect) to at least two (2) levels so that upon encountering the windshear the pilot may identify its presence and apply the recommended procedures for escape from such a windshear.

(1) If the intensity is lesser, the performance capability of the simulated airplane in the windshear permits the pilot to maintain a satisfactory flightpath; and

(2) If the intensity is greater, the performance capability of the simulated airplane in the windshear does not permit the pilot to maintain a satisfactory flightpath (crash).

Note: The means used to accomplish the ''nonsurvivable'' scenario of paragraph 3.b.(2) of this attachment, that involve operational elements of the simulated airplane, must reflect the dispatch limitations of the airplane.

c. Be available for use in the FAA-approved windshear flight training program.

End QPS Requirements

---

4. Demonstrations

Begin QPS Requirements

a. The sponsor must identify one survivable takeoff windshear training model and one survivable approach windshear training model. The wind components of the survivable models must be presented in graphical format so that all components of the windshear are shown, including initiation point, variance in magnitude, and time or distance correlations. The simulator must be operated at the same gross weight, airplane configuration, and initial airspeed in all of the following situations:

(1) Takeoff—through calm air.

(2) Takeoff—through the first selected survivable windshear.

(3) Approach—through calm air.

(4) Approach—through the second selected survivable windshear.

b. In each of these four situations, at an ''initiation point'' (i.e., where windshear onset is or should be recognized), the recommended procedures for windshear recovery are applied and the results are recorded as specified in paragraph 5 of this attachment.

c. These recordings are made without inserting programmed random turbulence. Turbulence that results from the windshear model is to be expected, and no attempt may be made to neutralize turbulence from this source.

d. The definition of the models and the results of the demonstrations of all four (4) cases described in paragraph 4.a of this attachment, must be made a part of the MQTG.

End QPS Requirements

---

5. Recording Parameters

Begin QPS Requirements

a. In each of the four MQTG cases, an electronic recording (time history) must be made of the following parameters:

(1) Indicated or calibrated airspeed.

(2) Indicated vertical speed.

(3) Pitch attitude.

(4) Indicated or radio altitude.

(5) Angle of attack.

(6) Elevator position.

(7) Engine data (thrust, N1, or throttle position).

(8) Wind magnitudes (simple windshear model assumed).

b. These recordings must be initiated at least 10 seconds prior to the initiation point, and continued until recovery is complete or ground contact is made.

End QPS Requirements

---

6. Equipment Installation and Operation

Begin QPS Requirements

All windshear warning, caution, or guidance hardware installed in the simulator must operate as it operates in the airplane. For example, if a rapidly changing wind speed and/or direction would have caused a windshear warning in the airplane, the simulator must respond equivalently without instructor/evaluator intervention.

End QPS Requirements

---

7. Qualification Test Guide

Begin QPS Requirements

a. All QTG material must be forwarded to the NSPM.

b. A simulator windshear evaluation will be scheduled in accordance with normal procedures. Recurrent evaluation schedules will be used to the maximum extent possible.

c. During the on-site evaluation, the evaluator will ask the operator to run the performance tests and record the results. The results of these on-site tests will be compared to those results previously approved and placed in the QTG or MQTG, as appropriate.

d. QTGs for new (or MQTGs for upgraded) simulators must contain or reference the information described in paragraphs 2, 3, 4, and 5 of this attachment.

End QPS Requirements

---

8. Subjective Evaluation

Begin Information

The NSPM will fly the simulator in at least two of the available windshear scenarios to subjectively evaluate simulator performance as it encounters the programmed windshear conditions.

a. One scenario will include parameters that enable the pilot to maintain a satisfactory flightpath.

b. One scenario will include parameters that will not enable the pilot to maintain a satisfactory flightpath (crash).

c. Other scenarios may be examined at the NSPM's discretion.

End Information

---

9. Qualification Basis

Begin Information

The addition of windshear programming to a simulator in order to comply with the qualification for required windshear training does not change the original qualification basis of the simulator.

End Information

---

10. Demonstration Repeatability

Begin Information

For the purposes of demonstration repeatability, it is recommended that the simulator be flown by means of the simulator's autodrive function (for those simulators that have autodrive capability) during the demonstrations.

End Information

Appendix B to Part 60—Qualification Performance Standards for Airplane Flight Training Devices

---

Begin Information

This appendix establishes the standards for Airplane Flight Training Device (FTD) evaluation and qualification at Level 4, Level 5, or Level 6. The Flight Standards Service, National Simulator Program Manager (NSPM), is responsible for the development, application, and implementation of the standards contained within this appendix. The procedures and criteria specified in this appendix will be used by the NSPM, or a person or persons assigned by the NSPM when conducting airplane FTD evaluations.

Table of Contents

End Information

---

1. Introduction

Begin Information

a. This appendix contains background information as well as regulatory and informative material as described later in this section. To assist the reader in determining what areas are required and what areas are permissive, the text in this appendix is divided into two sections: ‘‘QPS Requirements’’ and ‘‘Information.’’ The QPS Requirements sections contain details regarding compliance with the part 60 rule language. These details are regulatory, but are found only in this appendix. The Information sections contain material that is advisory in nature, and designed to give the user general information about the regulation.

b. Related Reading References.

(1) 14 CFR part 60.

(2) 14 CFR part 61.

(3) 14 CFR part 63.

(4) 14 CFR part 119.

(5) 14 CFR part 121.

(6) 14 CFR part 125.

(7) 14 CFR part 135.

(8) 14 CFR part 141.

(9) 14 CFR part 142.

(10) Advisory Circular (AC) 120–28C, Criteria for Approval of Category III Landing Weather Minima.

(11) AC 120–29, Criteria for Approving Category I and Category II Landing Minima for part 121 operators.

(12) AC 120–35B, Line Operational Simulations: Line-Oriented Flight Training, Special Purpose Operational Training, Line Operational Evaluation.

(13) AC 120–41, Criteria for Operational Approval of Airborne Wind Shear Alerting and Flight Guidance Systems.

(14) AC 120–57A, Surface Movement Guidance and Control System (SMGS).

(15) AC 150/5300–13, Airport Design.

(16) AC 150/5340–1G, Standards for Airport Markings.

(17) AC 150/5340–4C, Installation Details for Runway Centerline Touchdown Zone Lighting Systems.

(18) AC 150/5340–19, Taxiway Centerline Lighting System.

(19) AC 150/5340–24, Runway and Taxiway Edge Lighting System.

(20) AC 150/5345–28D, Precision Approach Path Indicator (PAPI) Systems.

(21) International Air Transport Association document, ‘‘Flight Simulator Design and Performance Data Requirements,’’ as amended.

(22) AC 25–7, as amended, Flight Test Guide for Certification of Transport Category Airplanes.

(23) AC 23–8A, as amended, Flight Test Guide for Certification of Part 23 Airplanes.

(24) International Civil Aviation Organization (ICAO) Manual of Criteria for the Qualification of Flight Simulators, as amended.

(25) Airplane Flight Simulator Evaluation Handbook, Volume I, as amended and Volume II, as amended, The Royal Aeronautical Society, London, UK.

(26) FAA Publication FAA–S–8081 series (Practical Test Standards for Airline Transport Pilot Certificate, Type Ratings, Commercial Pilot, and Instrument Ratings).

(27) The FAA Aeronautical Information Manual (AIM). An electronic version of the AIM is on the internet at *http://www.faa.gov/atpubs.*

End Information

---

2. Applicability (§§ 60.1 & 60.2)

There is no additional regulatory or informational material that applies to § 60.1, Applicability, or to § 60.2, Applicability of sponsor rules to person who are not sponsors and who are engaged in certain unauthorized activities.

3. Definitions (§ 60.3)

Begin Information

See appendix F of this part for a list of definitions and abbreviations from part 1, part 60, and the QPS appendices of part 60.

End Information

---

4. Qualification Performance Standards (§ 60.4)

There is no additional regulatory or informational material that applies to § 60.4, Qualification Performance Standards.

5. Quality Management System (§ 60.5)

Begin Information

Additional regulatory material and informational material regarding Quality Management Systems for FTDs may be found in appendix E of this part.

End Information

---

6. Sponsor Qualification Requirements (§ 60.7)

Begin Information

a. The intent of the language in § 60.7(b) is to have a specific FTD, identified by the sponsor, used at least once in an FAA-approved flight training program for the airplane simulated during the 12-month period described. The identification of the specific FTD may change from one 12-month period to the next 12-month period as long as that sponsor sponsors and uses at least one FTD at least once during the prescribed period. There is no minimum number of hours or minimum FTD periods required.

b. The following examples describe acceptable operational practices:

(1) Example One.

(a) A sponsor is sponsoring a single, specific FTD for its own use, in its own facility or elsewhere—this single FTD forms the basis for the sponsorship. The sponsor uses that FTD at least once in each 12-month period in that sponsor's FAA-approved flight training program for the airplane simulated. This 12-month period is established according to the following schedule:

(i) If the FTD was qualified prior to October 30, 2007 the 12-month period begins on the date of the first continuing qualification evaluation conducted in accordance with § 60.19 after October 30, 2007 and continues for each subsequent 12-month period;

(ii) A device qualified on or after October 30, 2007 will be required to undergo an initial or upgrade evaluation in accordance with § 60.15. Once the initial or upgrade evaluation is complete, the first continuing qualification evaluation will be conducted within 6 months. The 12 month continuing qualification evaluation cycle begins on that date and continues for each subsequent 12-month period.

(b) There is no minimum number of hours of FTD use required.

(c) The identification of the specific FTD may change from one 12-month period to the next 12-month period as long as that sponsor sponsors and uses at least one FTD at least once during the prescribed period.

(2) Example Two.

(a) A sponsor sponsors an additional number of FTDs, in its facility or elsewhere. Each additionally sponsored FTD must be—

(i) Used by the sponsor in the sponsor's FAA-approved flight training program for the airplane simulated (as described in § 60.7(d)(1));

OR

(ii) Used by another FAA certificate holder in that other certificate holder's FAA-approved flight training program for the airplane simulated (as described in § 60.7(d)(1)). This 12-month period is established in the same manner as in example one.

OR

(iii) Provided a statement each year from a qualified pilot, (after having flown the airplane, not the subject FTD or another FTD, during the preceding 12-month period) stating that the subject FTD's performance and handling qualities represent the airplane (as described in § 60.7(d)(2)). This statement is provided at least once in each 12-month period established in the same manner as in example one.

(b) There is no minimum number of hours of FTD use required.

(3) Example Three.

(a) A sponsor in New York (in this example, a Part 142 certificate holder) establishes ‘‘satellite’’ training centers in Chicago and Moscow.

(b) The satellite function means that the Chicago and Moscow centers must operate under the New York center's certificate (in accordance with all of the New York center's practices, procedures, and policies; *e.g.,* instructor and/or technician training/checking requirements, recordkeeping, QMS program).

(c) All of the FTDs in the Chicago and Moscow centers could be dry-leased (*i.e.,* the certificate holder does not have and use FAA-approved flight training programs for the FTDs in the Chicago and Moscow centers) because—

(i) Each FTD in the Chicago center and each FTD in the Moscow center is used at least once each 12-month period by another FAA certificate holder in that other certificate holder's FAA-approved flight training program for the airplane (as described in § 60.7(d)(1));

OR

(ii) A statement is obtained from a qualified pilot (having flown the airplane, not the subject FTD or another FTD during the preceding 12-month period) stating that the performance and handling qualities of each FTD in the Chicago and Moscow centers represents the airplane (as described in § 60.7(d)(2)).

End Information

---

7. Additional Responsibilities of the Sponsor (§ 60.9)

Begin Information

The phrase ''as soon as practicable'' in § 60.9(a) means without unnecessarily disrupting or delaying beyond a reasonable time the training, evaluation, or experience being conducted in the FSTD.

End Information

---

8. FSTD Use (§ 60.11)

There is no additional regulatory or informational material that applies to § 60.11, FSTD use.

9. FTD Objective Data Requirements (§ 60.13)

Begin QPS Requirements

a. Flight test data used to validate FTD performance and handling qualities must have been gathered in accordance with a flight test program containing the following:

(1) A flight test plan consisting of:

(a) The maneuvers and procedures required for aircraft certification and simulation programming and validation.

(b) For each maneuver or procedure—

(i) The procedures and control input the flight test pilot and/or engineer used.

(ii) The atmospheric and environmental conditions.

(iii) The initial flight conditions.

(iv) The airplane configuration, including weight and center of gravity.

(v) The data to be gathered.

(vi) All other information necessary to recreate the flight test conditions in the FTD.

(2) Appropriately qualified flight test personnel.

(3) An understanding of the accuracy of the data to be gathered using appropriate alternative data sources, procedures, and instrumentation that is traceable to a recognized standard as described in Attachment 2, Table B2F.

(4) Appropriate and sufficient data acquisition equipment or system(s), including appropriate data reduction and analysis methods and techniques, as would be acceptable to the FAA's Aircraft Certification Service.

b. The data, regardless of source, must be presented:

(1) In a format that supports the FTD validation process;

(2) In a manner that is clearly readable and annotated correctly and completely;

(3) With resolution sufficient to determine compliance with the tolerances set forth in Attachment 2, Table B2A appendix.

(4) With any necessary guidance information provided; and

(5) Without alteration, adjustments, or bias; however the data may be re-scaled, digitized, or otherwise manipulated to fit the desired presentation.

c. After completion of any additional flight test, a flight test report must be submitted in support of the validation data. The report must contain sufficient data and rationale to support qualification of the FTD at the level requested.

d. As required by § 60.13(f), the sponsor must notify the NSPM when it becomes aware that an addition to or a revision of the flight related data or airplane systems related data is available if this data is used to program and operate a qualified FTD. The data referred to in this sub-section are those data that are used to validate the performance, handling qualities, or other characteristics of the aircraft, including data related to any relevant changes occurring after the type certification is issued. This notification must be made within 10 working days.

End QPS Requirements

Begin Information

e. The FTD sponsor is encouraged to maintain a liaison with the manufacturer of the aircraft being simulated (or with the holder of the aircraft type certificate for the aircraft being simulated if the manufacturer is no longer in business), and if appropriate, with the person having supplied the aircraft data package for the FTD in order to facilitate the notification described in this paragraph.

f. It is the intent of the NSPM that for new aircraft entering service, at a point well in advance of preparation of the Qualification Test Guide (QTG), the sponsor should submit to the NSPM for approval, a descriptive document (a validation data roadmap) containing the plan for acquiring the validation data, including data sources. This document should clearly identify sources of data for all required tests, a description of the validity of these data for a specific engine type and thrust rating configuration, and the revision levels of all avionics affecting the performance or flying qualities of the aircraft. Additionally, this document should provide other information such as the rationale or explanation for cases where data or data parameters are missing, instances where engineering simulation data are used, or where flight test methods require further explanations. It should also provide a brief narrative describing the cause and effect of any deviation from data requirements. The aircraft manufacturer may provide this document.

g. There is no requirement for any flight test data supplier to submit a flight test plan or program prior to gathering flight test data. However, the NSPM notes that inexperienced data gatherers often provide data that is irrelevant, improperly marked, lacking adequate justification for selection. Other problems include inadequate information regarding initial conditions or test maneuvers. The NSPM has been forced to refuse these data submissions as validation data for an FTD evaluation. It is for this reason that the NSPM recommends that any data supplier not previously experienced in this area review the data necessary for programming and for validating the performance of the FTD and discuss the flight test plan anticipated for acquiring such data with the NSPM well in advance of commencing the flight tests.

h. In those cases where the objective test results authorize a ''snapshot test'' or a ''series of snapshot tests'' results in lieu of a time-history result, Attachment 2 requires the sponsor or other data provider to ensure that a steady state condition exists at the instant of time captured by the ''snapshot.'' This is often verified by showing that a steady state condition existed from some period of time during which the snap shot is taken. The time period most frequently used is 5 seconds prior through 2 seconds following the instant of time captured by the snap shot. This paragraph is primarily addressing the source data and the method by which the data provider ensures that the steady state condition for the snap shot is representative.

i. The NSPM will consider, on a case-by-case basis, whether or not to approve supplemental validation data derived from flight data recording systems such as a Quick Access Recorder or Flight Data Recorder.

End Information

---

10. Special Equipment and Personnel Requirements for Qualification of the FTD (§ 60.14)

Begin Information

a. In the event that the NSPM determines that special equipment or specifically qualified persons will be required to conduct an evaluation, the NSPM will make every attempt to notify the sponsor at least one (1) week, but in no case less than 72 hours, in advance of the evaluation. Examples of special equipment include flight control measurement devices, accelerometers, or oscilloscopes. Examples of specially qualified personnel include individuals specifically qualified to install or use any special equipment when its use is required.

b. Examples of a special evaluation include an evaluation conducted after an FTD is moved; at the request of the TPAA; or as a result of comments received from FTD users that raise questions regarding the continued qualification or use of the FTD.

End Information

---

11. Initial (and Upgrade) Qualification Requirements (§ 60.15)

Begin QPS Requirement

a. In order to be qualified at a particular qualification level, the FTD must:

(1) Meet the general requirements listed in Attachment 1;

(2) Meet the objective testing requirements listed in Attachment 2 (Level 4 FTDs do not require objective tests); and

(3) Satisfactorily accomplish the subjective tests listed in Attachment 3.

b. The request described in § 60.15(a) must include all of the following:

(1) A statement that the FTD meets all of the applicable provisions of this part and all applicable provisions of the QPS.

(2) A confirmation that the sponsor will forward to the NSPM the statement described in § 60.15(b) in such time as to be received no later than 5 business days prior to the scheduled evaluation and may be forwarded to the NSPM via traditional or electronic means.

(3) Except for a Level 4 FTD, a qualification test guide (QTG), acceptable to the NSPM, that includes all of the following:

(a) Objective data obtained from aircraft testing or another approved source.

(b) Correlating objective test results obtained from the performance of the FTD as prescribed in the applicable QPS.

(c) The result of FTD subjective tests prescribed in the applicable QPS.

(d) A description of the equipment necessary to perform the evaluation for initial qualification and the continuing qualification evaluations.

c. The QTG described in paragraph a(3) of this section, must provide the documented proof of compliance with the FTD objective tests in Attachment 2,Table B2A of this appendix.

d. The QTG is prepared and submitted by the sponsor, or the sponsor's agent on behalf of the sponsor, to the NSPM for review and approval, and must include, for each objective test:

(1) Parameters, tolerances, and flight conditions;

(2) Pertinent and complete instructions for conducting automatic and manual tests;

(3) A means of comparing the FTD test results to the objective data;

(4) Any other information as necessary to assist in the evaluation of the test results;

(5) Other information appropriate to the qualification level of the FTD.

e. The QTG described in paragraphs (a)(3) and (b) of this section, must include the following:

(1) A QTG cover page with sponsor and FAA approval signature blocks (see Attachment 4, Figure B4C, for a sample QTG cover page).

(2) A continuing qualification evaluation requirements page. This page will be used by the NSPM to establish and record the frequency with which continuing qualification evaluations must be conducted and any subsequent changes that may be determined by the NSPM in accordance with § 60.19. See Attachment 4, Figure B4G, for a sample Continuing Qualification Evaluation Requirements page.

(3) An FTD information page that provides the information listed in this paragraph, if applicable (see Attachment 4, Figure B4B, for a sample FTD information page). For convertible FTDs, the sponsor must submit a separate page for each configuration of the FTD.

(a) The sponsor's FTD identification number or code.

(b) The airplane model and series being simulated.

(c) The aerodynamic data revision number or reference.

(d) The engine model(s) and its data revision number or reference.

(e) The flight control data revision number or reference.

(f) The flight management system identification and revision level.

(g) The FTD model and manufacturer.

(h) The date of FTD manufacture.

(i) The FTD computer identification.

(j) The visual system model and manufacturer, including display type.

(k) The motion system type and manufacturer, including degrees of freedom.

(4) A Table of Contents.

(5) A log of revisions and a list of effective pages.

(6) List of all relevant data references.

(7) A glossary of terms and symbols used (including sign conventions and units).

(8) Statements of compliance and capability (SOCs) with certain requirements. SOCs must provide references to the sources of information that show the capability of the FTD to comply with the requirement, a rationale explaining how the referenced material is used, mathematical equations and parameter values used, and the conclusions reached; *i.e.*, that the FTD complies with the requirement. Refer to the ''General FTD Requirements'' column, Table B1A, in Attachment 1, or in the ''Alternative Data Sources, Procedures, and Instrumentation'' column, Table B2F, in Attachment 2, to see when SOCs are required.

(9) Recording procedures or equipment required to accomplish the objective tests.

(10) The following information for each objective test designated in Attachment 2, as applicable to the qualification level sought:

(a) Name of the test.

(b) Objective of the test.

(c) Initial conditions.

(d) Manual test procedures.

(e) Automatic test procedures (if applicable).

(f) Method for evaluating FTD objective test results.

(g) List of all relevant parameters driven or constrained during the automatic test(s).

(h) List of all relevant parameters driven or constrained during the manual test(s).

(i) Tolerances for relevant parameters.

(j) Source of Validation Data (document and page number).

(k) Copy of the Validation Data (if located in a separate binder, a cross reference for the identification and page number for pertinent data location must be provided).

(l) FTD Objective Test Results as obtained by the sponsor. Each test result must reflect the date completed and must be clearly labeled as a product of the device being tested.

f. A convertible FTD is addressed as a separate FTD for each model and series airplane to which it will be converted and for the FAA qualification level sought. The NSPM will conduct an evaluation for each configuration. If a sponsor seeks qualification for two or more models of an airplane type using a convertible FTD, the sponsor must provide a QTG for each airplane model, or a supplemented QTG for each airplane model. The NSPM will conduct evaluations for each airplane model.

g. The form and manner of presentation of objective test results in the QTG must include the following:

(1) The sponsor's FTD test results must be recorded in a manner acceptable to the NSPM, that allows easy comparison of the FTD test results to the validation data (*e.g.*, use of a multi-channel recorder, line printer, cross plotting, overlays, transparencies).

(2) FTD results must be labeled using terminology common to airplane parameters as opposed to computer software identifications.

(3) Validation data documents included in a QTG may be photographically reduced only if such reduction will not alter the graphic scaling or cause difficulties in scale interpretation or resolution.

(4) Scaling on graphical presentations must provide the resolution necessary to evaluate the parameters shown in Attachment 2, Table B2A of this appendix.

(5) Tests involving time histories, data sheets (or transparencies thereof) and FTD test results must be clearly marked with appropriate reference points to ensure an accurate comparison between FTD and airplane with respect to time. Time histories recorded via a line printer are to be clearly identified for cross-plotting on the airplane data. Over-plots must not obscure the reference data.

h. The sponsor may elect to complete the QTG objective and subjective tests at the manufacturer's facility or at the sponsor's training facility. If the tests are conducted at the manufacturer's facility, the sponsor must repeat at least one-third of the tests at the sponsor's training facility in order to substantiate FTD performance. The QTG must be clearly annotated to indicate when and where each test was accomplished. Tests conducted at the manufacturer's facility and at the sponsor's training facility must be conducted after the FTD is assembled with systems and sub-systems functional and operating in an interactive manner. The test results must be submitted to the NSPM.

i. The sponsor must maintain a copy of the MQTG at the FTD location.

j. All FTDs for which the initial qualification is conducted after October 30, 2013 must have an electronic MQTG (eMQTG) including all objective data obtained from airplane testing, or another approved source (reformatted or digitized), together with correlating objective test results obtained from the performance of the FTD (reformatted or digitized) as prescribed in this appendix. The eMQTG must also contain the general FTD performance or demonstration results (reformatted or digitized) prescribed in this appendix, and a description of the equipment necessary to perform the initial qualification evaluation and the continuing qualification evaluations. The eMQTG must include the original validation data used to validate FTD performance and handling qualities in either the original digitized format from the data supplier or an electronic scan of the original time-history plots that were provided by the data supplier. A copy of the eMQTG must be provided to the NSPM.

k. All other FTDs (not covered in subparagraph ''j'') must have an electronic copy of the MQTG by and after October 30, 2013. A copy of the eMQTG must be provided to the NSPM. This may be provided by an electronic scan presented in a Portable Document File (PDF), or similar format acceptable to the NSPM.

End QPS Requirements

Begin Information

l. Only those FTDs that are sponsored by a certificate holder as defined in appendix F will be evaluated by the NSPM. However, other FTD evaluations may be conducted on a case-by-case basis as the Administrator deems appropriate, but only in accordance with applicable agreements.

m. The NSPM will conduct an evaluation for each configuration, and each FTD must be evaluated as completely as possible. To ensure a thorough and uniform evaluation, each FTD is subjected to the general FTD requirements in Attachment 1, the objective tests listed in Attachment 2, and the subjective tests listed in Attachment 3 of this appendix. The evaluations described herein will include, but not necessarily be limited to the following:

(1) Airplane responses, including longitudinal and lateral-directional control responses (see Attachment 2 of this appendix);

(2) Performance in authorized portions of the simulated airplane's operating envelope, to include tasks evaluated by the NSPM in the areas of surface operations, takeoff, climb, cruise, descent, approach and landing, as well as abnormal and emergency operations (see Attachment 2 of this appendix);

(3) Control checks (see Attachment 1 and Attachment 2 of this appendix);

(4) Cockpit configuration (see Attachment 1 of this appendix);

(5) Pilot, flight engineer, and instructor station functions checks (see Attachment 1 and Attachment 3 of this appendix);

(6) Airplane systems and sub-systems (as appropriate) as compared to the airplane simulated (see attachment 1 and attachment 3 of this appendix);

(7) FTD systems and sub-systems, including force cueing (motion), visual, and aural (sound) systems, as appropriate (see Attachment 1 and Attachment 2 of this appendix); and

(8) Certain additional requirements, depending upon the qualification level sought, including equipment or circumstances that may become hazardous to the occupants. The sponsor may be subject to Occupational Safety and Health Administration requirements.

n. The NSPM administers the objective and subjective tests, which includes an examination of functions. The tests include a qualitative assessment of the FTD by an NSP pilot. The NSP evaluation team leader may assign other qualified personnel to assist in accomplishing the functions examination and/or the objective and subjective tests performed during an evaluation when required.

(1) Objective tests provide a basis for measuring and evaluating FTD performance and determining compliance with the requirements of this part.

(2) Subjective tests provide a basis for:

(a) Evaluating the capability of the FTD to perform over a typical utilization period;

(b) Determining that the FTD satisfactorily simulates each required task;

(c) Verifying correct operation of the FTD controls, instruments, and systems; and

(d) Demonstrating compliance with the requirements of this part.

o. The tolerances for the test parameters listed in Attachment 2 of this appendix reflect the range of tolerances acceptable to the NSPM for FTD validation and are not to be confused with design tolerances specified for FTD manufacture. In making decisions regarding tests and test results, the NSPM relies on the use of operational and engineering judgment in the application of data (including consideration of the way in which the flight test was flown and way the data was gathered and applied) data presentations, and the applicable tolerances for each test.

p. In addition to the scheduled continuing qualification evaluation, each FTD is subject to evaluations conducted by the NSPM at any time without prior notification to the sponsor. Such evaluations would be accomplished in a normal manner (i.e., requiring exclusive use of the FTD for the conduct of objective and subjective tests and an examination of functions) if the FTD is not being used for flight crewmember training, testing, or checking. However, if the FTD were being used, the evaluation would be conducted in a non-exclusive manner. This non-exclusive evaluation will be conducted by the FTD evaluator accompanying the check airman, instructor, Aircrew Program Designee (APD), or FAA inspector aboard the FTD along with the student(s) and observing the operation of the FTD during the training, testing, or checking activities.

q. Problems with objective test results are handled as follows:

(1) If a problem with an objective test result is detected by the NSP evaluation team during an evaluation, the test may be repeated or the QTG may be amended.

(2) If it is determined that the results of an objective test do not support the qualification level requested but do support a lower level, the NSPM may qualify the FTD at a lower level. For example, if a Level 6 evaluation is requested, but the FTD fails to meet the spiral stability test tolerances, it could be qualified at Level 5.

r. After an FTD is successfully evaluated, the NSPM issues a statement of qualification (SOQ) to the sponsor, The NSPM recommends the FTD to the TPAA, who will approve the FTD for use in a flight training program. The SOQ will be issued at the satisfactory conclusion of the initial or continuing qualification. However, it is the sponsor's responsibility to obtain TPAA approval prior to using the FTD in an FAA-approved flight training program.

s. Under normal circumstances, the NSPM establishes a date for the initial or upgrade evaluation within ten (10) working days after determining that a complete QTG is acceptable. Unusual circumstances may warrant establishing an evaluation date before this determination is made. A sponsor may schedule an evaluation date as early as 6 months in advance. However, there may be a delay of 45 days or more in rescheduling and completing the evaluation if the sponsor is unable to meet the scheduled date. See Attachment 4, Figure B4A, Sample Request for Initial, Upgrade, or Reinstatement Evaluation.

t. The numbering system used for objective test results in the QTG should closely follow the numbering system set out in Attachment 2, FTD Objective Tests, Table B2A.

u. Contact the NSPM or visit the NSPM Web site for additional information regarding the preferred qualifications of pilots used to meet the requirements of § 60.15(d).

v. Examples of the exclusions for which the FTD might not have been subjectively tested by the sponsor or the NSPM and for which qualification might not be sought or granted, as described in § 60.15(g)(6), include engine out maneuvers or circling approaches.

End Information

---

12. Additional Qualifications for Currently Qualified FTDs (§ 60.16)

There is no additional regulatory or informational material that applies to § 60.16, Additional Qualifications for a Currently Qualified FTD.

13. Previously Qualified FTDs (§ 60.17)

Begin QPS Requirements

a. In instances where a sponsor plans to remove an FTD from active status for a period of less than two years, the following procedures apply:

(1) The NSPM must be notified in writing and the notification must include an estimate of the period that the FTD will be inactive;

(2) Continuing Qualification evaluations will not be scheduled during the inactive period;

(3) The NSPM will remove the FTD from the list of qualified FSTDs on a mutually established date not later than the date on which the first missed continuing qualification evaluation would have been scheduled;

(4) Before the FTD is restored to qualified status, it must be evaluated by the NSPM. The evaluation content and the time required to accomplish the evaluation is based on the number of continuing qualification evaluations and sponsor-conducted quarterly inspections missed during the period of inactivity.

(5) The sponsor must notify the NSPM of any changes to the original scheduled time out of service;

b. FTDs qualified prior to October 30, 2007, are not required to meet the general FTD requirements, the objective test requirements, and the subjective test requirements of Attachments 1, 2, and 3, respectively, of this appendix.

c. [Reserved]

End QPS Requirements

Begin Information

d. Other certificate holders or persons desiring to use an FTD may contract with

FTD sponsors to use FTDs previously qualified at a particular level for an airplane type and approved for use within an FAA-approved flight training program. Such FTDs are not required to undergo an additional qualification process, except as described in § 60.16.

e. Each FTD user must obtain approval from the appropriate TPAA to use any FTD in an FAA-approved flight training program.

f. The intent of the requirement listed in § 60.17(b), for each FTD to have a Statement of Qualification within 6 years, is to have the availability of that statement (including the configuration list and the limitations to authorizations) to provide a complete picture of the FTD inventory regulated by the FAA. The issuance of the statement will not require any additional evaluation or require any adjustment to the evaluation basis for the FTD.

g. Downgrading of an FTD is a permanent change in qualification level and will necessitate the issuance of a revised Statement of Qualification to reflect the revised qualification level, as appropriate. If a temporary restriction is placed on an FTD because of a missing, malfunctioning, or inoperative component or on-going repairs, the restriction is not a permanent change in qualification level. Instead, the restriction is temporary and is removed when the reason for the restriction has been resolved.

h. It is not the intent of the NSPM to discourage the improvement of existing simulation (*e.g.*, the ''updating'' of a control loading system, or the replacement of the IOS with a more capable unit) by requiring the ''updated'' device to meet the qualification standards current at the time of the update. Depending on the extent of the update, the NSPM may require that the updated device be evaluated and may require that an evaluation include all or a portion of the elements of an initial evaluation. However, the standards against which the device would be evaluated are those that are found in the MQTG for that device.

i. The NSPM will determine the evaluation criteria for an FTD that has been removed from active status for a prolonged period. The criteria will be based on the number of continuing qualification evaluations and quarterly inspections missed during the period of inactivity. For example, if the FTD were out of service for a 1 year period, it would be necessary to complete the entire QTG, since all of the quarterly evaluations would have been missed. The NSPM will also consider how the FTD was stored, whether parts were removed from the FTD and whether the FTD was disassembled.

j. The FTD will normally be requalified using the FAA-approved MQTG and the criteria that was in effect prior to its removal from qualification. However, inactive periods of 2 years or more will require re-qualification under the standards in effect and current at the time of requalification.

End Information

---

14. Inspection, Continuing Evaluation Qualification Requirements (§ 60.19)

Begin QPS Requirement

a. The sponsor must conduct a minimum of four evenly spaced inspections throughout the year. The objective test sequence and content of each inspection in this sequence must be developed by the sponsor and must be acceptable to the NSPM.

b. The description of the functional preflight inspection must be contained in the sponsor's QMS.

c. Record ''functional preflight'' in the FTD discrepancy log book or other acceptable location, including any item found to be missing, malfunctioning, or inoperative.

End QPS Requirements

Begin Information

d. The sponsor's test sequence and the content of each quarterly inspection required in § 60.19(a)(1) should include a balance and a mix from the objective test requirement areas listed as follows:

(1) Performance.

(2) Handling qualities.

(3) Motion system (where appropriate).

(4) Visual system (where appropriate).

(5) Sound system (where appropriate).

(6) Other FTD systems.

e. If the NSP evaluator plans to accomplish specific tests during a normal continuing qualification evaluation that requires the use of special equipment or technicians, the sponsor will be notified as far in advance of the evaluation as practical; but not less than 72 hours. Examples of such tests include latencies, control sweeps, or motion or visual system tests.

f. The continuing qualification evaluations described in § 60.19(b) will normally require 4 hours of FTD time. However, flexibility is necessary to address abnormal situations or situations involving aircraft with additional levels of complexity (*e.g.*, computer controlled aircraft). The sponsor should anticipate that some tests may require additional time. The continuing qualification evaluations will consist of the following:

(1) Review of the results of the quarterly inspections conducted by the sponsor since the last scheduled continuing qualification evaluation.

(2) A selection of approximately 8 to 15 objective tests from the MQTG that provide an adequate opportunity to evaluate the performance of the FTD. The tests chosen will be performed either automatically or manually and should be able to be conducted within approximately one-third (1⁄3) of the allotted FTD time.

(3) A subjective evaluation of the FTD to perform a representative sampling of the tasks set out in attachment 3 of this appendix. This portion of the evaluation should take approximately two-thirds (2⁄3) of the allotted FTD time.

(4) An examination of the functions of the FTD may include the motion system, visual system, sound system as applicable, instructor operating station, and the normal functions and simulated malfunctions of the airplane systems. This examination is normally accomplished simultaneously with the subjective evaluation requirements.

g. The requirement established in § 60.19(b)(4) regarding the frequency of NSPM-conducted continuing qualification evaluations for each FTD is typically 12 months. However, the establishment and satisfactory implementation of an approved QMS for a sponsor will provide a basis for adjusting the frequency of evaluations to exceed 12-month intervals.

End Information

---

15. Logging FTD Discrepancies (§ 60.20)

There is no additional regulatory or informational material that applies to § 60.20. Logging FTD Discrepancies.

16. Interim Qualification of FTDs for New Airplane Types or Models (§ 60.21)

Begin Information

There is no additional regulatory or informational material that applies to § 60.21, Interim Qualification of FTDs for New Airplane Types or Models.

End Information

---

17. Modifications to FTDs (§ 60.23)

Begin QPS Requirements

a. The notification described in § 60.23(c)(2) must include a complete description of the planned modification, with a description of the operational and engineering effect the proposed modification will have on the operation of the FTD and the results that are expected with the modification incorporated.

b. Prior to using the modified FTD:

(1) All the applicable objective tests completed with the modification incorporated, including any necessary updates to the MQTG (*e.g.*, accomplishment of FSTD Directives) must be acceptable to the NSPM; and

(2) The sponsor must provide the NSPM with a statement signed by the MR that the factors listed in § 60.15(b) are addressed by the appropriate personnel as described in that section.

End QPS Requirements

Begin Information

c. FSTD Directives are considered modification of an FTD. See Attachment 4 for a sample index of effective FSTD Directives.

End Information

---

18. Operation With Missing, Malfunctioning, or Inoperative Components (§ 60.25)

Begin Information

a. The sponsor's responsibility with respect to § 60.25(a) is satisfied when the sponsor fairly and accurately advises the user of the current status of an FTD, including any missing, malfunctioning, or inoperative (MMI) component(s).

b. If the 29th or 30th day of the 30-day period described in § 60.25(b) is on a Saturday, a Sunday, or a holiday, the FAA will extend the deadline until the next business day.

c. In accordance with the authorization described in § 60.25(b), the sponsor may develop a discrepancy prioritizing system to accomplish repairs based on the level of impact on the capability of the FTD. Repairs having a larger impact on the FTD's ability to provide the required training, evaluation, or flight experience will have a higher priority for repair or replacement.

End Information

---

19. Automatic Loss of Qualification and Procedures for Restoration of Qualification (§ 60.27)

Begin Information

If the sponsor provides a plan for how the FTD will be maintained during its out-of-service period (*e.g.*, periodic exercise of mechanical, hydraulic, and electrical systems; routine replacement of hydraulic fluid; control of the environmental factors in which the FTD is to be maintained.) there is a greater likelihood that the NSPM will be able to determine the amount of testing that required for requalification.

End Information

---

20. Other Losses of Qualification and Procedures for Restoration of Qualification (§ 60.29)

Begin Information

If the sponsor provides a plan for how the FTD will be maintained during its out-of-service period (*e.g.*, periodic exercise of mechanical, hydraulic, and electrical systems; routine replacement of hydraulic fluid; control of the environmental factors in which the FTD is to be maintained.) there is a greater likelihood that the NSPM will be able to determine the amount of testing that required for requalification.

End Information

---

21. Recordkeeping and Reporting (§ 60.31)

Begin QPS Requirements

a. FTD modifications can include hardware or software changes. For FTD modifications involving software programming changes, the record required by § 60.31(a)(2) must consist of the name of the aircraft system software, aerodynamic model, or engine model change, the date of the change, a summary of the change, and the reason for the change.

b. If a coded form for recordkeeping is used, it must provide for the preservation and retrieval of information with appropriate security or controls to prevent the inappropriate alteration of such records after the fact.

End QPS Requirements

---

22. Applications, Logbooks, Reports, and Records: Fraud, Falsification, or Incorrect Statements (§ 60.33)

There are no additional QPS requirements or informational material that apply to § 60.33, Applications, Logbooks, Reports, and Records: Fraud, Falsification, or Incorrect Statements.

23. [Reserved]

24. Levels of FTD

Begin Information

a. The following is a general description of each level of FTD. Detailed standards and tests for the various levels of FTDs are fully defined in Attachments 1 through 3 of this appendix.

(1) *Level 4.* A device that may have an open airplane-specific flight deck area, or an enclosed airplane-specific cockpit and at least one operating system with air/ground logic (no aerodynamic programming required).

(2) *Level 5.* A device that may have an open airplane-specific flight deck area, or an enclosed airplane-specific cockpit and a generic aerodynamic program with at least one operating system and control loading that is representative of the simulated airplane only at an approach speed and configuration.

(3) *Level 6.* A device that has an enclosed airplane-specific cockpit and aerodynamic program with all applicable airplane systems operating and control loading that is representative of the simulated airplane throughout its ground and flight envelope and significant sound representation.

End Information

---

25. FSTD Qualification on the Basis of a Bilateral Aviation Safety Agreement (BASA) (§ 60.37)

Begin Information

There are no additional QPS requirements or informational material that apply to § 60.37, FSTD Qualification on the Basis of a Bilateral Aviation Safety Agreement (BASA).

End Information

Attachment 1 to Appendix B to Part 60—General FTD Requirements

---

Begin QPS Requirements

1. Requirements

a. Certain requirements included in this appendix must be supported with a Statement of Compliance and Capability (SOC), which may include objective and subjective tests. The SOC will confirm that the requirement was satisfied, and describe how the requirement was met. The requirements for SOCs and tests are indicated in the ''General FTD Requirements'' column in Table B1A of this appendix.

b. Table B1A describes the requirements for the indicated level of FTD. Many devices include operational systems or functions that exceed the requirements outlined in this section. In any event, all systems will be tested and evaluated in accordance with this appendix to ensure proper operation.

End QPS Requirements

Begin Information

2. Discussion

a. This attachment describes the general requirements for qualifying Level 4 through Level 6 FTDs. The sponsor should also consult the objectives tests in Attachment 2 and the examination of functions and subjective tests listed in Attachment 3 to determine the complete requirements for a specific level FTD.

b. The material contained in this attachment is divided into the following categories:

(1) General Cockpit Configuration.

(2) Programming.

(3) Equipment Operation.

(4) Equipment and facilities for instructor/evaluator functions.

(5) Motion System.

(6) Visual System.

(7) Sound System.

c. Table B1A provides the standards for the General FTD Requirements.

End Information

TABLE B1A—MINIMUM FTD REQUIREMENTS

<<<QPS requirements>>>		FTD level			<<Information>> Notes
No.	General FTD requirements	4	5	6	
1. General Cockpit Configuration					

TABLE B1A—MINIMUM FTD REQUIREMENTS—Continued

<<<QPS requirements>>>		FTD level			<<Information>> Notes
No.	General FTD requirements	4	5	6	
1.a	The FTD must have a cockpit that is a replica of the airplane simulated with controls, equipment, observable cockpit indicators, circuit breakers. and bulkheads properly located, functionally accurate and replicating the airplane. The direction of movement of controls and switches must be identifical to that in the airplane. Pilot seat(s) must afford the capability for the occupant to be able to achieve the design "eye position".			X	For FTD purposes, the cockpit consists of all that space forward of a cross section of the fuselage at the most extreme aft setting of the pilots' seats including additional, required flight crewmember duty stations and those required bulkheads aft of the pilot seats. For clarification, bulkheads containing only item such as leanding gear pin storage compartments, fire axes or extinguishers, spare light bulbs, aircraft documents pouches are not considered essential and may be omitted.
1.b	The FTS must have equipment (e.g., instruments, panels, systems, circuit breakers, and controls) simulated sufficiently for the authorized training/checking events to be accomplished. The installed equipment must be located in a spatially correct location and may be in a cockpit or an open flight deck area. Actuation of equipment must replicate the appropriate function in the airplane.	X	X		
2. Programming					
2.a	The FTD must provide the proper effect of aerodynamic changes for the combinations of drag and thrust normally encountered in flight. This must include the effect of change in airplane attitude, thrust, drag, altitude, temperature, and configuration. Level 6 additionally requires the effects of changes in gross weight and center of gravity. Level 5 requires only generic aerodynamic programming.		X	X	
2.b	The FTD must have the computer (analog or digital) capability (i.e., capacity, accuracy, resolution, and dynamic response) needed to meet the qualification level sought.	X	X	X	
2.c	Relative responses of the cockpit instruments must be measured by latency tests, or transport delay tests, and may not exceed 300 milliseconds. The instruments must respond to abrupt input at the pilot's position within the allotted time, but not before the time when the airplane would respond under the same conditions. • Latency: The FTD instrument and, if applicable, the motion system and the visual system response must not be prior to that time when the airplane responds and may respond up to 300 milliseconds after that time under the same conditions. • Transport Delay: As an alternative to the Latency requirement, a transport delay objective test may be used to demonstrate that the FTD system does not exceed the specified limit. The sponsor must measure all the delay encountered by a step signal migrating from the pilot's control through all the simulation software modules in the correct order, using a handshaking protocol, finally through the normal output interfaces to the instrument display and, if applicable, the motion system, and the visual system.		X	X	The intent is to verify that the FTD provides instrument cues that are, within the stated time delays, like the airplane responses. For airplane response, acceleration in the appropriate, corresponding rotational axis is preferred. Additional information regarding Latency and Transport Delay testing may be found in appendix A, Attachment 2, paragraph 14.
3. Equipment Operations					
3.a	All relevant instrument indications involved in the simulation of the airplane must automatically respond to control movement or external disturbances to the simulated airplane; e.g., turbulence or winds.		X	X	

TABLE B1A—MINIMUM FTD REQUIREMENTS—Continued

<<<QPS requirements>>>		FTD level			<<Information>> Notes
No.	General FTD requirements	4	5	6	
3.b	Navigation equipment must be installed and operate within the tolerances applicable for the airplane. Levels 6 must also include communication equipment (inter-phone and air/ground) like that in the airplane and, if appropriate to the operation being conducted, an oxygen mask microphone system. Level 5 need have only that navigation equipment necessary to fly an instrument approach.		X	X	
3.c	Installed systems must simulate the applicable airplane system operation, both on the ground and in flight. Installed systems must be operative to the extent that applicable normal, abnormal, and emergency operating procedures included in the sponsor's training programs can be accomplished. Level 6 must simulate all applicable airplane flight, navigation, and systems operation. Level 5 must have at least functional flight and navigational controls, displays, and instrumentation. Level 4 must have at least one airplane system installed and functional.	X	X	X	
3.d	The lighting environment for panels and instruments must be sufficient for the operation being conducted.			X	
3.e	The FTD must provide control forces and control travel that correspond to the airplane being simulated. Control forces must react in the same manner as in the airplane under the same flight conditions.		X		
3.f	The FTD must provide control forces and control travel of sufficient precision to manually fly an instrument approach.		X		
4. Instructor or Evaluator Facilities					
4.a	In addition to the flight crewmember stations, suitable seating arrangements for an instructor/check airman and FAA Inspector must be available. These seats must provide adequate view of crewmember's panel(s).	X	X	X	These seats need not be a replica of an aircraft seat and may be as simple as an office chair placed in an appropriate position.
4.b	The FTD must have instructor controls that permit activation of normal, abnormal, and emergency conditions as may be appropriate. Once activated, proper system operation must result from system management by the crew and not require input from the instructor controls.	X	X	X	
5. Motion System (not required)					
5.a.	The FTD may have a motion system, if desired, although it is not required. If a motion system is installed and additional training, testing, or checking credits are being sought on the basis of having a motion system, the motion system operation must not be distracting and must be coupled closely to provide integrated sensory cues. The motion system must also respond to abrupt input at the pilot's position within the allotted time, but not before the time when the airplane would respond under the same conditions. A Subjective Test is required.		X	X	The motion system standards set out in part 60, appendix A for at least Level A simulators is acceptable.
6. Visual System (not required)					

TABLE B1A—MINIMUM FTD REQUIREMENTS—Continued

<<<QPS requirements>>>		FTD level			<<Information>> Notes
No.	General FTD requirements	4	5	6	
6.a.	The FTD may have a visual system, if desired, although it is not required. If a visual system is installed, it must not be distracting.	X	X	X	
6.b.	If a visual system is installed and additional training, testing, or checking credits are being sought on the basis of having a visual system, the visual system must meet the following criteria:				
6.b.1	The visual system must respond to abrupt input at the pilot's position. An SOC is required. A Subjective Test is required.	X	X	X	
6.b.2	The visual system must be at least a single channel, non-collimated display?. An SOC is required. A Subjective Test is required.	X	X	X	
6.b.3	The visual system must provide at least a field of view of 18° vertical/24° horizontal for the pilot flying.. An SOC is required.	X	X	X	
6.b.4	The visual system must provide for a maximum parallax of 10° per pilot. An SOC is required.	X	X	X	
6.b.5	The visual scene content may not be distracting An SOC is required. A Subjective Test is required.	X	X	X	
6.b.6	The minimum distance from the pilot's eye position to the surface of a direct view display may not be less than the distance to any front panel instrument. An SOC is required.	X	X	X	
6.b.7	The visual system must provide for a minimum resolution of 5 arc-minutes for both computed and displayed pixel size. An SOC is required.	X	X	X	

7. Sound System

7.a	The FTD must simulate significant cockpit sounds resulting from pilot actions that correspond to those heard in the airplane.			X	

Attachment 2 to Appendix B to Part 60—Flight Training Device (FTD) Objective Tests

Begin Information

1. For the purposes of this attachment, the flight conditions specified in the Flight Conditions Column of Table B2A, are defined as follows:

(1) *Ground*—on ground, independent of airplane configuration;

(2) *Take-off*—gear down with flaps/slats in any certified takeoff position;

(3) *First segment climb*—gear down with flaps/slats in any certified takeoff position (normally not above 50 ft AGL);

(4) *Second segment climb*—gear up with flaps/slats in any certified takeoff position (normally between 50 ft and 400 ft AGL);

(5) *Clean*—flaps/slats retracted and gear up;

(6) *Cruise*—clean configuration at cruise altitude and airspeed;

(7) *Approach*—gear up or down with flaps/slats at any normal approach position as recommended by the airplane manufacturer; and

(8) *Landing*—gear down with flaps/slats in any certified landing position.

2. The format for numbering the objective tests in appendix A, Attachment 2, Table A2A, and the objective tests in appendix B, Attachment 2, Table B2A, is identical. However, each test required for FFSs is not necessarily required for FTDs. Also, each test required for FTDs is not necessarily required for FFSs. Therefore, when a test number (or series of numbers) is not required, the term ''Reserved'' is used in the table at that location. Following this numbering format provides a degree of commonality between the two tables and substantially reduces the potential for confusion when referring to objective test numbers for either FFSs or FTDs.

3. The QPS Requirements section imposes a duty on the sponsor or other data provider to ensure that a steady state condition exists at the instant of time captured by the ''snapshot'' for cases where the objective test results authorize a ''snapshot test'' or a ''series of snapshot tests'' results in lieu of a time-history. This is often verified by showing that a steady state condition existed from some period prior to, through some period following, the snap shot. The time period most frequently used is from 5 seconds prior through 2 seconds following the instant of time captured by the snap shot. Other time periods may be acceptable as authorized by the NSPM.

4. The reader is encouraged to review the Airplane Flight Simulator Evaluation Handbook, Volumes I and II, published by the Royal Aeronautical Society, London, UK,

and FAA Advisory Circulars (AC) 25–7, as may be amended, Flight Test Guide for Certification of Transport Category Airplanes, and (AC) 23–8, as may be amended, Flight Test Guide for Certification of Part 23 Airplanes, for references and examples regarding flight testing requirements and techniques.

5. If relevant winds are present in the objective data, the wind vector should be clearly noted as part of the data presentation, expressed in conventional terminology, and related to the runway being used for the test.

6. A Level 4 FTD does not require objective tests and therefore, Level 4 is not addressed in the following table.

End Information

Begin QPS Requirements

1. Test Requirements

a. The ground and flight tests required for qualification are listed in Table B2A Objective Evaluation. Computer generated FTD test results must be provided for each test except where an alternate test is specifically authorized by the NSPM. If a flight condition or operating condition is required for the test but does not apply to the airplane being simulated or to the qualification level sought, it may be disregarded (e.g., an engine out missed approach for a single-engine airplane; a maneuver using reverse thrust for an airplane without reverse thrust capability). Each test result is compared against the validation data described in § 60.13, and in appendix B. The results must be produced on an appropriate recording device acceptable to the NSPM and must include FTD number, date, time, conditions, tolerances, and appropriate dependent variables portrayed in comparison to the validation data. Time histories are required unless otherwise indicated in Table B2A. All results must be labeled using the tolerances and units given.

b. Table B2A in this attachment sets out the test results required, including the parameters, tolerances, and flight conditions for FTD validation. Tolerances are provided for the listed tests because mathematical modeling and acquisition and development of reference data are often inexact. All tolerances listed in the following tables are applied to FTD performance. When two tolerance values are given for a parameter, the less restrictive may be used unless otherwise indicated.

c. Certain tests included in this attachment must be supported with a Statement of Compliance and Capability (SOC). In Table B2A, requirements for SOCs are indicated in the ''Test Details'' column.

d. When operational or engineering judgment is used in making assessments for flight test data applications for FTD validity, such judgment must not be limited to a single parameter. For example, data that exhibit rapid variations of the measured parameters may require interpolations or a ''best fit'' data section. All relevant parameters related to a given maneuver or flight condition must be provided to allow overall interpretation. When it is difficult or impossible to match FTD to airplane data throughout a time history, differences must be justified by providing a comparison of other related variables for the condition being assessed.

e. It is not acceptable to program the FTD so that the mathematical modeling is correct only at the validation test points. Unless noted otherwise, tests must represent airplane performance and handling qualities at operating weights and centers of gravity (CG) typical of normal operation. If a test is supported by aircraft data at one extreme weight or CG, another test supported by aircraft data at mid-conditions or as close as possible to the other extreme is necessary. Certain tests that are relevant only at one extreme CG or weight condition need not be repeated at the other extreme. The results of the tests for Level 6 are expected to be indicative of the device's performance and handling qualities throughout all of the following:

(1) The airplane weight and CG envelope;

(2) The operational envelope; and

(3) Varying atmospheric ambient and environmental conditions—including the extremes authorized for the respective airplane or set of airplanes.

f. When comparing the parameters listed to those of the airplane, sufficient data must also be provided to verify the correct flight condition and airplane configuration changes. For example, to show that control force is within the parameters for a static stability test, data to show the correct airspeed, power, thrust or torque, airplane configuration, altitude, and other appropriate datum identification parameters must also be given. If comparing short period dynamics, normal acceleration may be used to establish a match to the airplane, but airspeed, altitude, control input, airplane configuration, and other appropriate data must also be given. If comparing landing gear change dynamics, pitch, airspeed, and altitude may be used to establish a match to the airplane, but landing gear position must also be provided. All airspeed values must be properly annotated (*e.g.*, indicated versus calibrated). In addition, the same variables must be used for comparison (*e.g.*, compare inches to inches rather than inches to centimeters).

g. The QTG provided by the sponsor must clearly describe how the FTD will be set up and operated for each test. Each FTD subsystem may be tested independently, but overall integrated testing of the FTD must be accomplished to assure that the total FTD system meets the prescribed standards. A manual test procedure with explicit and detailed steps for completing each test must also be provided.

h. In those cases where the objective test results authorize a ''snapshot test'' or a ''series of snapshot test'' results in lieu of a time-history result, the sponsor or other data provider must ensure that a steady state condition exists at the instant of time captured by the ''snapshot.''

i. For previously qualified FTDs, the tests and tolerances of this attachment may be used in subsequent continuing qualification evaluations for any given test if the sponsor has submitted a proposed MQTG revision to the NSPM and has received NSPM approval.

j. FTDs are evaluated and qualified with an engine model simulating the airplane data supplier's flight test engine. For qualification of alternative engine models (either variations of the flight test engines or other manufacturer's engines) additional tests with the alternative engine models may be required. This Attachment contains guidelines for alternative engines.

k. Testing Computer Controlled Airplane (CCA) simulators, or other highly augmented airplane simulators, flight test data is required for the Normal (N) and/or Non-normal (NN) control states, as indicated in this Attachment. Where test results are independent of control state, Normal or Non-normal control data may be used. All tests in Table A2A require test results in the Normal control state unless specifically noted otherwise in the Test Details section following the CCA designation. The NSPM will determine what tests are appropriate for airplane simulation data. When making this determination, the NSPM may require other levels of control state degradation for specific airplane tests. Where Non-normal control states are required, test data must be provided for one or more Non-normal control states, and must include the least augmented state. Where applicable, flight test data must record Normal and Non-normal states for:

(1) Pilot controller deflections or electronically generated inputs, including location of input; and

(2) Flight control surface positions unless test results are not affected by, or are independent of, surface positions.

l. Tests of handling qualities must include validation of augmentation devices. FTDs for highly augmented airplanes will be validated both in the unaugmented configuration (or failure state with the maximum permitted degradation in handling qualities) and the augmented configuration. Where various levels of handling qualities result from failure states, validation of the effect of the failure is necessary. Requirements for testing will be mutually agreed to between the sponsor and the NSPM on a case-by-case basis.

m. Some tests will not be required for airplanes using airplane hardware in the FTD cockpit (*e.g.*, ''side stick controller''). These exceptions are noted in Section 2 ''Handling Qualities'' in Table B2A of this attachment. However, in these cases, the sponsor must provide a statement that the airplane hardware meets the appropriate manufacturer's specifications and the sponsor must have supporting information to that fact available for NSPM review.

End QPS Requirements

TABLE B2A.—FLIGHT TRAINING DEVICE (FTD) OBJECTIVE TESTS

<<< QPS Requirements >>>							<< Information >>
Test		Tolerances	Flight conditions	Test details	FTD level		Notes
Number	Title				5	6	
1. Performance							
1.a	(Reserved).						
1.b	Takeoff.						
1.b.1	Ground Acceleration Time.	±5% time or ±1 sec	Takeoff	Record acceleration time for a minimum of 80% of the segment from brake release to V_R. Preliminary aircraft certification data may be used.		X	This test is required only if RTO training credit is sought.
1.b.2. through 1.b.6.	(Reserved)						
1.b.7	Rejected Takeoff	±3% time or ±1 second	Dry Runway	Record time for at least 80% of the segment from initiation of the Rejected Takeoff to full stop.		X	
1.b.8	(Reserved)						
1.c	Climb						
1.c.1	Normal Climb all engines operating.	±3 kt airspeed, ±5% or ±100 ft/min (0.5 m/sec) climb rate.	Clean	Flight test data or airplane performance manual data may be used. Record at nominal climb speed and at nominal altitude. May be a snapshot test result.	X	X	
1.c.2. through 1.c.4.	(Reserved)						
1.d	(Reserved)						
1.e	(Reserved)						
1.f	Engines						
1.f.1	Acceleration	±10% T_t, ±1 sec for Level 5	Approach or Landing.	Record engine power (N_1, N_2, EPR, Torque, Manifold Pressure) from idle to maximum takeoff power for a rapid (slam) throttle movement.	X	X	T_t is the total time from initial throttle movement to reaching 90% of go around power.

TABLE B2A.—FLIGHT TRAINING DEVICE (FTD) OBJECTIVE TESTS—Continued

<<< QPS Requirements >>>							<< Information >>
Test		Tolerances	Flight conditions	Test details	FTD level		Notes
Number	Title				5	6	
1.f.2	Deceleration	±10% T_t, or ±1 sec for Level 5.	Ground	Record engine power (N_1, N_2, EPR, Torque, Manifold Pressure) from maximum takeoff power to idle for a rapid (slam) throttle movement.	X	X	T_t is the total time from initial throttle movement to reaching 90% decay of maximum takeoff power.
2. Handling Qualities							
	(3) For FTDs requiring Static tests at the controls (i.e., column, wheel, rudder pedal), special test fixtures will not be required during initial or upgrade evaluations if the sponsor's QTG/MQTG shows both test fixture results *and* the results of an alternative approach, such as computer plots produced concurrently, that show satisfactory agreement. Repeat of the alternative method during the initial or upgrade evaluation would then satisfy this test requirement						Testing of position versus force is not applicable if forces are generated solely by use of airplane hardware in the FTD.
2.a	(3) Static Control Tests						
2.a.1.a	Pitch Controller Position vs. Force and Surface Position Calibration.	±2 lb (0.9 daN) breakout, ±10% or ±5 lb (2.2 daN) force, ±2° elevator.	Ground	Record results for an uninterrupted control sweep to the stops.		X	
2.a.1.b	Pitch Controller Position vs. Force.	±2 lb (0.9 daN) breakout, ±10% or ±5 lb (2.2 daN) force.	Ground	Record results for an uninterrupted control sweep to the stops.	X		Applicable only on continuing qualification evaluations. The intent is to design the control feel for Level 5 to be able to manually fly an instrument approach; and not to compare results to flight test or other such data.
2.a.2.a	Roll Controller Position vs. Force and Surface Position Calibration.	±2 lb (0.9 daN) breakout, ±10% or ±3 lb (1.3 daN) force, ±2° aileron, ±3° spoiler angle.	Ground	Record results for an uninterrupted control sweep to the stops.		X	
2.a.2.b	Roll Controller Position vs. Force.	±2 lb (0.9 daN) breakout, ±10% or ±3 lb (1.3 daN) force.	Ground	Record results for an uninterrupted control sweep to the stops.	X		Applicable only on continuing qualification evaluations. The intent is to design the control feel for Level 5 to be able to manually fly an instrument approach; and not to compare results to flight test or other such data.

TABLE B2A.—FLIGHT TRAINING DEVICE (FTD) OBJECTIVE TESTS—Continued

<<< QPS Requirements >>>							<< Information >>
Test		Tolerances	Flight conditions	Test details	FTD level		Notes
Number	Title				5	6	
2.a.3.a	Rudder Pedal Position vs. Force and Surface Position Calibration.	±5 lb (2.2 daN) breakout, ±10% or ±5 lb (2.2 daN) force, ±2° rudder angle.	Ground	Record results for an uninterrupted control sweep to the stops.		X	
2.a.3.b	Rudder Pedal Position vs. Force.	±5 lb (2.2 daN) breakout, ±10% or ±5 lb (2.2 daN) force.	Ground	Record results for an uninterrupted control sweep to the stops.	X		Applicable only on continuing qualification evaluations. The intent is to design the control feel for Level 5 to be able to manually fly an instrument approach; and not to compare results to flight test or other such data.
2.a.4	Nosewheel Steering Controller Force.	±2 lb (0.9 daN) breakout, ±10% or ±3 lb (1.3 daN) force.	Ground			X	
2.a.5	Rudder Pedal Steering Calibration.	±2° nosewheel angle	Ground			X	
2.a.6	Pitch Trim Indicator vs. Surface Position Calibration.	±0.5° of computed trim surface angle.	Ground			X	The purpose of the test is to compare the FTD against design data or equivalent.
2.a.7	(Reserved).						
2.a.8	Alignment of Cockpit Throttle Lever vs. Selected Engine Parameter.	±5° of throttle lever angle ±0.8 in (2 cm) for power control without angular travel.	Ground	Requires simultaneous recording for all engines. The tolerances apply against airplane data and between engines. In the case of propeller powered airplanes, if a propeller lever is present, it must also be checked.		X	
2.a.9	Brake Pedal Position vs. Force.	±5 lb (2.2 daN) or 10% force.	Ground	Two data points are required: zero and maximum deflection. Computer output results may be used to show compliance.		X	Test not required unless RTO credit is sought.
2.b	(Reserved)						
2.c	Longitudinal Control Tests						
	Power setting is that required for level flight unless otherwise specified						

TABLE B2A.—FLIGHT TRAINING DEVICE (FTD) OBJECTIVE TESTS—Continued

<<< QPS Requirements >>>							<< Information >>
Test		Tolerances	Flight conditions	Test details	FTD level		Notes
Number	Title				5	6	
2.c.1	Power Change Force	±5 lb (2.2 daN) or, ±20% force.	Cruise or Approach.	May be a series of snapshot test results. Power change dynamics test as described in test 2.c.1 of Table A2A of this part will be accepted.	X	X	
2.c.2	Flap/Slat Change Force.	±5 lb (2.2 daN) or, ±20% force.	Takeoff through initial flap retraction, and approach to landing.	May be a series of snapshot test results. Flap/Slat change dynamics test as described in test 2.c.2 of Table A2A of this part will be accepted.	X	X	
2.c.3	(Reserved)						
2.c.4	Gear Change Force	±5 lb (2.2 daN) or, ±20% force.	Takeoff (retraction) and Approach (extension).	May be a series of snapshot test results. Gear change dynamics test as described in test 2.c.4 of Table A2A of this part will be accepted.	X	X	
2.c.5	Longitudinal Trim	±0.5° trim surface angle ±1° elevator ±1° pitch angle ±5% net thrust or equivalent.	Cruise, Approach, and Landing.	May be a series of snapshot tests. Level 5 may use equivalent stick and trim controllers in lieu of elevator and trim surface.	X	X	
2.c.6	Longitudinal Maneuvering Stability (Stick Force/g).	±5 lb (±2.2 daN) or ±10% pitch controller force.	Cruise, Approach and Landing.	May be a series of snapshot test results.		X	
2.c.7	Longitudinal Static Stability.	±5 lb (±2.2 daN) or ±10% pitch controller force.	Approach	May be a series of snapshot test results. Level 5 must exhibit positive static stability, but need not comply with the numerical tolerance.	X	X	
2.c.8	Stall Warning (actuation of stall warning device).	±3 kts. airspeed, ±2° bank	Second Segment Climb, and Approach or Landing.	Record the stall warning signal.	X	X	The stall maneuver may be entered with thrust at or near idle power and wings level (1g).

TABLE B2A.—FLIGHT TRAINING DEVICE (FTD) OBJECTIVE TESTS—Continued

<<< QPS Requirements >>>							<< Information >>
Test		Tolerances	Flight conditions	Test details	FTD level		Notes
Number	Title				5	6	
2.c.9.a	Phugoid Dynamics	±10% period, ±10% of time to ½ or double amplitude or ±.02 of damping ratio.	Cruise	The test must include whichever is less of the following: Three full cycles (six overshoots after the input is completed), or the number of cycles sufficient to determine time to ½ or double amplitude.		X	
2.c.9.b	Phugoid Dynamics	±10% period, Representative damping.	Cruise	The test must include whichever is less of the following: Three full cycles (six overshoots after the input is completed), or the number of cycles sufficient to determine representative damping.	X		
2.c.10	Short Period Dynamics.	±1.5° pitch angle or ±2°/sec pitch rate, ±0.10g acceleration.	Cruise			X	
2.d	(3) Lateral Directional Tests						
	(3) Power setting is that required for level flight unless otherwise specified.						
2.d.1	(Reserved).						
2.d.2	Roll Response (Rate)	±10% or ±2°/sec roll rate	Cruise, and Approach or Landing.		X	X	Results should be recorded for normal roll controller deflection (about one-third of maximum roll controller travel). May be combined with step input of flight deck roll controller test (2.d.3.).
2.d.3	Roll Response to Cockpit Roll Controller Step Input.	±10% or ±2° bank angle	Approach or Landing.			X	May be combined with roll response (rate) test (2.d.2.).
2.d.4.a	Spiral Stability	Correct trend and ±3° or ±10% bank angle in 20 seconds.	Cruise			X	Airplane data averaged from multiple tests in same direction may be used.

TABLE B2A.—FLIGHT TRAINING DEVICE (FTD) OBJECTIVE TESTS—Continued

<<< QPS Requirements >>>							<< Information >>
Test		Tolerances	Flight conditions	Test details	FTD level		Notes
Number	Title				5	6	
2.d.4.b	Spiral Stability	Correct trend	Cruise		X		Airplane data averaged from multiple tests in same direction may be used.
2.d.5	(Reserved)						
2.d.6.a	Rudder Response	±2°/sec or ±10% yaw rate.	Approach or Landing.	Not required if rudder input and response is shown in Dutch Roll Test (test 2.d.7).		X	A rudder step input of 20%–30% rudder pedal throw may be used.
2.d.6.b	Rudder Response	Roll rate ±2°/sec, bank angle ±3°.	Approach or Landing.	May be roll response to a given rudder deflection.	X		
2.d.7	Dutch, Roll, (Yaw Damper OFF).	±0.5 sec or ±10% of period, ±10% of time to ½ or double amplitude or ±.02 of damping ratio.	Cruise, and Approach or Landing.	Record results for at least 6 complete cycles with stability augmentation OFF, or the number of cycles sufficient to determine time to ½ or double amplitude.		X	
2.d.8	Steady State Sideslip	For given rudder position ±2° bank angle, ±1° sideslip angle, ±10% or ±2° aileron, ±10% or ±5° spoiler or equivalent roll, controller position or force.	Approach or Landing.	May be a series of snapshot test results. Propeller driven airplanes must test in each direction.	X	X	Sideslip angle is matched for repeatability on continuing qualification evaluations.
2.e. through 2.h.	(Reserved)						
3	(Reserved)						
4	(Reserved)						
5	(Reserved)						
6. FTD System Response Time							
6a.	Latency.						
		300 ms (or less) after airplane response.	Take-off cruise, and approach or landing.	One test is required in each axis (pitch, roll and yaw) for each of the three conditions (take-off, cruise, and approach or landing).	X	X	
	Transport Delay. If Transport Delay is chosen to demonstrate response time than Latency, it is expected that when reviewing those existing tests where latency can be identified (e.g., short period, roll response, rudder response) the sponsor and the NSPM will apply additional scrutiny to ensure proper FTD response.						

TABLE B2A.—FLIGHT TRAINING DEVICE (FTD) OBJECTIVE TESTS—Continued

<<< QPS Requirements >>>							<< Information >>
Test		Tolerances	Flight conditions	Test details	FTD level		Notes
Number	Title				5	6	
		300 ms (or less) after controller movement.	N/A	A separate test is required in each axis (pitch, roll, and yaw).	X	X	

3. For Additional Information on the Following Topics, Please Refer to Appendix A, Attachment 2, and the Indicated Paragraph Within That Attachment

- Control Dynamics, paragraph 3.
- Motion System, paragraph 5.
- Sound System, paragraph 6.
- Engineering Simulator Validation Data, paragraph 8.
- Approval Guidelines for Engineering Simulator Validation Data, paragraph 9.
- Validation Test Tolerances, paragraph 10.
- Validation Data Road Map, paragraph 11.
- Acceptance Guidelines for Alternative Engines Data, paragraph 12.
- Acceptance Guidelines for Alternative Avionics, paragraph 13.
- Transport Delay Testing, paragraph 14.
- Continuing Qualification Evaluation Validation Data Presentation, paragraph 15.

4. Alternative Objective Data for FTD Level 5.

Begin QPS Requirements

a. This paragraph (including the following tables) is relevant only to FTD Level 5. It is provided because this level is required to simulate the performance and handling characteristics of a set of airplanes with similar characteristics, such as normal airspeed/altitude operating envelope and the same number and type of propulsion systems (engines).

b. Tables B2B through B2E reflect FTD performance standards that are acceptable to the FAA. A sponsor must demonstrate that a device performs within these parameters, as applicable. If a device does not meet the established performance parameters for some or for all of the applicable tests listed in Tables B2B through B2E, the sponsor may use NSP accepted flight test data for comparison purposes for those tests.

c. Sponsors using the data from Tables B2B through B2E must comply with the following:

(1) Submit a complete QTG, including results from all of the objective tests appropriate for the level of qualification sought as set out in Table B2A. The QTG must highlight those results that demonstrate the performance of the FTD is within the allowable performance ranges indicated in Tables B2B through B2E, as appropriate.

(2) The QTG test results must include all relevant information concerning the conditions under which the test was conducted; *e.g.*, gross weight, center of gravity, airspeed, power setting, altitude (climbing, descending, or level), temperature, configuration, and any other parameter that impacts the conduct of the test.

(3) The test results become the validation data against which the initial and all subsequent recurrent evaluations are compared. These subsequent evaluations will use the tolerances listed in Table B2A.

(4) Subjective testing of the device must be performed to determine that the device performs and handles like an airplane within the appropriate set of airplanes.

TABLE B2B. — ALTERNATIVE DATA SOURCE FOR FTD LEVEL 5 SMALL, SINGLE ENGINE (RECIPROCATING) AIRPLANE

<<< QPS requirement >>>		
Applicable test		Authorized performance range
No.	Title and procedure	
1. Performance		
1.c	Climb.	
1.c.1	Normal climb with nominal gross weight, at best rate-of-climb airspeed.	Climb rate = 500–1200 fpm (2.5–6 m/sec).
1.f	Engines.	
1.f.1	Acceleration; idle to takeoff power	2–4 Seconds.
1.f.2	Deceleration; takeoff power to idle	2–4 Seconds.
2. Handling Qualities		
2.c	Longitudinal Tests.	
2.c.1	Power change force	
	(a) Trim for straight and level flight at 80% of normal cruise airspeed with necessary power. Reduce power to flight idle. Do not change trim or configuration. After stabilization, record column force necessary to maintain original airspeed.	5–15 lbs (2.2–6.6 daN) of force (Pull).
	OR	

TABLE B2B. — ALTERNATIVE DATA SOURCE FOR FTD LEVEL 5 SMALL, SINGLE ENGINE (RECIPROCATING) AIRPLANE—Continued

<<< QPS requirement >>>		
Applicable test		Authorized performance range
No.	Title and procedure	
	(b) Trim for straight and level flight at 80% of normal cruise airspeed with necessary power. Add power to maximum setting. Do not change trim or configuration. After stabilized, record column force necessary to maintain original airspeed.	5–15 lbs (2.2–6.6 daN) of force (Push).
2.c.2	Flap/slat change force.	
	(a) Trim for straight and level flight with flaps fully retracted at a constant airspeed within the flaps- extended airspeed range. Do not adjust trim or power. Extend the flaps to 50% of full flap travel. After stabilized, record stick force necessary to maintain original airspeed.	5–15 lbs (2.2–6.6 daN) of force (Pull).
	OR	
	(b) Trim for straight and level flight with flaps extended to 50% of full flap travel, at a constant airspeed within the flaps-extended airspeed range. Do not adjust trim or power. Retract the flaps to zero. After stabilized, record stick force necessary to maintain original airspeed.	5–15 lbs (2.2–6.6 daN) of force (Push).
2.c.4	Gear change force	
	(a) Trim for straight and level flight with landing gear retracted at a constant airspeed within the landing gear-extended airspeed range. Do not adjust trim or power. Extend the landing gear. After stabilized, record stick force necessary to maintain original airspeed.	2–12 lbs (0.88–5.3 daN) of force (Pull).
	OR	
	(b) Trim for straight and level flight with landing gear extended, at a constant airspeed within the landing gear-extended airspeed range. Do not adjust trim or power. Retract the landing gear. After stabilized, record stick force necessary to maintain original airspeed.	2–12 lbs (0.88–5.3 daN) of force (Push).
2.c.5	Longitudinal trim	Must be able to trim longitudinal stick force to "zero" in each of the following configurations: cruise; approach; and landing.
2.c.7	Longitudinal static stability	Must exhibit positive static stability.
2.c.8	Stall warning (actuation of stall warning device) with nominal gross weight; wings level; and a deceleration rate of approximately one (1) knot per second.	
	(a) Landing configuration	40–60 knots; ± 5° of bank.
	(b) Clean configuration	Landing configuration speed + 10–20%.
2.c.9.b ..	Phugoid dynamics	Must have a phugoid with a period of 30–60 seconds. May not reach ½ or double amplitude in less than 2 cycles.
2.d	Lateral Directional Tests.	
2.d.2	Roll response Roll rate must be measured through at least 30 degrees of roll. Aileron control must be deflected ½ (50 percent) of maximum travel.	Must have a roll rate of 6–40 degrees/second.
2.d.4.b ..	Spiral stability Cruise configuration and normal cruise airspeed. Establish a 20–30 degree bank. When stabilized, neutralize the aileron control and release. Must be completed in both directions of turn.	Initial bank angle (± 5 degrees) after 20 seconds.
2.d.6.b ..	Rudder response	6–12 degrees/second yaw rate.

TABLE B2B. — ALTERNATIVE DATA SOURCE FOR FTD LEVEL 5 SMALL, SINGLE ENGINE (RECIPROCATING) AIRPLANE—Continued

<<< QPS requirement >>>		
Applicable test		Authorized performance range
No.	Title and procedure	
	Use 50 percent of maximum rudder deflection. (Applicable to approach or landing configuration.).	
2.d.7	Dutch roll, yaw damper off .... (Applicable to cruise and approach configurations.).	A period of 2–5 seconds; and ½–2 cycles.
2.d.8	Steady state sideslip .... Use 50 percent rudder deflection. (Applicable to approach and landing degrees of configurations.).	2–10 degrees of bank; 4–10 degrees of sideslip; and 2–10 degrees of aileron.
6	FTD System Response Time.	
6.a	Cockpit instrument systems response to an abrupt pilot controller input. One test is required in each axis (pitch, roll, yaw).	300 milliseconds or less.

TABLE B2C.—ALTERNATIVE DATA SOURCE FOR FTD LEVEL 5 SMALL, MULTI-ENGINE (RECIPROCATING) AIRPLANE

<<< QPS requirement >>>		
Applicable test		Authorized performance range
Number	Title and procedure	
1. Performance		
1.c	Climb	
1.c.1	Normal climb with nominal gross weight, at best rate-of-climb airspeed.	Climb airspeed = 95–115 knots. Climb rate = 500–1500 fpm (2.5–7.5 m/sec).
1.f.	Engines	
1.f.1	Acceleration; idle to takeoff power	2–5 Seconds
1.f.2	Deceleration; takeoff power to idle	2–5 Seconds
2. Handling Qualities		
2.c Longitudinal Tests		
2.c.1	Power change force	
	a) Trim for straight and level flight at 80% of normal cruise airspeed with necessary power. Reduce power to flight idle. Do not change trim or configuration. After stabilized, record column force necessary to maintain original airspeed.	10–25 lbs (2.2–6.6 daN) of force (Pull).
	OR	
	b) Trim for straight and level flight at 80% of normal cruise airspeed with necessary power. Add power to maximum setting. Do not change trim or configuration. After stabilized, record column force necessary to maintain original airspeed.	5–15 lbs (2.2–6.6 daN) of force (Push).
2.c.2	Flap/slat change force	
	a) Trim for straight and level flight with flaps fully retracted at a constant airspeed within the flaps-extended airspeed range. Do not adjust trim or power. Extend the flaps to 50% of full flap travel. After stabilized, record stick force necessary to maintain original airspeed.	5–15 lbs (2.2–6.6 daN) of force (Pull).
	OR	

TABLE B2C.—ALTERNATIVE DATA SOURCE FOR FTD LEVEL 5 SMALL, MULTI-ENGINE (RECIPROCATING) AIRPLANE—Continued

<<< QPS requirement >>>		
Applicable test		Authorized performance range
Number	Title and procedure	
	b) Trim for straight and level flight with flaps extended to 50% of full flap travel, at a constant airspeed within the flaps-extended airspeed range. Do not adjust trim or power. Retract the flaps to zero. After stabilized, record stick force necessary to maintain original airspeed.	5–15 lbs (2.2–6.6 daN) of force (Push).
2.c.4	Gear change force	
	a) Trim for straight and level flight with landing gear retracted at a constant airspeed within the landing gear-extended airspeed range. Do not adjust trim or power. Extend the landing gear. After stabilized, record stick force necessary to maintain original airspeed.	2–12 lbs (0.88–5.3 daN) of force (Pull).
	OR	
	b) Trim for straight and level flight with landing gear extended, at a constant airspeed within the landing gear-extended airspeed range. Do not adjust trim or power. Retract the landing gear. After stabilized, record stick force necessary to maintain original airspeed.	2–12 lbs (0.88–5.3 daN) of force (Push).
2.c.4	Longitudinal trim	Must be able to trim longitudinal stick force to "zero" in each of the following configurations: cruise; approach; and landing.
2.c.7	Longitudinal static stability	Must exhibit positive static stability.
2.c.8	Stall warning (actuation of stall warning device) with nominal gross weight; wings level; and a deceleration rate of approximately one (1) knot per second.	
	a) Landing configuration:	60–90 knots; ± 5° of bank.
	b) Clean configuration:	Landing configuration speed + 10–20%.
2.c.9.b ..	Phugoid dynamics	Must have a phugoid with a period of 30–60 seconds. May not reach ½ or double amplitude in less than 2 cycles.
2.d	Lateral Directional Tests	
2.d.2	Roll response Roll rate must be measured through at least 30 degrees of roll. ... Aileron control must be deflected ½ (50 percent) of maximum travel.	Must have a roll rate of 6–40 degrees/second.
2.d.4.b ..	Spiral stability Cruise configuration and normal cruise airspeed. Establish a 20–30 degree bank. When stabilized, neutralize the aileron control and release. Must be completed in both directions of turn.	Initial bank angle (± 5 degrees) after 20 seconds.
2.d.6.b ..	Rudder response Use 50 percent of maximum rudder deflection. (Applicable to approach or landing configuration.).	6–12 degrees/second yaw rate.
2.d.7	Dutch roll, yaw damper off (Applicable to cruise and approach configurations.).	A period of 2–5 seconds; and ½-2 cycles.
2.d.8	Steady state sideslip Use 50 percent rudder deflection. (Applicable to approach and landing configurations.).	2–10 degrees of bank; 4–10 degrees of sideslip; and 2–10 degrees of aileron.
6. FTD System Response Time		
6.a	Cockpit instrument systems response to an abrupt pilot controller input. One test is required in each axis (pitch, roll, yaw).	300 milliseconds or less.

TABLE B2D.—ALTERNATIVE DATA SOURCE FOR FTD LEVEL 5 SMALL, SINGLE ENGINE (TURBO-PROPELLER) AIRPLANE

<<< QPS requirement >>>		
Applicable test		Authorized performance range
Number	Title and procedure	
1. Performance		
1.c	Climb	
1.c.1	Normal climb with nominal gross weight, at best rate-of-climb airspeed.	Climb airspeed = 95–115 knots, Climb rate = 800–1800 fpm (4–9 m/sec).
1.f	Engines	
1.f.1	Acceleration; idle to takeoff power	4–8 Seconds
1.f.2	Deceleration; takeoff power to idle	3–7 Seconds
2. Handling Qualities		
2.c Longitudinal Tests		
2.c.1	Power change force	
	a) Trim for straight and level flight at 80% of normal cruise airspeed with necessary power. Reduce power to flight idle. Do not change trim or configuration. After stabilized, record column force necessary to maintain original airspeed.	8 lbs (3.5 daN) of Push force—8 lbs (3.5 daN) of Pull force
	OR	
	b) Trim for straight and level flight at 80% of normal cruise airspeed with necessary power. Add power to maximum setting. Do not change trim or configuration. After stabilized, record column force necessary to maintain original airspeed.	12–22 lbs (5.3–9.7 daN) of force (Push)
2.c.2	Flap/slat change force	
	a) Trim for straight and level flight with flaps fully retracted at a constant airspeed within the flaps-extended airspeed range. Do not adjust trim or power. Extend the flaps to 50% of full flap travel. After stabilized, record stick force necessary to maintain original airspeed.	5–15 lbs (2.2–6.6 daN) of force (Pull).
	OR	
	b) Trim for straight and level flight with flaps extended to 50% of full flap travel, at a constant airspeed within the flaps-extended airspeed range. Do not adjust trim or power. Retract the flaps to zero. After stabilized, record stick force necessary to maintain original airspeed.	5–15 lbs (2.2–6.6 daN) of force (Push)
2.c.4	Gear change force	
	a) Trim for straight and level flight with landing gear retracted at a constant airspeed within the landing gear-extended airspeed range. Do not adjust trim or power. Extend the landing gear. After stabilized, record stick force necessary to maintain original airspeed.	2–12 lbs (0.88–5.3 daN) of force (Pull)
	OR	
	b) Trim for straight and level flight with landing gear extended, at a constant airspeed within the landing gear-extended airspeed range. Do not adjust trim or power. Retract the landing gear. After stabilized, record stick force necessary to maintain original airspeed.	2–12 lbs (0.88– 5.3 daN) of force (Push)
2.b.5	Longitudinal trim	Must be able to trim longitudinal stick force to “zero” in each of the following configurations: cruise; approach; and landing.
2.c.7	Longitudinal static stability	Must exhibit positive static stability.

TABLE B2D.—ALTERNATIVE DATA SOURCE FOR FTD LEVEL 5 SMALL, SINGLE ENGINE (TURBO-PROPELLER) AIRPLANE—Continued

<<< QPS requirement >>>		
Applicable test		Authorized performance range
Number	Title and procedure	
2.c.8	Stall warning (actuation of stall warning device) with nominal gross weight; wings level; and a deceleration rate of approximately one (1) knot per second.	
	a) Landing configuration:	60–90 knots; ±5° of bank.
	b) Clean configuration:	Landing configuration speed + 10–20%.
2.c.8.b	Phugoid dynamics	Must have a phugoid with a period of 30–60 seconds. May not reach ½ or double amplitude in less than 2 cycles.
2.d	Lateral Directional Tests	
2.d.2	Roll response Roll rate must be measured through at least 30 degrees of roll. Aileron control must be deflected ½ (50 percent) of maximum travel.	Must have a roll rate of 6–40 degrees/second.
2.d.4.b	Spiral stability Cruise configuration and normal cruise airspeed. Establish a 20–30 degree bank. When stabilized, neutralize the aileron control and release. Must be completed in both directions of turn.	Initial bank angle (± 5 degrees) after 20 seconds.
2.d.6.b	Rudder response Use 50 percent of maximum rudder deflection. (Applicable to approach or landing configuration.).	6–12 degrees/second yaw rate.
2.d.7	Dutch roll, yaw damper off (Applicable to cruise and approach configurations.).	A period of 2–5 seconds; and 1.2–3 cycles.
2.d.8	Steady state sideslip Use 50 percent rudder deflection. (Applicable to approach and landing degrees of configurations.).	2–10 degrees of bank; 4–10 degrees of sideslip; and 2–10 degrees of aileron.
6. FTD System Response Time		
6.a	Cockpit instrument systems response to an abrupt pilot controller input. One test is required in each axis (pitch, roll, yaw).	300 milliseconds or less.

TABLE B2E.—ALTERNATIVE DATA SOURCE FOR FTD LEVEL 5 MULTI-ENGINE (TURBO-PROPELLER) AIRPLANE

<<< QPS requirement >>>		
Applicable test		Authorized performance range
No.	Title and procedure	
1. Performance		
1.c	Climb	
1.b.1	Normal climb with nominal gross weight, at best rate-of-climb airspeed	Climb airspeed= 120–140 knots. Climb rate= 1000–3000 fpm (5–15 m/sec).
1.f	Engines	
1.f.1	Acceleration; idle to takeoff power	2–6 Seconds.
1.f.2	Deceleration; takeoff power to idle	1–5 Seconds.
2. Handling Qualities		
2.c Longitudinal Tests		
2.c.1	Power change force	

TABLE B2E.—ALTERNATIVE DATA SOURCE FOR FTD LEVEL 5 MULTI-ENGINE (TURBO-PROPELLER) AIRPLANE—Continued

<<< QPS requirement >>>		
Applicable test		Authorized performance range
No.	Title and procedure	
	a) Trim for straight and level flight at 80% of normal cruise airspeed with necessary power. Reduce power to flight idle. Do not change trim or configuration. After stabilized, record column force necessary to maintain original airspeed	8 lbs (3.5 daN) of Push force to 8 lbs (3.5 daN) of Pull force.
	OR	
	b) Trim for straight and level flight at 80% of normal cruise airspeed with necessary power. Add power to maximum setting. Do not change trim or configuration. After stabilized, record column force necessary to maintain original airspeed	12–22 lbs (5.3–9.7 daN) of force (Push).
2.c.2	Flap/slat change force	
	a) Trim for straight and level flight with flaps fully retracted at a constant airspeed within the flaps-extended airspeed range. Do not adjust trim or power. Extend the flaps to 50% of full flap travel. After stabilized, record stick force necessary to maintain original airspeed	5–15 lbs (2.2–6.6 daN) of force (Pull).
	OR	
	b) Trim for straight and level flight with flaps extended to 50% of full flap travel, at a constant airspeed within the flaps-extended airspeed range. Do not adjust trim or power. Retract the flaps to zero. After stabilized, record stick force necessary to maintain original airspeed	5–15 lbs (2.2–6.6 daN) of force (Push).
2.c.4	Gear change force	
	a) Trim for straight and level flight with landing gear retracted at a constant airspeed within the landing gear-extended airspeed range. Do not adjust trim or power. Extend the landing gear. After stabilized, record stick force necessary to maintain original airspeed	2–12 lbs (0.88–5.3 daN) of force (Pull).
	OR	
	b) Trim for straight and level flight with landing gear extended, at a constant airspeed within the landing gear-extended airspeed range. Do not adjust trim or power. Retract the landing gear. After stabilized, record stick force necessary to maintain original airspeed	2–12 lbs (0.88–5.3 daN) of force (Push).
2.b.5	Longitudinal trim	Must be able to trim longitudinal stick force to "zero" in each of the following configurations; cruise; approach; and landing.
2.c.7	Longitudinal static stability	Must exhibit positive static stability.
2.c.8	Stall warning (actuation of stall warning device) with nominal gross weight; wings level; and a deceleration rate of approximately one (1) knot per second	
	a) Landing configuration	80–100 knots; ± 5° of bank.
	b) Clean configuration	Landing configuration speed + 10–20%
2.c.8.b	Phugoid dynamics	Must have a phugoid with a period of 30–60 seconds. May not reach ½ or double amplitude in less than 2 cycles.
2.d Lateral Directional Test		
2.d.2	Roll response Roll rate must be measured through at least 30 degrees of roll. Aileron control must be deflected approximately ½ (50 percent) of maximum travel	Must have a roll rate of 6–40 degrees/second.

TABLE B2E.—ALTERNATIVE DATA SOURCE FOR FTD LEVEL 5 MULTI-ENGINE (TURBO-PROPELLER) AIRPLANE—Continued

<<< QPS requirement >>>		
Applicable test		Authorized performance range
No.	Title and procedure	
2.d.4.b ..	Spiral stability ..... Cruise configuration and normal cruise airspeed. Establish a 20–30 degree bank. When stabilized, neutralize the aileron control and release. Must be completed in both directions of turn	Initial bank angle (±5 degrees) after 20 seconds.
2.d.6.b ..	Rudder response ..... Use 50 percent of maximum rudder deflection (Applicable to approach or landing configuration.)	6–12 degrees/second yaw rate.
2.d.7	Dutch roll, yaw damper off (Applicable to cruise and approach configurations.)	A period of 2–5 seconds; and ½–3 cycles.
2.d.8	Steady state sideslip ..... Use 50 percent rudder deflection ..... (Applicable to approach and landing configurations.)	2–10 degrees of bank; 4–10 degrees of sideslip; and 2–10 degrees of aileron.
6. FTD System Response Time		
6.a	Cockpit instrument systems response to an abrupt pilot controller input. One test is required in each axis (pitch, roll, yaw)	300 milliseconds or less.

End QPS Requirements

5. Alternative Data Sources, Procedures, and Instrumentation: Level 6 FTD Only.

Begin Information

a. In recent years, considerable progress has been made by highly experienced aircraft and FTD manufacturers in improvement of aerodynamic modeling techniques. In conjunction with increased accessibility to very high powered computer technology, these techniques have become quite sophisticated. Additionally, those who have demonstrated success in combining these modeling techniques with minimal flight testing have incorporated the use of highly mature flight controls models and have had extensive experience in comparing the output of their effort with actual flight test data—and they have been able to do so on an iterative basis over a period of years.

b. It has become standard practice for experienced FTD manufacturers to use such techniques as a means of establishing data bases for new FTD configurations while awaiting the availability of actual flight test data; and then comparing this new data with the newly available flight test data. The results of such comparisons have, as reported by some recognized and experienced simulation experts, become increasingly consistent and indicate that these techniques, applied with appropriate experience, are becoming dependably accurate for the development of aerodynamic models for use in Level 6 FTDs.

c. In reviewing this history, the NSPM has concluded that, with proper care, those who are experienced in the development of aerodynamic models for FTD application can successfully use these modeling techniques to acceptably alter the method by which flight test data may be acquired and, when applied to Level 6 FTDs, does not compromise the quality of that simulation.

a. The information in the table that follows (Table of Alternative Data Sources, Procedures, and Information: Level 6 FTD Only) is presented to describe an acceptable alternative to data sources for Level 6 FTD modeling and validation, and an acceptable alternative to the procedures and instrumentation found in the flight test methods traditionally accepted for gathering modeling and validation data.

(1) Alternative data sources that may be used for part or all of a data requirement are the Airplane Maintenance Manual, the Airplane Flight Manual (AFM), Airplane Design Data, the Type Inspection Report (TIR), Certification Data or acceptable supplemental flight test data.

(2) The NSPM recommends that use of the alternative instrumentation noted in the following Table be coordinated with the NSPM prior to employment in a flight test or data gathering effort.

b. The NSPM position regarding the use of these alternative data sources, procedures, and instrumentation is based on three primary preconditions and presumptions regarding the objective data and FTD aerodynamic program modeling.

(1) Data gathered through the alternative means does not require angle of attack (AOA) measurements or control surface position measurements for any flight test. AOA can be sufficiently derived if the flight test program insures the collection of acceptable level, unaccelerated, trimmed flight data. Angle of attack may be validated by conducting the three basic ‘‘fly-by’’ trim tests. The FTD time history tests should begin in level, unaccelerated, and trimmed flight, and the results should be compared with the flight test pitch angle.

(2) A simulation controls system model should be rigorously defined and fully mature. It should also include accurate gearing and cable stretch characteristics (where applicable) that are determined from actual aircraft measurements. Such a model does not require control surface position measurements in the flight test objective data for Level 6 FTD applications.

c. This table is *not* applicable to Computer Controlled Aircraft FTDs.

d. Utilization of these alternate data sources, procedures, and instrumentation does not relieve the sponsor from compliance with the balance of the information contained in this document relative to Level 6 FTDs.

e. The term ‘‘inertial measurement system’’ allows the use of a functional global positioning system (GPS).

End Information

TABLE B2F.—ALTERNATIVE DATA SOURCES, PROCEDURES, AND INSTRUMENTATION LEVEL 6 FTD INFORMATION

Objective test reference number and title	Alternative data sources, procedures, and instrumentation	Notes and reminders
1.b.1 .... Performance Takeoff Ground acceleration time.	Data may be acquired through a synchronized video recording of a stop watch and the calibrated airplane airspeed indicator. Hand-record the flight conditions and airplane configuration.	This test is required only if RTO is sought.
1.b.7 .... Performance Takeoff Rejected takeoff.	Data may be acquired through a synchronized video recording of a stop watch and the calibrated airplane airspeed indicator. Hand-record the flight conditions and airplane configuration.	This test is required only if RTO is sought.
1.c.1 .... Performance Climb Normal climb all engines operating.	Data may be acquired with a synchronized video of calibrated airplane instruments and engine power throughout the climb range.	
1.f.1 .... Performance Engines Acceleration.	Data may be acquired with a synchronized video recording of engine instruments and throttle position.	
1.f.2 .... Performance Engines Deceleration.	Data may be acquired with a synchronized video recording of engine instruments and throttle position.	
2.a.1.a .... Handling qualities Static control tests Pitch controller position vs. force and surface position calibration.	Surface position data may be acquired from flight data recorder (FDR) sensor or, if no FDR sensor, at selected, significant column positions (encompassing significant column position data points), acceptable to the NSPM, using a control surface protractor on the ground (for airplanes with reversible control systems, this function should be accomplished with winds less than 5 kt). Force data may be acquired by using a hand held force gauge at the same column position data points.	
2.a.2.a .... Handling qualities Static control tests Wheel position vs. force and surface position calibration.	Surface position data may be acquired from flight data recorder (FDR) sensor or, if no FDR sensor, at selected, significant column positions (encompassing significant column position data points), acceptable to the NSPM, using a control surface protractor on the ground (for airplanes with reversible control systems, this function should be accomplished with winds less than 5 kt). Force data may be acquired by using a hand held force gauge at the same column position data points.	
2.a.3.a .... Handling qualities Static control tests Rudder pedal position vs. force and surface position calibration.	Surface position data may be acquired from flight data recorder (FDR) sensor or, if no FDR sensor, at selected, significant column positions (encompassing significant column position data points), acceptable to the NSPM, using a control surface protractor on the ground (for airplanes with reversible control systems, this function should be accomplished with winds less than 5 kt). Force data may be acquired by using a hand held force gauge at the same column position data points.	
2.a.4 .... Handling qualities Static control tests Nosewheel steering force.	Breakout data may be acquired with a hand held force gauge. The remainder of the force to the stops may be calculated if the force gauge and a protractor are used to measure force after breakout for at least 25% of the total displacement capability.	
2.a.5 .... Handling qualities Static control tests Rudder pedal steering calibration.	Data may be acquired through the use of force pads on the rudder pedals and a pedal position measurement device, together with design data for nose wheel position.	
2.a.6 .... Handling qualities Static control tests Pitch trim indicator vs. surface position calibration.	Data may be acquired through calculations.	

TABLE B2F.—ALTERNATIVE DATA SOURCES, PROCEDURES, AND INSTRUMENTATION LEVEL 6 FTD INFORMATION—Continued

Objective test reference number and title	Alternative data sources, procedures, and instrumentation	Notes and reminders
2.a.8 Handling qualities Static control tests Alignment of power lever angle vs. selected engine parameter (e.g., EPR, N_1, Torque).	Data may be acquired through the use of a temporary throttle quadrant scale to document throttle position. Use a synchronized video to record steady state instrument readings or hand-record steady state engine performance readings.	
2.a.9 Handling qualities Static control tests Brake pedal position vs. force.	Use of design or predicted data is acceptable. Data may be acquired by measuring deflection at "zero" and at "maximum.".	
2.c.1 Handling qualities. Longitudinal control tests Power change force.	Data may be acquired by using an inertial measurement system and a synchronized video of the calibrated airplane instruments, throttle position, and the force/position measurements of cockpit controls.	Power change dynamics test is acceptable using the same data acquisition methodology.
2.c.2 Handling qualities Longitudinal control tests Flap/slat change force.	Data may be acquired by using an inertial measurement system and a synchronized video of calibrated airplane instruments, flap/slat position, and the force/position measurements of cockpit controls.	Flap/slat change dynamics test is acceptable using the same data acquisition methodology.
2.c.4 Handling qualities Longitudinal control tests Gear change force.	Data may be acquired by using an inertial measurement system and a synchronized video of the calibrated airplane instruments, gear position, and the force/position measurements of cockpit controls.	Gear change dynamics test is acceptable using the same data acquisition methodology.
2.c.5 Handling qualities Longitudinal control tests Longitudinal trim.	Data may be acquired through use of an inertial measurement system and a synchronized video of the cockpit controls position (previously calibrated to show related surface position) and the engine instrument readings.	
2.c.6 Handling qualities Longitudinal control tests Longitudinal maneuvering stability (stick force/g).	Data may be acquired through the use of an inertial measurement system and a synchronized video of the calibrated airplane instruments; a temporary, high resolution bank angle scale affixed to the attitude indicator; and a wheel and column force measurement indication.	
2.c.7 Handling qualities Longitudinal control tests Longitudinal static stability.	Data may be acquired through the use of a synchronized video of the airplane flight instruments and a hand held force gauge.	
2.c.8 Handling qualities Longitudinal control tests Stall Warning (activation of stall warning device).	Data may be acquired through a synchronized video recording of a stop watch and the calibrated airplane airspeed indicator. Hand-record the flight conditions and airplane configuration.	Airspeeds may be cross checked with those in the TIR and AFM.
2.c.9.a Handling qualities Longitudinal control tests Phugoid dynamics.	Data may be acquired by using an inertial measurement system and a synchronized video of the calibrated airplane instruments and the force/position measurements of cockpit controls.	
2.c.10 Handling qualities Longitudinal control tests Short period dynamics.	Data may be acquired by using an inertial measurement system and a synchronized video of the calibrated airplane instruments and the force/position measurements of cockpit controls.	
2.c.11 Handling qualities Longitudinal control tests Gear and flap/slat operating times.	May use design data, production flight test schedule, or maintenance specification, together with an SOC.	
2.d.2 Handling qualities Lateral directional tests Roll response (rate).	Data may be acquired by using an inertial measurement system and a synchronized video of the calibrated airplane instruments and the force/position measurements of cockpit lateral controls.	

TABLE B2F.—ALTERNATIVE DATA SOURCES, PROCEDURES, AND INSTRUMENTATION LEVEL 6 FTD INFORMATION—Continued

Objective test reference number and title	Alternative data sources, procedures, and instrumentation	Notes and reminders
2.d.3 Handling qualities Lateral directional tests (a) Roll overshoot OR (b) Roll response to cockpit roll controller step input.	Data may be acquired by using an inertial measurement system and a synchronized video of the calibrated airplane instruments and the force/position measurements of cockpit lateral controls.	
2.d.4 Handling qualities Lateral directional tests Spiral stability.	Data may be acquired by using an inertial measurement system and a synchronized video of the calibrated airplane instruments; the force/position measurements of cockpit controls; and a stop watch.	
2.d.6.a Handling qualities Lateral directional tests Rudder response.	Data may be acquired by using an inertial measurement system and a synchronized video of the calibrated airplane instruments; the force/position measurements of rudder pedals.	
2.d.7 Handling qualities Lateral directional tests Dutch roll, (yaw damper OFF).	Data may be acquired by using an inertial measurement system and a synchronized video of the calibrated airplane instruments and the force/position measurements of cockpit controls.	
2.d.8 Handling qualities Lateral directional tests Steady state sideslip.	Data may be acquired by using an inertial measurement system and a synchronized video of the calibrated airplane instruments and the force/position measurements of cockpit controls.	

Attachment 3 to Appendix B to Part 60—Flight Training Device (FTD) Subjective Evaluation

1. Discussion

Begin Information

a. The subjective tests provide a basis for evaluating the capability of the FTD to perform over a typical utilization period. The items listed in the Table of Functions and Subjective Tests are used to determine whether the FTD competently simulates each required maneuver, procedure, or task; and verifying correct operation of the FTD controls, instruments, and systems. The tasks do not limit or exceed the authorizations for use of a given level of FTD as described on the Statement of Qualification or as may be approved by the TPAA. All items in the following paragraphs are subject to examination.

b. All simulated airplane systems functions will be assessed for normal and, where appropriate, alternate operations. Simulated airplane systems are listed separately under ''Any Flight Phase'' to ensure appropriate attention to systems checks. Operational navigation systems (including inertial navigation systems, global positioning systems, or other long-range systems) and the associated electronic display systems will be evaluated if installed. The NSP pilot will include in his report to the TPAA, the effect of the system operation and any system limitation.

e. At the request of the TPAA, the NSP Pilot may assess the FTD for a special aspect of a sponsor's training program during the functions and subjective portion of an evaluation. Such an assessment may include a portion of a Line Oriented Flight Training (LOFT) scenario or special emphasis items in the sponsor's training program. Unless directly related to a requirement for the qualification level, the results of such an evaluation would not affect the qualification of the FTD.

End Information

TABLE B3A.—TABLE OF FUNCTIONS AND SUBJECTIVE TESTS LEVEL 6 FTD

<<< QPS requirement >>>	
No.	
	Tasks in this table are subject to evaluation if appropriate for the airplane system or systems simulated as indicated in the SOQ Configuration List as defined in appendix B, Attachment 2 of this part.
1. Preflight	
	Accomplish a functions check of all installed switches, indicators, systems, and equipment at all crewmembers' and instructors' stations, and determine that the cockpit (or flight deck area) design and functions replicate the appropriate airplane.
2. Surface Operations (pre-takeoff)	
2.a	Engine start:

TABLE B3A.—TABLE OF FUNCTIONS AND SUBJECTIVE TESTS LEVEL 6 FTD—Continued

<<< QPS requirement >>>	No.
2.a.1	Normal start.
2.a.2	Alternative procedures start.
2.a.3	Abnormal procedures start/shut down.
2.b	Pushback/Powerback (powerback requires visual system).
3. Takeoff (requires appropriate visual system as set out in Table B1A, item 6.b.; appendix B, Attachment 1.)	
3.a	Instrument takeoff:
3.a.1	Engine checks (e.g., engine parameter relationships, propeller/mixture controls).
3.a.2	Acceleration characteristics.
3.a.3	Nosewheel/rudder steering.
3.a.4	Landing gear, wing flap, leading edge device operation.
3.b	Rejected takeoff:
3.b.1	Deceleration characteristics.
3.b.2	Brakes/engine reverser/ground spoiler operation.
3.b.3	Nosewheel/rudder steering.
4. In-Flight Operations	
4.a	Normal climb.
4.b	Cruise:
4.b.1	Demonstration of performance characteristics (speed vs. power).
4.b.2	Normal turns.
4.b.3	Demonstration of high altitude handling.
4.b.4	Demonstration of high airspeed handling/overspeed warning.
4.b.5	Demonstration of Mach effects on control and trim.
4.b.6	Steep turns.
4.b.10 ...	In-Flight engine shutdown (procedures only).
4.b.11 ...	In-Flight engine restart (procedures only).
4.b.13 ...	Specific flight characteristics.
4.b.14 ...	Response to loss of flight control power.
4.b.15 ...	Response to other flight control system failure modes.
4.b.19 ...	Operations during icing conditions.
4.b.20 ...	Effects of airframe/engine icing.
4.c	Other flight phase:
4.c.1	Approach to stalls in the following configurations:
4.c.1.a ..	Cruise.
4.c.1.b ..	Takeoff or approach.
4.c.1.c ..	Landing.

TABLE B3A.—TABLE OF FUNCTIONS AND SUBJECTIVE TESTS LEVEL 6 FTD—Continued

<<< QPS requirement >>>	No.
4.c.2	High angle of attack maneuvers in the following configurations:
4.c.2.a	Cruise.
4.c.2.b	Takeoff or approach.
4.c.2.c	Landing.
4.c.3	Slow flight.
4.c.4	Holding.
5.a.1	Non-precision Instrument Approaches:
5.a.1.a.1	With use of autopilot and autothrottle, as applicable.
5.a.1.a.2	Without use of autopilot and autothrottle, as applicable.
5.a.1.b.1	With 10 knot tail wind.
5.a.1.b.2	With 10 knot crosswind.
5.a.2	Precision Instrument Approaches:
5.a.2.a.1	With use of autopilot, autothrottle, and autoland, as applicable.
5.a.2.a.2	Without use of autopilot, autothrottle, and autoland, as applicable.
5.a.2.b.1	With 10 knot tail wind.
5.a.2.b.2	With 10 knot crosswind.
6. Missed Approach	
6.a	Manually controlled.
6.b	Automatically controlled (if applicable).
7. Any Flight Phase, as appropriate	
7.a	Normal system operation (installed systems).
7.b	Abnormal/Emergency system operation (installed systems).
7.c	Flap operation.
7.d	Landing gear operation.
7.e	Engine Shutdown and Parking.
7.e.1	Systems operation.
7.e.2	Parking brake operation.
8. Instructor Operating Station (IOS), as appropriate	
8.a	Functions in this section are subject to evaluation only if appropriate for the airplane and/or installed on the specific FTD involved. Power Switch(es).
8.b	Airplane conditions.
8.b.1	Gross weight, center of gravity, and fuel loading and allocation.
8.b.2	Airplane systems status.
8.b.3	Ground crew functions (e.g., external power, push back).
8.c	Airports.
8.c.1	Selection.

TABLE B3A.—TABLE OF FUNCTIONS AND SUBJECTIVE TESTS LEVEL 6 FTD—Continued

<<< QPS requirement >>>	No.
8.c.2	Runway selection.
8.c.3	Preset positions (e.g., ramp, over FAF).
8.d	Environmental controls.
8.d.1	Temperature.
8.d.2	Climate conditions (e.g., ice, rain).
8.d.3	Wind speed and direction.
8.e	Airplane system malfunctions.
8.e.1	Insertion/deletion.
8.e.2	Problem clear.
8.f	Locks, Freezes, and Repositioning.
8.f.1	Problem (all) freeze/release.
8.f.2	Position (geographic) freeze/release.
8.f.3	Repositioning (locations, freezes, and releases).
8.f.4	Ground speed control.
8.f.5	Remote IOS, if installed.
9. Sound Controls. On/off/adjustment	
10. Control Loading System (as applicable) On/off/emergency stop	
11. Observer Stations	
11.a	Position.
11.b	Adjustments.

End QPS Requirements

TABLE B3B.—TABLE OF FUNCTIONS AND SUBJECTIVE TESTS—LEVEL 5 FTD

<<< QPS Requirements >>>	
No.	Operations tasks
	Tasks in this table are subject to evaluation if appropriate for the airplane system or systems simulated as indicated in the SOQ Configuration List as defined in appendix B, Attachment 2 of this part.
1. Preflight	
	Accomplish a functions check of all installed switches, indicators, systems, and equipment at all crewmembers' and instructors' stations, and determine that the cockpit (or flight deck area) design and functions replicate the appropriate airplane.
2. Surface Operations (pre-takeoff)	
2.a	Engine start (if installed):
2.a.1	Normal start.
2.a.2	Alternative procedures start.
2.a.3	Abnormal/Emergency procedures start / shut down.
3. In-Flight Operations	
3.a	Normal climb.

TABLE B3B.—TABLE OF FUNCTIONS AND SUBJECTIVE TESTS—LEVEL 5 FTD—Continued

<<< QPS Requirements >>>	
No.	Operations tasks
3.b	Cruise:
3.b.1	Performance characteristics (speed vs. power).
3.b.2	Normal turns.
3.c	Normal descent.
4. Approaches	
4.a.	Coupled instrument approach maneuvers (as applicable for the systems installed).
5. Any Flight Phase	
5.a	Normal system operation (Installed systems).
5.b	Abnormal/Emergency system operation (installed systems).
5.c	Flap operation.
5.d	Landing gear operation.
5.e	Engine Shutdown and Parking (if installed).
5.e.1	Systems operation.
5.e.2	Parking brake operation.
6. Instructor Operating Station (IOS)	
6.a	Power Switch(es).
6.b	Preset positions—ground, air.
6.c	Airplane system malfunctions (Installed systems).
6.c.1	Insertion/deletion.
6.c.2	Problem clear.

TABLE B3C.—TABLE OF FUNCTIONS AND SUBJECTIVE TESTS—LEVEL 4 FTD

<<< QPS Requirements >>>	
No.	Operations tasks
	Tasks in this table are subject to evaluation if appropriate for the airplane system or systems simulated as indicated in the SOQ Configuration List as defined in appendix B, Attachment 2 of this part.
1	Level 4 FTDs are required to have at least one system. However, the NSP will accomplish a functions check of all installed systems, switches, indicators, and equipment at all crewmembers' and instructors' stations, and determine that the cockpit (or flight deck area) design and functions replicate the appropriate airplane.

Attachment 4 to Appendix B to Part 60—Sample Documents

Begin Information

Table of Contents

BILLING CODE 491073–P

Attachment 4 to Appendix B to Part 60—
Figure B4A – Sample Letter , Request for Initial, Upgrade, or Reinstatement Evaluation..
INFORMATION

Date _______

Edward D. Cook, Ph.D.
Manager, National Simulator Program
Federal Aviation Administration
100 Hartsfield Centre Parkway
Suite 400
Atlanta, GA 30354

Dear Dr. Cook:

RE: Request for Initial/Upgrade Evaluation Date

This is to advise you of our intent to request an (initial or upgrade) evaluation of our (FSTD Manufacturer), (Aircraft Type/Level) Flight Simulation Training Device (FSTD), (FAA ID Number, if previously qualified), located in (City, State) at the (Facility) on (Proposed Evaluation Date). (The proposed evaluation date shall not be more than 180 days following the date of this letter.) The FSTD will be sponsored by (Name of Training Center/Air Carrier), FAA Designator (4 Letter Code). The FSTD will be sponsored under the following options: (Select One)

☐ The FSTD will be used within the sponsor's FAA approved training program and placed on the sponsor's Training/Operations Specifications; or

☐ The FSTD will be used for dry lease only in accordance with Paragraph 3b, FSTD Guidance Bulletin 03-08.

We agree to provide the formal request for the evaluation (*Ref: Appendix 4, AC 120-40B*) to your staff as follows: (check one)

☐ For QTG tests run at the factory, not later, than 45 days prior to the proposed evaluation date with the additional "1/3 on-site" tests provided not later than 14 days prior to the proposed evaluation date.

☐ For QTG tests run on-site, not later than 30 days prior to the proposed evaluation date.

We understand that the formal request will contain the following documents:

4. Sponsor's Letter of Request (*Company Compliance Letter*).
5. Principal Operations Inspector (POI) or Training Center Program Manager's (TCPM) endorsement.
6. Complete QTG.

If we are unable to meet the above requirements, we understand this may result in a significant delay, perhaps 45 days or more, in rescheduling and completing the evaluation.

(The sponsor should add additional comments as necessary).

Please contact (Name Telephone and Fax Number of Sponsor's Contact) to confirm the date for this initial evaluation. We understand a member of your National Simulator Program staff will respond to this request within 14 days.

A copy of this letter of intent has been provided to (Name), the Principal Operations Inspector (POI) and/or Training Center Program Manager (TCPM).

Sincerely,

Attachment: FSTD Information and Characteristics Form
cc: POI/TCPM

ATTACHMENT 4 TO APPENDIX A TO PART 60—
Figure B4B – Sample Letter , Request for Initial, Upgrade, or Reinstatement Evaluation
Attachment: FSTD Information Form
INFORMATION

Date: _____

Section 1. FSTD Information and Characteristics

Sponsor Name:	_____	**FSTD Location:**	
Address:	_____ _____	**Physical Address:**	_____ _____
City:	_____	**City:**	_____
State:	_____	**State:**	_____
Country:	_____	**Country:**	_____
ZIP:	_____	**ZIP:**	_____
Manager	_____		
Sponsor ID No: *(Four Letter FAA Designator)*	_____	**Nearest Airport:** *(Airport Designator)*	_____

Type of Evaluation Requested:			☐ Initial ☐ Upgrade ☐ Recurrent ☐ Special ☐ Reinstatement		
Qualification Basis: _____	☐ A	☐ B	☐ Interim C	☐ C	☐ D
	☐ 6	☐ 7	☐ Provisional Status		

Initial Qualification: (If Applicable)	Date: _____ Level _____	**Manufacturer's Identification/Serial No:**	_____
Upgrade Qualification: (If Applicable)	Date: _____ Level _____ MM/DD/YYYY	☐ **eQTG**	

Other Technical Information:

FAA FSTD ID No: (If Applicable)	_____	**FSTD Manufacturer:**	_____
Convertible FSTD:	☐ Yes:	**Date of Manufacture:**	_____ MM/DD/YYYY
Related FAA ID No. (If Applicable)	_____ _____ _____	**Sponsor FSTD ID No:** _____	
Aircraft model/series: _____		**Source of aerodynamic model:** _____	
Engine model(s) and data revision: _____		**Source of aerodynamic coefficient data:** _____	
FMS identification and revision level: _____		**Aerodynamic data revision number:** _____	
Visual system manufacturer/model: _____		**Visual system display:** _____	
Flight control data revision: _____		**FSTD computer(s) identification:** _____	
Motion system manufacturer/type: _____			

National Aviation Authority (NAA): (If Applicable)	_____		_____

ATTACHMENT 4 TO APPENDIX A TO PART 60—
Figure B4B – Sample Letter , Request for Initial, Upgrade, or Reinstatement Evaluation
Attachment: FSTD Information Form
INFORMATION

Visual System Manufacturer and Type:	_____	**Motion System Manufacturer and Type:**	_____
Aircraft Make/Model/Series:	_____	**FSTD Seats Available:**	_____

Aircraft Equipment	**ENGINE TYPE(S):** _____	**Flight Instrumentation:** ☐ EFIS ☐ HUD ☐ HGS ☐ EFVS ☐ TCAS ☐ GPWS ☐ Plain View ☐ GPS ☐ FMS Type: _____ ☐ WX Radar ☐ Other: _____	Engine Instrumentation: ☐ **EICAS** ☐ **FADEC** ☐ **Other:**

Airport Models:	3.6.1 _____ *Airport Designator*	3.6.2_____ *Airport Designator*	3.6.3 _____ *Airport Designator*
Circle to Land:	3. 7.1 _____ *Airport Designator*	3. 7.2_____ *Approach*	3. 7.3 _____ *Landing Runway*
Visual Ground Segment	3.8.1 _____ *Airport Designator*	3.8 .2_____ *Approach*	3. 8.3 _____ *Landing Runway*

Section 2. Supplementary Information

FAA Training Program Approval Authority:		☐ **POI** ☐ **TCPM** ☐ **Other:** _____	
Name:	_____	**Office:**	_____
Tel:	_____	**Fax:**	_____
Email:	_____		

FSTD Scheduling Person:			
Name:	_____		
Address 1:	_____	**Address 2**	_____
City:	_____	**State:**	_____
ZIP:	_____	**Email:**	_____
Tel:	_____	**Fax:**	_____

FSTD Technical Contact:			
Name:	_____		
Address 1:	_____	**Address 2**	_____
City:	_____	**State:**	_____
ZIP:	_____	**Email:**	_____
Tel:	_____	**Fax:**	_____

Section 3. Training, Testing and Checking Considerations

Area/Function/Maneuver	Requested	Remarks
Private Pilot - Training / Checks: (142)	☐	_____
Commercial Pilot - Training /Checks:(142)	☐	_____
Multi-Engine Rating - Training / Checks (142)	☐	_____
Instrument Rating -Training / Checks (142)	☐	_____
Type Rating - Training / Checks (135/121/142)	☐	_____
Proficiency Checks (135/121/142)	☐	_____

ATTACHMENT 4 TO APPENDIX A TO PART 60—
Figure B4B – Sample Letter , Request for Initial, Upgrade, or Reinstatement Evaluation
Attachment: FSTD Information Form
INFORMATION

Section 3. Training, Testing and Checking Considerations		
Area/Function/Maneuver	**Requested**	**Remarks**
Private Pilot - Training / Checks: (142)	☐	____
Commercial Pilot - Training /Checks:(142)	☐	____
Multi-Engine Rating - Training / Checks (142)	☐	____
Instrument Rating -Training / Checks (142)	☐	____
Type Rating - Training / Checks (135/121/142)	☐	____
Proficiency Checks (135/121/142)	☐	____
CAT I: (RVR 2400/1800 ft. DH200 ft)	☐	____
CAT II: (RVR 1200 ft. DH 100 ft)	☐	____
CAT III * (lowest minimum) _____ RVR _____ ft. * *State CAT III (≤ 700 ft.), CAT IIIb (≤ 150 ft.), or CAT IIIc (0 ft.)*	☐	____
Circling Approach	☐	____
Windshear Training: (FSTD GB 03-05)	☐	____
Windshear Training IAW 121.409d (121 Turbojets Only) (FSTD GB 03-05)	☐	____
Generic Unusual Attitudes and Recoveries within the Normal Flight Envelope (FSTD GB 04-03)	☐	____
Specific Unusual Attitudes Recoveries (HBAT 95-10) (FSTD GB 04-03)	☐	____
Auto-coupled Approach/Auto Go Around	☐	____
Auto-land / Roll Out Guidance	☐	____
TCAS/ACAS I / II	☐	____
WX-Radar	☐	____
HUD (FSTD GB 03-02)	☐	____
HGS (FSTD GB 03-02)	☐	
EFVS (FSTD GB 03-03)	☐	
Future Air Navigation Systems (HBAT 98-16A)	☐	____
GPWS / EGPWS	☐	____
ETOPS Capability	☐	____
GPS	☐	____
SMGCS	☐	____
Helicopter Slope Landings	☐	____
Helicopter External Load Operations	☐	____
Helicopter Pinnacle Approach to Landings	☐	____
Helicopter Night Vision Maneuvers	☐	____
Helicopter Category A Takeoffs	☐	____

ATTACHMENT 4 TO APPENDIX B TO PART 60—
Figure B4C – Sample Qualification Test Guide Cover Page
INFORMATION

SPONSOR NAME

SPONSOR ADDRESS

FAA QUALIFICATION TEST GUIDE

(SPECIFIC AIRPLANE MODEL)
for example
Stratos BA797-320A

(Type of FTD)

(FTD Identification Including Manufacturer, Serial Number, Visual System Used)

(FTD Level)

(Qualification Performance Standard Used)

(FTD Location)

FAA Initial Evaluation

Date: ____________

________________________ Date: __________
(Sponsor)

________________________ Date: __________
Manager, National
Simulator Program, FAA

ATTACHMENT 4 TO APPENDIX B TO PART 60—
Figure B4D – Sample Statement of Qualification - Certificate

INFORMATION

Federal Aviation Administration
National Simulator Program

Statement of Qualification

This is to certify that representatives of the National Simulator Program
Completed an evaluation of the

Go-Fast Airlines
Farnsworth Z-100 Flight Training Device
FAA Identification Number 998

And found it to meet the standards set forth in
AC 120-45A

The Master Qualification Test Guide and the attached
Configuration List and Restrictions List
Provide the Qualification Basis for this device to operate at

Level 6

Until December 31, 2008

Unless sooner rescinded or extended by the National Simulator Program Manager

November 15, 2007 (date)

J. B. Checkin, Jr. (for the NSPM)

ATTACHMENT 4 TO APPENDIX B TO PART 60—
Figure B4E – Sample Statement of Qualification; Configuration List
INFORMATION

STATEMENT of QUALIFICATION
CONFIGURATION LIST

Date: _____			
Section 1. FSTD Information and Characteristics			
Sponsor Name:	_____	**FSTD Location:**	
Address:	_____ _____	**Physical Address:**	_____ _____
City:	_____	**City:**	_____
State:	_____	**State:**	_____
Country:	_____	**Country:**	_____
ZIP:	_____	**ZIP:**	_____
Manager	_____		
Sponsor ID No: *(Four Letter FAA Designator)*	_____	**Nearest Airport:** *(Airport Designator)*	_____

Type of Evaluation Requested:			☐ **Initial** ☐ **Upgrade** ☐ **Recurrent** ☐ **Special** ☐ **Reinstatement**		
Qualification Basis: _____	☐ **A**	☐ **B**	☐ **Interim C**	☐ **C**	☐ **D**
	☐ **6**	☐ **7**	☐ **Provisional Status**		

Initial Qualification: (If Applicable)	**Date:** _____ **Level** _____	**Manufacturer's Identification/Serial No:**	_____
Upgrade Qualification: (If Applicable)	**Date:** _____ **Level** _____ MM/DD/YYYY	☐ **eQTG**	

Other Technical Information:			
FAA FSTD ID No: (If Applicable)	_____	**FSTD Manufacturer:**	_____
Convertible FSTD:	☐Yes:	**Date of Manufacture:**	_____ MM/DD/YYYY
Related FAA ID No. (If Applicable)	_____ _____ _____	**Sponsor FSTD ID No:** _____	
Aircraft model/series: _____		**Source of aerodynamic model:** _____	
Engine model(s) and data revision: _____		**Source of aerodynamic coefficient data:** _____	
FMS identification and revision level: _____		**Aerodynamic data revision number:** _____	
Visual system manufacturer/model: _____		**Visual system display:** _____	
Flight control data revision: _____		**FSTD computer(s) identification:** _____	
Motion system manufacturer/type: _____			

National Aviation Authority (NAA): (If Applicable)	_____		_____

ATTACHMENT 4 TO APPENDIX B TO PART 60—
Figure B4E – Sample Statement of Qualification; Configuration List
INFORMATION

Visual System Manufacturer and Type:	_____	**Motion System Manufacturer and Type:**	_____
Aircraft Make/Model/Series:	_____	**FSTD Seats Available:**	_____

Aircraft Equipment	**ENGINE TYPE(S):** _____	**Flight Instrumentation:** ☐ **EFIS** ☐ **HUD** ☐ **HGS** ☐ **EFVS** ☐ **TCAS** ☐ **GPWS** ☐ **Plain View** ☐ **GPS** ☐ **FMS Type:** _____ ☐ **WX Radar** ☐ **Other:** _____	Engine Instrumentation: ☐ **EICAS** ☐ **FADEC** ☐ **Other:** _____

Airport Models:	3.6.1 _____ *Airport Designator*	3.6.2_____ *Airport Designator*	3.6.3 _____ *Airport Designator*
Circle to Land:	3. 7.1 _____ *Airport Designator*	3. 7.2_____ *Approach*	3. 7.3 _____ *Landing Runway*
Visual Ground Segment	3.8.1 _____ *Airport Designator*	3.8 .2_____ *Approach*	3. 8.3 _____ *Landing Runway*

Section 2. Supplementary Information

FAA Training Program Approval Authority:		☐ **POI** ☐ **TCPM** ☐ **Other**: ______	
Name:	_____	**Office:**	_____
Tel:	_____	**Fax:**	_____
Email:	_____		

FSTD Scheduling Person:			
Name:	_____		
Address 1:	_____	**Address 2**	_____
City:	_____	**State:**	_____
ZIP:	_____	**Email:**	_____
Tel:	_____	**Fax:**	_____

FSTD Technical Contact:			
Name:	_____		
Address 1:	_____	**Address 2**	_____
City:	_____	**State:**	_____
ZIP:	_____	**Email:**	_____
Tel:	_____	**Fax:**	_____

Section 3. Training, Testing and Checking Considerations

Area/Function/Maneuver	**Requested**	**Remarks**
Private Pilot - Training / Checks: (142)	☐	_____
Commercial Pilot - Training /Checks:(142)	☐	_____
Multi-Engine Rating - Training / Checks (142)	☐	_____
Instrument Rating -Training / Checks (142)	☐	_____
Type Rating - Training / Checks (135/121/142)	☐	_____
Proficiency Checks (135/121/142)	☐	_____
CAT I: (RVR 2400/1800 ft. DH200 ft)	☐	_____

ATTACHMENT 4 TO APPENDIX B TO PART 60—

Figure B4E – Sample Statement of Qualification; Configuration List

INFORMATION

Commercial Pilot - Training /Checks:(142)	☐	_____
Multi-Engine Rating - Training / Checks (142)	☐	_____
Instrument Rating -Training / Checks (142)	☐	_____
Type Rating - Training / Checks (135/121/142)	☐	_____
Proficiency Checks (135/121/142)	☐	_____
CAT I: (RVR 2400/1800 ft. DH200 ft)	☐	_____
CAT II: (RVR 1200 ft. DH 100 ft)	☐	_____
CAT III * (lowest minimum) _____ RVR _____ ft. * *State CAT III (≤ 700 ft.), CAT IIIb (≤ 150 ft.), or CAT IIIc (0 ft.)*	☐	_____
Circling Approach	☐	_____
Windshear Training: (FSTD GB 03-05)	☐	_____
Windshear Training IAW 121.409d (121 Turbojets Only) (FSTD GB 03-05)	☐	_____
Generic Unusual Attitudes and Recoveries within the Normal Flight Envelope (FSTD GB 04-03)	☐	_____
Specific Unusual Attitudes Recoveries (HBAT 95-10) (FSTD GB 04-03)	☐	_____
Auto-coupled Approach/Auto Go Around	☐	_____
Auto-land / Roll Out Guidance	☐	_____
TCAS/ACAS I / II	☐	_____
WX-Radar	☐	_____
HUD (FSTD GB 03-02)	☐	_____
HGS (FSTD GB 03-02)	☐	
EFVS (FSTD GB 03-03)	☐	
Future Air Navigation Systems (HBAT 98-16A)	☐	_____
GPWS / EGPWS	☐	_____
ETOPS Capability	☐	_____
GPS	☐	_____
SMGCS	☐	_____
Helicopter Slope Landings	☐	_____
Helicopter External Load Operations	☐	_____
Helicopter Pinnacle Approach to Landings	☐	_____
Helicopter Night Vision Maneuvers	☐	_____
Helicopter Category A Takeoffs	☐	_____

ATTACHMENT 4 TO APPENDIX B TO PART 60—
Figure B4F – Sample Statement of Qualification;– List of Qualified Tasks
INFORMATION

STATEMENT of QUALIFICATION
List of Qualified Tasks

Go Fast Airline Training -- Farnsworth Z-100 -- Level D -- FAA ID# 999

The FSTD is qualified to perform all of the tasks listed in
Appendix 1, Table B1B
for its assigned level of qualification *except* for the following listed tasks.

Qualified for all tasks in Table B1B, for which the sponsor has requested qualification, except for the following:

4.e.	Circling Approach
6. (a)	Emergency Descent (maximum rate)
6. (b)	Inflight Fire and Smoke Removal
6. (c)	Rapid Decompression
6. (d)	Emergency Evacuation

Additional tasks for which this FSTD is qualified (i.e., in addition to the list in Table B1B):

NONE

Attachment 4 to Appendix B to Part 60—
Figure B4G – Sample Continuing Qualification Evaluation Requirements Page Information

Recurrent Evaluation Requirements ***Completed at conclusion of Initial Evaluation***	
Recurrent Evaluations to be conducted each _(fill in)__ months Allotting ______ hours of FTD time. Signed: ______________________________ NSPM / Evaluation Team Leader	Recurrent evaluations are due as follows: _(month)__ and __(month)_ and __(month)_ (enter or strike out, as appropriate) ____________________ Date

Revision: Based on (enter reasoning):	
Recurrent Evaluations are to be conducted each _(fill in)__ months. Allotting ______ hours. Signed: ______________________________ NSPM Evaluation Team Leader	Recurrent evaluations are due as follows: _(month)__ and __(month)_ and __(month)_ (enter or strike out, as appropriate) ____________________ Date

Revision: Based on (enter reasoning):	
Recurrent Evaluations are to be conducted each _(fill in)__ months. Allotting ______ hours. Signed: ______________________________ NSPM Evaluation Team Leader	Recurrent evaluations are due as follows: _(month)__ and __(month)_ and __(month)_ (enter or strike out, as appropriate) ____________________ Date

(Repeat as Necessary)

Attachment 4 to Appendix B to Part 60—
Figure B4H – Sample MQTG Index of Effective FSTD Directives

Index of Effective FSTD Directives
Filed in this Section

Notification Number	Received From: (TPAA/NSPM)	Date of Notification	Date of Modification Completion

Continue as Necessary....

BILLING CODE 491073–C

Appendix C to Part 60—Qualification Performance Standards for Helicopter Full Flight Simulators

Begin Information

This appendix establishes the standards for Helicopter Full Flight Simulator (FFS) evaluation and qualification. The Flight Standards Service, National Simulator Program Manager (NSPM), is responsible for the development, application, and implementation of the standards contained within this appendix. The procedures and criteria specified in this appendix will be used by the NSPM, or a person assigned by the NSPM, when conducting helicopter FFS evaluations.

Table of Contents

End Information

1. Introduction

Begin Information

a. This appendix contains background information as well as regulatory and informative material as described later in this section. To assist the reader in determining what areas are required and what areas are permissive, the text in this appendix is divided into two sections: ''QPS Requirements'' and ''Information.'' The QPS Requirements sections contain details regarding compliance with the part 60 rule language. These details are regulatory, but are found only in this appendix. The Information sections contain material that is advisory in nature, and designed to give the user general information about the regulation.

b. Related Reading References.
(1) 14 CFR part 60.
(2) 14 CFR part 61.
(3) 14 CFR part 63.
(4) 14 CFR part 119.
(5) 14 CFR part 121.
(6) 14 CFR part 125.
(7) 14 CFR part 135.
(8) 14 CFR part 141.

(9) 14 CFR part 142.
(10) AC 120–35B, Line Operational Simulations: Line-Oriented Flight Training, Special Purpose Operational Training, Line Operational Evaluation.
(11) AC 120–57A, Surface Movement Guidance and Control System (SMGS).
(12) AC 150/5300–13, Airport Design.
(13) AC 150/5340–1G, Standards for Airport Markings.
(14) AC 150/5340–4C, Installation Details for Runway Centerline Touchdown Zone Lighting Systems.
(15) AC 150/5340–19, Taxiway Centerline Lighting System.
(16) AC 150/5340–24, Runway and Taxiway Edge Lighting System.
(17) AC 150/5345–28D, Precision Approach Path Indicator (PAPI) Systems.
(18) AC 150/5390–2B, Heliport Design.
(19) International Air Transport Association document, ''Flight Simulator Design and Performance Data Requirements,'' as amended.
(20) AC 29–2B, Flight Test Guide for Certification of Transport Category Rotorcraft.
(21) AC 27–1A, Flight Test Guide for Certification of Normal Category Rotorcraft.
(22) International Civil Aviation Organization (ICAO) Manual of Criteria for the Qualification of Flight Simulators, as amended.
(23) Airplane Flight Simulator Evaluation Handbook, Volume I, as amended and Volume II, as amended, The Royal Aeronautical Society, London, UK.
(24) FAA Publication FAA–S–8081 series (Practical Test Standards for Airline Transport Pilot Certificate, Type Ratings, Commercial Pilot, and Instrument Ratings).
(25) The FAA Aeronautical Information Manual (AIM). An electronic version of the AIM is on the internet at *http://www.faa.gov/atpubs*.

End Information

---

2. Applicability (§§ 60.1 & 60.2)

Begin Information

There is no additional regulatory or informational material that applies to § 60.1, Applicability, or to § 60.2, Applicability of sponsor rules to person who are not sponsors and who are engaged in certain unauthorized activities.

End Information

---

3. Definitions (§ 60.3)

Begin Information

See appendix F for a list of definitions and abbreviations from part 1 and part 60, including the appropriate appendices of part 60.

End Information

---

4. Qualification Performance Standards (§ 60.4)

Begin Information

There is no additional regulatory or informational material that applies to § 60.4, Qualification Performance Standards.

End Information

---

5. Quality Management System (§ 60.5)

Begin Information

See appendix E for additional regulatory and informational material regarding Quality Management Systems.

End Information

---

6. Sponsor Qualification Requirements (§ 60.7)

Begin Information

a. The intent of the language in § 60.7(b) is to have a specific FFS, identified by the sponsor, used at least once in an FAA-approved flight training program for the helicopter simulated during the 12-month period described. The identification of the specific FFS may change from one 12-month period to the next 12-month period as long as that sponsor sponsors and uses at least one FFS at least once during the prescribed period. There is no minimum number of hours or minimum FFS periods required.

b. The following examples describe acceptable operational practices:

(1) Example One.

(a) A sponsor is sponsoring a single, specific FFS for its own use, in its own facility or elsewhere—this single FFS forms the basis for the sponsorship. The sponsor uses that FFS at least once in each 12-month period in that sponsor's FAA-approved flight training program for the helicopter simulated. This 12-month period is established according to the following schedule:

(i) If the FFS was qualified prior to October 30, 2007 the 12-month period begins on the date of the first continuing qualification evaluation conducted in accordance with § 60.19 after October 30, 2007 and continues for each subsequent 12-month period;

(ii) A device qualified on or after October 30, 2007 will be required to undergo an initial or upgrade evaluation in accordance with § 60.15. Once the initial or upgrade evaluation is complete, the first continuing qualification evaluation will be conducted within 6 months. The 12 month continuing qualification evaluation cycle begins on that date and continues for each subsequent 12-month period.

(b) There is no minimum number of hours of FFS use required.

(c) The identification of the specific FFS may change from one 12-month period to the next 12-month period as long as that sponsor sponsors and uses at least one FFS at least once during the prescribed period.

(2) Example Two.

(a) A sponsor sponsors an additional number of FFSs, in its facility or elsewhere. Each additionally sponsored FFS must be—

(i) Used by the sponsor in the sponsor's FAA-approved flight training program for the helicopter simulated (as described in § 60.7(d)(1));

OR

(ii) Used by another FAA certificate holder in that other certificate holder's FAA-approved flight training program for the helicopter simulated (as described in § 60.7(d)(1)). This 12-month period is established in the same manner as in example one.

OR

(iii) Provided a statement each year from a qualified pilot (after having flown the helicopter, not the subject FFS or another FFS, during the preceding 12-month period) stating that the subject FFS's performance and handling qualities represent the helicopter (as described in § 60.7(d)(2)). This statement is provided at least once in each 12-month period established in the same manner as in example one.

(b) There is no minimum number of hours of FFS use required.

(3) Example Three.

(a) A sponsor in New York (in this example, a Part 142 certificate holder) establishes ''satellite'' training centers in Chicago and Moscow.

(b) The satellite function means that the Chicago and Moscow centers must operate under the New York center's certificate (in accordance with all of the New York center's practices, procedures, and policies; *e.g.*, instructor and/or technician training/checking requirements, record keeping, QMS program).

(c) All of the FFSs in the Chicago and Moscow centers could be dry-leased (*i.e.*, the certificate holder does not have and use FAA-approved flight training programs for the FFSs in the Chicago and Moscow centers) because —

(i) Each FFS in the Chicago center and each FFS in the Moscow center is used at least once each 12-month period by another FAA certificate holder in that other certificate holder's FAA-approved flight training program for the helicopter (as described in § 60.7(d)(1));

OR

(ii) A statement is obtained from a qualified pilot (having flown the helicopter, not the subject FFS or another FFS during the preceding 12-month period) stating that the performance and handling qualities of each FFS in the Chicago and Moscow centers represents the helicopter (as described in § 60.7(d)(2)).

End Information

---

7. Additional Responsibilities of the Sponsor (§ 60.9)

Begin Information

The phrase ''as soon as practicable'' in § 60.9(a) means without unnecessarily disrupting or delaying beyond a reasonable time the training, evaluation, or experience being conducted in the FSTD.

End Information

---

8. FSTD Use (§ 60.11)

Begin Information

There is no additional regulatory or informational material that applies to § 60.11, FSTD Use.

End Information

9. Simulator Objective Data Requirements (§ 60.13)

Begin QPS Requirements

a. Flight test data used to validate FFS performance and handling qualities must have been gathered in accordance with a flight test program containing the following:

(1) A flight test plan consisting of:

(a) The maneuvers and procedures required for aircraft certification and simulation programming and validation.

(b) For each maneuver or procedure—

(i) The procedures and control input the flight test pilot and/or engineer used.

(ii) The atmospheric and environmental conditions.

(iii) The initial flight conditions.

(iv) The helicopter configuration, including weight and center of gravity.

(v) The data to be gathered.

(vi) All other information necessary to recreate the flight test conditions in the FFS.

(2) Appropriately qualified flight test personnel.

(3) An understanding of the accuracy of the data to be gathered using appropriate alternative data sources, procedures, and instrumentation that is traceable to a recognized standard as described in Attachment 2, Table C2D.

(4) Appropriate and sufficient data acquisition equipment or system(s), including appropriate data reduction and analysis methods and techniques, as would be acceptable to the FAA's Aircraft Certification Service.

b. The data, regardless of source, must be presented:

(1) in a format that supports the FFS validation process;

(2) in a manner that is clearly readable and annotated correctly and completely;

(3) with resolution sufficient to determine compliance with the tolerances set forth in Attachment 2, Table C2A of this appendix.

(4) with any necessary instructions or other details provided, such as yaw damper or throttle position; and

(5) without alteration, adjustments, or bias; however the data may be re-scaled, digitized, or otherwise manipulated to fit the desired presentation.

c. After completion of any additional flight test, a flight test report must be submitted in support of the validation data. The report must contain sufficient data and rationale to support qualification of the FFS at the level requested.

d. As required by § 60.13(f), the sponsor must notify the NSPM when it becomes aware that an addition to, an amendment to, or a revision of data that may relate to FFS performance or handling characteristics is available. The data referred to in this paragraph are those data that are used to validate the performance, handling qualities, or other characteristics of the aircraft, including data related to any relevant changes occurring after the type certificate was issued. This notification must be made within 10 working days.

End QPS Requirements

Begin Information

e. The FFS sponsor is encouraged to maintain a liaison with the manufacturer of the aircraft being simulated (or with the holder of the aircraft type certificate for the aircraft being simulated if the manufacturer is no longer in business), and, if appropriate, with the person having supplied the aircraft data package for the FFS in order to facilitate the notification required by § 60.13(f).

f. It is the intent of the NSPM that for new aircraft entering service, at a point well in advance of preparation of the Qualification Test Guide (QTG), the sponsor should submit to the NSPM for approval, a descriptive document (a validation data roadmap) containing the plan for acquiring the validation data, including data sources. This document should clearly identify sources of data for all required tests, a description of the validity of these data for a specific engine type and thrust rating configuration, and the revision levels of all avionics affecting the performance or flying qualities of the aircraft. Additionally, this document should provide other information, such as the rationale or explanation for cases where data or data parameters are missing, instances where engineering simulation data are used or where flight test methods require further explanations. It should also provide a brief narrative describing the cause and effect of any deviation from data requirements. The aircraft manufacturer may provide this document.

g. There is no requirement for any flight test data supplier to submit a flight test plan or program prior to gathering flight test data. However, the NSPM notes that inexperienced data gatherers often provide data that is irrelevant, improperly marked, or lacking adequate justification for selection. Other problems include inadequate information regarding initial conditions or test maneuvers. The NSPM has been forced to refuse these data submissions as validation data for an FFS evaluation. It is for this reason that the NSPM recommends that any data supplier not previously experienced in this area review the data necessary for programming and for validating the performance of the FFS, and discuss the flight test plan anticipated for acquiring such data with the NSPM well in advance of commencing the flight tests.

h. In those cases where the objective test results authorize a ''snapshot test'' or a ''series of snapshot test'' results in lieu of a time-history result, Attachment 2 requires the sponsor or other data provider to ensure that a steady state condition exists at the instant of time captured by the ''snapshot.'' This is often verified by showing that a steady state condition existed from some period of time during which the snapshot is taken. The time period most frequently used is 5 seconds prior through 2 seconds following the instant of time captured by the snapshot. This paragraph is primarily addressing the source data and the method by which the data provider ensures that the steady state condition for the snapshot is representative.

i. The NSPM will consider, on a case-by-case basis, whether or not to approve supplemental validation data derived from flight data recording systems such as a Quick Access Recorder or Flight Data Recorder.

End Information

10. Special Equipment and Personnel Requirements for Qualification of the Simulator (§ 60.14)

Begin Information

a. In the event that the NSPM determines that special equipment or specifically qualified persons will be required to conduct an evaluation, the NSPM will make every attempt to notify the sponsor at least one (1) week, but in no case less than 72 hours, in advance of the evaluation. Examples of special equipment include spot photometers, flight control measurement devices, and sound analyzers. Examples of specially qualified personnel include individuals specifically qualified to install or use any special equipment when its use is required.

b. Examples of a special evaluation include an evaluation conducted after an FFS is moved, at the request of the TPAA, or as a result of comments received from FFS that raise questions regarding the continued qualification or use of the FFS.

End Information

11. Initial (and Upgrade) Qualification Requirements (§ 60.15)

Begin QPS Requirements

a. In order to be qualified at a particular qualification level, the FFS must:

(1) Meet the general requirements listed in Attachment 1;

(2) Meet the objective testing requirements listed in Attachment 2; and

(3) Satisfactorily accomplish the subjective tests listed in Attachment 3.

b. The request described in § 60.15(a) must include all of the following:

(1) A statement that the FFS meets all of the applicable provisions of this part and all applicable provisions of the QPS.

(2) A confirmation that the sponsor will forward to the NSPM the statement described in § 60.15(b) in such time as to be received no later than 5 business days prior to the scheduled evaluation and may be forwarded to the NSPM via traditional or electronic means.

(3) A qualification test guide (QTG), acceptable to the NSPM, that includes all of the following:

(i) Objective data obtained from aircraft testing or another approved source.

(ii) Correlating objective test results obtained from the performance of the FFS as prescribed in the applicable QPS.

(iii) The result of FFS subjective tests prescribed in the applicable QPS.

(iv) A description of the equipment necessary to perform the evaluation for initial qualification and the continuing qualification evaluations.

c. The QTG described in paragraph (a)(3) of this section, must provide the documented proof of compliance with the simulator objective tests in Attachment 2, Table C2A of this appendix.

d. The QTG is prepared and submitted by the sponsor, or the sponsor's agent on behalf of the sponsor, to the NSPM for review and approval, and must include, for each objective test:

(1) Parameters, tolerances, and flight conditions;

(2) Pertinent and complete instructions for the conduct of automatic and manual tests;

(3) A means of comparing the FFS test results to the objective data;

(4) Any other information as necessary, to assist in the evaluation of the test results;

(5) Other information appropriate to the qualification level of the FFS.

e. The QTG described in paragraphs (a)(3) and (b) of this section, must include the following:

(1) A QTG cover page with sponsor and FAA approval signature blocks (see Attachment 4, Figure C4C, for a sample QTG cover page).

(2) A continuing qualification evaluation schedule requirements page. This page will be used by the NSPM to establish and record the frequency with which continuing qualification evaluations must be conducted and any subsequent changes that may be determined by the NSPM in accordance with § 60.19. See Attachment 4, Figure C4G, for a sample Continuing Qualification Evaluation Requirements page.

(3) An FFS information page that provides the information listed in this paragraph (see Attachment 4, Figure C4B, for a sample FFS information page). For convertible FFSs, the sponsor must submit a separate page for each configuration of the FFS.

(a) The sponsor's FFS identification number or code.

(b) The helicopter model and series being simulated.

(c) The aerodynamic data revision number or reference.

(d) The engine model(s) and its data revision number or reference.

(e) The flight control data revision number or reference.

(f) The flight management system identification and revision level.

(g) The FFS model and manufacturer.

(h) The date of FFS manufacture.

(i) The FFS computer identification.

(j) The visual system model and manufacturer, including display type.

(k) The motion system type and manufacturer, including degrees of freedom.

(4) A Table of Contents.

(5) A log of revisions and a list of effective pages.

(6) List of all relevant data references.

(7) A glossary of terms and symbols used (including sign conventions and units).

(8) Statements of compliance and capability (SOCs) with certain requirements. SOCs must provide references to the sources of information that show the capability of the FFS to comply with the requirements. SOCs must also provide a rationale explaining how the referenced material is used, the mathematical equations and parameter values used, and the conclusions reached. Refer to the ''Additional Details'' column in Attachment 1, Table C1A, ''Simulator Standards,'' or in the ''Test Details'' column in Attachment 2, Table C2A, ''Simulator Objective Tests,'' to see when SOCs are required.

(9) Recording procedures or equipment required to accomplish the objective tests.

(10) The following information for each objective test designated in Attachment 2, Table C2A, as applicable to the qualification level sought:

(a) Name of the test.

(b) Objective of the test.

(c) Initial conditions.

(d) Manual test procedures.

(e) Automatic test procedures (if applicable).

(f) Method for evaluating FFS objective test results.

(g) List of all relevant parameters driven or constrained during the automatically conducted test(s).

(h) List of all relevant parameters driven or constrained during the manually conducted test(s).

(i) Tolerances for relevant parameters.

(j) Source of Validation Data (document and page number).

(k) Copy of the Validation Data (if located in a separate binder, a cross reference for the identification and page number for pertinent data location must be provided).

(l) Simulator Objective Test Results as obtained by the sponsor. Each test result must reflect the date completed and must be clearly labeled as a product of the device being tested.

f. A convertible FFS is addressed as a separate FFS for each model and series helicopter to which it will be converted and for the FAA qualification level sought. If a sponsor seeks qualification for two or more models of a helicopter type using a convertible FFS, the sponsor must submit a QTG for each helicopter model, or a supplemented QTG for each helicopter model. The NSPM will conduct evaluations for each helicopter model.

g. Form and manner of presentation of objective test results in the QTG:

(1) The sponsor's FFS test results must be recorded in a manner acceptable to the NSPM, that allows easy comparison of the FFS test results to the validation data (*e.g.*, use of a multi-channel recorder, line printer, cross plotting, overlays, transparencies).

(2) FFS results must be labeled using terminology common to helicopter parameters as opposed to computer software identifications.

(3) Validation data documents included in a QTG may be photographically reduced only if such reduction will not alter the graphic scaling or cause difficulties in scale interpretation or resolution.

(4) Scaling on graphical presentations must provide the resolution necessary to evaluate the parameters shown in Attachment 2, Table C2A of this appendix.

(5) Tests involving time histories, data sheets (or transparencies thereof) and FFS test results must be clearly marked with appropriate reference points to ensure an accurate comparison between the FFS and the helicopter with respect to time. Time histories recorded via a line printer are to be clearly identified for cross plotting on the helicopter data. Over-plots must not obscure the reference data.

h. The sponsor may elect to complete the QTG objective and subjective tests at the manufacturer's facility or at the sponsor's training facility. If the tests are conducted at the manufacturer's facility, the sponsor must repeat at least one-third of the tests at the sponsor's training facility in order to substantiate FFS performance. The QTG must be clearly annotated to indicate when and where each test was accomplished. Tests conducted at the manufacturer's facility and at the sponsor's training facility must be conducted after the FFS is assembled with systems and sub-systems functional and operating in an interactive manner. The test results must be submitted to the NSPM.

i. The sponsor must maintain a copy of the MQTG at the FFS location.

j. All FFSs for which the initial qualification is conducted after October 30, 2013 must have an electronic MQTG (eMQTG) including all objective data obtained from helicopter testing, or another approved source (reformatted or digitized), together with correlating objective test results obtained from the performance of the FFS (reformatted or digitized) as prescribed in this appendix. The eMQTG must also contain the general FFS performance or demonstration results (reformatted or digitized) prescribed in this appendix, and a description of the equipment necessary to perform the initial qualification evaluation and the continuing qualification evaluations. The eMQTG must include the original validation data used to validate FFS performance and handling qualities in either the original digitized format from the data supplier or an electronic scan of the original time-history plots that were provided by the data supplier. A copy of the eMQTG must be provided to the NSPM.

k. All other FFSs not covered in subparagraph ''j'' must have an electronic copy of the MQTG by October 30, 2013. A copy of the eMQTG must be provided to the NSPM. This may be provided by an electronic scan presented in a Portable Document File (PDF), or similar format acceptable to the NSPM.

End QPS Requirements

Begin Information

l. Only those FFSs that are sponsored by a certificate holder as defined in appendix F will be evaluated by the NSPM. However, other FFS evaluations may be conducted on a case-by-case basis as the Administrator deems appropriate, but only in accordance with applicable agreements.

m. The NSPM will conduct an evaluation for each configuration, and each FFS must be evaluated as completely as possible. To ensure a thorough and uniform evaluation, each FFS is subjected to the general simulator requirements in Attachment 1, the objective tests listed in Attachment 2, and the subjective tests listed in Attachment 3 of this appendix. The evaluations described herein will include, but not necessarily be limited to the following:

(1) Helicopter responses, including longitudinal and lateral-directional control responses (see Attachment 2 of this appendix);

(2) Performance in authorized portions of the simulated helicopter's operating envelope, to include tasks evaluated by the NSPM in the areas of surface operations, takeoff, climb, cruise, descent, approach, and landing as well as abnormal and emergency operations (see Attachment 2 of this appendix);

(3) Control checks (see Attachment 1 and Attachment 2 of this appendix);

(4) Cockpit configuration (see Attachment 1 of this appendix);

(5) Pilot, flight engineer, and instructor station functions checks (see Attachment 1 and Attachment 3 of this appendix);

(6) Helicopter systems and sub-systems (as appropriate) as compared to the helicopter simulated (see Attachment 1 and Attachment 3 of this appendix);

(7) FFS systems and sub-systems, including force cueing (motion), visual, and aural (sound) systems, as appropriate (see Attachment 1 and Attachment 2 of this appendix); and

(8) Certain additional requirements, depending upon the qualification level sought, including equipment or circumstances that may become hazardous to the occupants. The sponsor may be subject to Occupational Safety and Health Administration requirements.

n. The NSPM administers the objective and subjective tests, which includes an examination of functions. The tests include a qualitative assessment of the FFS by an NSP pilot. The NSP evaluation team leader may assign other qualified personnel to assist in accomplishing the functions examination and/or the objective and subjective tests performed during an evaluation when required.

(1) Objective tests provide a basis for measuring and evaluating FFS performance and determining compliance with the requirements of this part.

(2) Subjective tests provide a basis for:

(a) Evaluating the capability of the FFS to perform over a typical utilization period;

(b) Determining that the FFS satisfactorily simulates each required task;

(c) Verifying correct operation of the FFS controls, instruments, and systems; and

(d) Demonstrating compliance with the requirements of this part.

o. The tolerances for the test parameters listed in Attachment 2 of this appendix reflect the range of tolerances acceptable to the NSPM for FFS validation and are not to be confused with design tolerances specified for FFS manufacture. In making decisions regarding tests and test results, the NSPM relies on the use of operational and engineering judgment in the application of data (including consideration of the way in which the flight test was flown and way the data was gathered and applied) data presentations, and the applicable tolerances for each test.

p. In addition to the scheduled continuing qualification evaluation, each FFS is subject to evaluations conducted by the NSPM at any time without prior notification to the sponsor. Such evaluations would be accomplished in a normal manner (*i.e.*, requiring exclusive use of the FFS for the conduct of objective and subjective tests and an examination of functions) if the FFS is not being used for flight crewmember training, testing, or checking. However, if the FFS were being used, the evaluation would be conducted in a non-exclusive manner. This non-exclusive evaluation will be conducted by the FFS evaluator accompanying the check airman, instructor, Aircrew Program Designee (APD), or FAA inspector aboard the FFS along with the student(s) and observing the operation of the FFS during the training, testing, or checking activities.

q. Problems with objective test results are handled as follows:

(1) If a problem with an objective test result is detected by the NSP evaluation team during an evaluation, the test may be repeated or the QTG may be amended.

(2) If it is determined that the results of an objective test do not support the level requested but do support a lower level, the NSPM may qualify the FFS at that lower level. For example, if a Level D evaluation is requested and the FFS fails to meet sound test tolerances, it could be qualified at Level C.

r. After an FFS is successfully evaluated, the NSPM issues a statement of qualification (SOQ) to the sponsor. The NSPM recommends the FFS to the TPAA, who will approve the FFS for use in a flight training program. The SOQ will be issued at the satisfactory conclusion of the initial or continuing qualification. However, it is the sponsor's responsibility to obtain TPAA approval prior to using the FSTD in an FAA-approved flight training program.

s. Under normal circumstances, the NSPM establishes a date for the initial or upgrade evaluation within ten (10) working days after determining that a complete QTG is acceptable. Unusual circumstances may warrant establishing an evaluation date before this determination is made. A sponsor may schedule an evaluation date as early as 6 months in advance. However, there may be a delay of 45 days or more in rescheduling and completing the evaluation if the sponsor is unable to meet the scheduled date. See Attachment 4, Figure C4A, Sample Request for Initial, Upgrade, or Reinstatement Evaluation.

t. The numbering system used for objective test results in the QTG should closely follow the numbering system set out in Attachment 2, FFS Objective Tests, Table C2A.

u. Contact the NSPM or visit the NSPM Web site for additional information regarding the preferred qualifications of pilots used to meet the requirements of § 60.15(d).

v. Examples of the exclusions for which the FFS might not have been subjectively tested by the sponsor or the NSPM and for which qualification might not be sought or granted, as described in § 60.15(g)(6), include takeoffs and landing from slopes and pinnacles.

End Information

---

12. Additional Qualifications for a Currently Qualified Simulator (§ 60.16)

There is no additional regulatory or informational material that applies to § 60.16, Additional Qualifications for a Currently Qualified FFS.

13. Previously Qualified Simulators (§ 60.17)

Begin QPS Requirements

a. In instances where a sponsor plans to remove a FFS from active status for a period of less than two years, the following procedures apply:

(1) The NSPM must be notified in writing and the notification must include an estimate of the period that the FFS will be inactive;

(2) Continuing Qualification evaluations will not be scheduled during the inactive period;

(3) The NSPM will remove the FFS from the list of qualified FSTDs on a mutually established date not later than the date on which the first missed continuing qualification evaluation would have been scheduled;

(4) Before the FFS is restored to qualified status, it must be evaluated by the NSPM. The evaluation content and the time required to accomplish the evaluation is based on the number of continuing qualification evaluations and sponsor-conducted quarterly inspections missed during the period of inactivity.

(5) The sponsor must notify the NSPM of any changes to the original scheduled time out of service;

b. Simulators qualified prior to October 30, 2007, are not required to meet the general simulation requirements, the objective test requirements, and the subjective test requirements of attachments 1, 2, and 3, respectively, of this appendix.

c. [Reserved]

End QPS Requirements

Begin Information

d. Other certificate holders or persons desiring to use an FFS may contract with FFS sponsors to use FFSs previously qualified at a particular level for a helicopter type and approved for use within an FAA-approved flight training program. Such FFSs are not required to undergo an additional qualification process, except as described in § 60.16.

e. Each FFS user must obtain approval from the appropriate TPAA to use any FFS in an FAA-approved flight training program.

f. The intent of the requirement listed in § 60.17(b), for each FFS to have a Statement of Qualification within 6 years, is to have the availability of that statement (including the configuration list and the limitations to authorizations) to provide a complete picture of the FFS inventory regulated by the FAA.

The issuance of the statement will not require any additional evaluation or require any adjustment to the evaluation basis for the FFS.

g. Downgrading of an FFS is a permanent change in qualification level and will necessitate the issuance of a revised Statement of Qualification to reflect the revised qualification level, as appropriate. If a temporary restriction is placed on an FFS because of a missing, malfunctioning, or inoperative component or on-going repairs, the restriction is not a permanent change in qualification level. Instead, the restriction is temporary and is removed when the reason for the restriction has been resolved.

h. It is not the intent of the NSPM to discourage the improvement of existing simulation (*e.g.*, the ''updating'' of a visual system to a newer model, or the replacement of the IOS with a more capable unit) by requiring the ''updated'' device to meet the qualification standards current at the time of the update. Depending on the extent of the update, the NSPM may require that the updated device be evaluated and may require that an evaluation include all or a portion of the elements of an initial evaluation. However, the standards against which the device would be evaluated are those that are found in the MQTG for that device.

i. The NSPM will determine the evaluation criteria for an FSTD that has been removed from active status. The criteria will be based on the number of continuing qualification evaluations and quarterly inspections missed during the period of inactivity. For example, if the FFS were out of service for a 1 year period, it would be necessary to complete the entire QTG, since all of the quarterly evaluations would have been missed. The NSPM will also consider how the FFS was stored, whether parts were removed from the FFS and whether the FFS was disassembled.

j. The FFS will normally be requalified using the FAA-approved MQTG and the criteria that was in effect prior to its removal from qualification. However, inactive periods of 2 years or more will require requalification under the standards in effect and current at the time of requalification.

End Information

---

14. Inspection, Continuing Qualification Evaluation, and Maintenance Requirements (§ 60.19)

Begin QPS Requirements

a. The sponsor must conduct a minimum of four evenly spaced inspections throughout the year. The objective test sequence and content of each inspection must be developed by the sponsor and must be acceptable to the NSPM.

b. The description of the functional preflight inspection must be contained in the sponsor's QMS.

c. Record ''functional preflight'' in the FFS discrepancy log book or other acceptable location, including any item found to be missing, malfunctioning, or inoperative.

End QPS Requirements

Begin Information

d. The sponsor's test sequence and the content of each quarterly inspection required in § 60.19(a)(1) should include a balance and a mix from the objective test requirement areas listed as follows:

(1) Performance.

(2) Handling qualities.

(3) Motion system (where appropriate).

(4) Visual system (where appropriate).

(5) Sound system (where appropriate).

(6) Other FFS systems.

e. If the NSP evaluator plans to accomplish specific tests during a normal continuing qualification evaluation that requires the use of special equipment or technicians, the sponsor will be notified as far in advance of the evaluation as practical; but not less than 72 hours. Examples of such tests include latencies, control dynamics, sounds and vibrations, motion, and/or some visual system tests.

f. The continuing qualification evaluations, described in § 60.19(b), will normally require 4 hours of FFS time. However, flexibility is necessary to address abnormal situations or situations involving aircraft with additional levels of complexity (*e.g.*, computer controlled aircraft). The sponsor should anticipate that some tests may require additional time. The continuing qualification evaluations will consist of the following:

(1) Review of the results of the quarterly inspections conducted by the sponsor since the last scheduled continuing qualification evaluation.

(2) A selection of approximately 8 to 15 objective tests from the MQTG that provide an adequate opportunity to evaluate the performance of the FFS. The tests chosen will be performed either automatically or manually and should be able to be conducted within approximately one-third (1/3) of the allotted FFS time.

(3) A subjective evaluation of the FFS to perform a representative sampling of the tasks set out in attachment 3 of this appendix. This portion of the evaluation should take approximately two-thirds (2/3) of the allotted FFS time.

(4) An examination of the functions of the FFS may include the motion system, visual system, sound system, instructor operating station, and the normal functions and simulated malfunctions of the simulated helicopter systems. This examination is normally accomplished simultaneously with the subjective evaluation requirements.

g. The requirement established in § 60.19(b)(4) regarding the frequency of NSPM-conducted continuing qualification evaluations for each FFS is typically 12 months. However, the establishment and satisfactory implementation of an approved QMS for a sponsor will provide a basis for adjusting the frequency of evaluations to exceed 12-month intervals.

End Information

---

15. Logging Simulator Discrepancies (§ 60.20)

There is no additional regulatory or informational material that applies to § 60.20. Logging FFS Discrepancies.

16. Interim Qualification of Simulators for New Helicopter Types or Models (§ 60.21)

There is no additional regulatory or informational material that applies to § 60.21, Interim Qualification of FFSs for New Helicopter Types or Models.

17. Modifications to Simulators (§ 60.23)

Begin QPS Requirements

a. The notification described in § 60.23(c)(2) must include a complete description of the planned modification, with a description of the operational and engineering effect the proposed modification will have on the operation of the FFS and the results that are expected with the modification incorporated.

b. Prior to using the modified FFS:

(1) All the applicable objective tests completed with the modification incorporated, including any necessary updates to the MQTG (*e.g.*, accomplishment of FSTD Directives) must be acceptable to the NSPM; and

(2) The sponsor must provide the NSPM with a statement signed by the MR that the factors listed in § 60.15(b) are addressed by the appropriate personnel as described in that section.

End QPS Requirements

Begin Information

FSTD Directives are considered modifications of an FFS. See Attachment 4 for a sample index of effective FSTD Directives.

End Information

---

18. Operation with Missing, Malfunctioning, or Inoperative Components (§ 60.25)

Begin Information

a. The sponsor's responsibility with respect to § 60.25(a) is satisfied when the sponsor fairly and accurately advises the user of the current status of an FFS, including any missing, malfunctioning, or inoperative (MMI) component(s).

b. If the 29th or 30th day of the 30-day period described in § 60.25(b) is on a Saturday, a Sunday, or a holiday, the FAA will extend the deadline until the next business day.

c. In accordance with the authorization described in § 60.25(b), the sponsor may develop a discrepancy prioritizing system to accomplish repairs based on the level of impact on the capability of the FFS. Repairs having a larger impact on FFS capability to provide the required training, evaluation, or flight experience will have a higher priority for repair or replacement.

End Information

---

19. Automatic Loss of Qualification and Procedures for Restoration of Qualification (§ 60.27)

Begin Information

If the sponsor provides a plan for how the FFS will be maintained during its out-of-service period (*e.g.*, periodic exercise of mechanical, hydraulic, and electrical systems; routine replacement of hydraulic fluid; control of the environmental factors in which the FFS is to be maintained) there is a greater likelihood that the NSPM will be able to determine the amount of testing required for requalification.

End Information

20. Other Losses of Qualification and Procedures for Restoration of Qualification (§ 60.29)

Begin Information

If the sponsor provides a plan for how the FFS will be maintained during its out-of-service period (*e.g.*, periodic exercise of mechanical, hydraulic, and electrical systems; routine replacement of hydraulic fluid; control of the environmental factors in which the FFS is to be maintained) there is a greater likelihood that the NSPM will be able to determine the amount of testing required for requalification.

End Information

21. Recordkeeping and Reporting (§ 60.31)

Begin QPS Requirements

a. FSTD modifications can include hardware or software changes. For FSTD modifications involving software programming changes, the record required by § 60.31(a)(2) must consist of the name of the aircraft system software, aerodynamic model, or engine model change, the date of the change, a summary of the change, and the reason for the change.

b. If a coded form for record keeping is used, it must provide for the preservation and retrieval of information with appropriate security or controls to prevent the inappropriate alteration of such records after the fact.

End QPS Requirements

22. Applications, Logbooks, Reports, and Records: Fraud, Falsification, or Incorrect Statements (§ 60.33)

There are no additional QPS requirements or informational material that apply to § 60.33, Applications, Logbooks, Reports, and Records: Fraud, Falsification, or Incorrect Statements.

23. [Reserved]

24. [Reserved]

25. FSTD Qualification on the Basis of a Bilateral Aviation Safety Agreement (BASA) (§ 60.37)

There are no additional QPS requirements or informational material that apply to § 60.37, FSTD Qualification on the Basis of a Bilateral Aviation Safety Agreement (BASA).

Attachment 1 to Appendix C to Part 60—General Simulator Requirements

Begin QPS Requirements

1. Requirements.

a. Certain requirements included in this appendix must be supported with a Statement of Compliance and Capability (SOC), which may include objective and subjective tests. The SOC will confirm that the requirement was satisfied, and describe how the requirement was met, such as gear modeling approach or coefficient of friction sources. The requirements for SOCs and tests are indicated in the ''General Simulator Requirements'' column in Table C1A of this appendix.

b. Table C1A describes the requirements for the indicated level of FFS. Many devices include operational systems or functions that exceed the requirements outlined in this section. However, all systems will be tested and evaluated in accordance with this appendix to ensure proper operation.

End QPS Requirements

Begin Information

2. Discussion.

a. This attachment describes the general simulator requirements for qualifying a helicopter FFS. The sponsor should also consult the objective tests in Attachment 2 and the examination of functions and subjective tests listed in Attachment 3 to determine the complete requirements for a specific level simulator.

b. The material contained in this attachment is divided into the following categories:

(1) General cockpit configuration.
(2) Simulator programming.
(3) Equipment operation.
(4) Equipment and facilities for instructor/evaluator functions.
(5) Motion system.
(6) Visual system.
(7) Sound system.

c. Table C1A provides the standards for the General Simulator Requirements.

End Information

TABLE C1A.— MINIMUM SIMULATOR REQUIREMENTS

QPS requirements		Simulator levels				Information
No.	General simulator requirements	A	B	C	D	Notes
1. General Cockpit Configuration						
1.a ..	The simulator must have a cockpit that is a replica of the helicopter simulated with controls, equipment, observable cockpit indicators, circuit breakers, and bulkheads properly located, functionally accurate and replicating the helicopter. The direction of movement of controls and switches must be identical to that in the helicopter. Pilot seats must afford the capability for the occupant to be able to achieve the design ''eye position'' established for the helicopter being simulated. Equipment for the operation of the cockpit windows must be included, but the actual windows need not be operable. Fire axes, extinguishers, spare light bulbs, etc., must be available in the FFS but may be relocated to a suitable location as near as practical to the original position. Fire axes, landing gear pins, and any similar purpose instruments need only be represented in silhouette. An SOC is required.		X	X	X	For simulator purposes, the cockpit consists of all that space forward of a cross section of the fuselage at the most extreme aft setting of the pilots' seats including addiitonal, required flight crewmember duty stations and those required bulkheads aft of the pilot seats. For clarification, bulkheads containing only items such as landing gear pin storage compartments, fire axes or extinguishers, spare light bulbs, aircraft documents pouches etc., are not considered essential and may be omitted.
1.b.	Those circuit breakers that affect procedures and/or result in observable cockpit indications must be properly located and functionally accurate.		X	X	X	

TABLE C1A.— MINIMUM SIMULATOR REQUIREMENTS—Continued

QPS requirements		Simulator levels				Information Notes
No.	General simulator requirements	A	B	C	D	
	An SOC is required.					
2. Programming						
2.a.	A flight dynamics model that accounts for various combinations of drag and thrust normally encountered in flight must correspond to actual flight conditions, including the effect of change in helicopter attitude, thrust, drag, altitude, temperature, gross weight, moments of inertia, center of gravity location, and configuration. An SOC is required.		X	X	X	
2.b.	The simulator must have the computer capacity, accuracy, resolution, and dynamic response needed to meet the qualification level sought. An SOC is required.		X	X	X	
2.c ..	Ground handling and aerodynamic programming must include the following:					
2.c.1	Ground effect .... Level B does not require hover programming. An SOC is required.		X	X	X	Applicable areas include flare and touchdown from a running landing as well as for in-ground-effect (IGE) hover. A reasonable simulation of ground effect includes modeling of lift, drag, pitching moment, trim, and power while in ground effect.
2.c.2	Ground reaction .... Level B does not require hover programming. An SOC is required.		X	X	X	Reaction of the helicopter upon contact with the landing surface during landing, (e.g., strut deflection, tire or skid friction, side forces) and may differ with changes in gross weight, airspeed, rate of descent on touchdown, and slide slip.
2.c.3	Ground handling characteristics. Control inputs required during operations in crosswind, during braking and deceleration, and for turning radius.		X	X	X	
2.d ..	The simulator must provide for manual and automatic testing of simulator hardware and software programming to determine compliance with simulator objective tests as prescribed in Attachment 2. An SOC is required.			X	X	This may include an automated system, which could be used for conducting at least a portion of the QTG tests. Automatic ''flagging'' of out-of-tolerance situations is encouraged.
2.e ..	Relative responses of the motion system, visual system, and cockpit instruments, measured by latency tests or transport delay tests. Motion onset should occur before the start of the visual scene change (the start of the scan of the first video field containing different information) but must occur before the end of the scan of that video field. Instrument response may not occur prior to motion onset. Test results must be within the following limits:					The intent is to verify that the simulator provides instrument, motion, and visual cues that are like the helicopter responses within the stated time delays. For helicopter response, acceleration in the appropriate corresponding rotational axis is preferred.
2.e.1	Response must be within 150 milliseconds of the helicopter response. Objective Tests are required. See Attachment 2 for Transport Delay and Latency Tests.		X			
2.e.2	Response must be within 100 milliseconds of the helicopter response. Objective Tests are required. See Attachment 2 for Transport Delay and Latency Tests.			X	X	
2.f ...	The simulator must accurately reproduce the following runway conditions: (1) Dry;			X	X	

TABLE C1A.— MINIMUM SIMULATOR REQUIREMENTS—Continued

QPS requirements		Simulator levels				Information Notes
No.	General simulator requirements	A	B	C	D	
	(2) Wet; (3) Icy; (4) Patchy Wet (5) Patchy Icy An SOC is required. Objective tests are required for dry, wet, and icy runway conditions. Subjective tests are required for patchy wet, patchy icy, and wet on rubber residue in touchdown zone conditions.					
2.g.	The simulator must simulate: (1) Brake and tire failure dynamics (including antiskid failure). (2) Decreased brake efficiency due to high brake temperatures, if applicable. An SOC is required.			X	X	Simulator pitch, side loading, and directional control characteristics should be representative of the helicopter.
2.h ..	The modeling in the simulator must include: (1) Ground effect, (2) Effects of airframe icing (if applicable), (3) Aerodynamic interference effects between the rotor wake and fuselage, (4) Influence of the rotor on control and stabilization systems, and (5) Representations of nonlinearities due to sideslip. An SOC is required and must include references to computations of aeroelastic representations and of nonlinearities due to sideslip. An SOC and a demonstration of icing effects (if applicable) are required.			X	X	See Attachment 2 for further information on ground effect.
2.i ...	The simulator must provide for realistic mass properties, including gross weight, center of gravity, and moments of inertia as a function of payload and fuel loading. An SOC is required and must include a range of tabulated target values to enable a subjective test of the mass properties model to be conducted from the instructor's station.		X	X	X	
3. Equipment Operation						
3.a.	All relevant instrument indications involved in the simulation of the helicopter must automatically respond to control movement or external disturbances to the simulated helicopter; e.g., turbulence or windshear. Numerical values must be presented in the appropriate units. A subjective test is required.		X	X	X	
3.b ..	Communications, navigation, caution, and warning equipment must be installed and operate within the tolerances applicable for the helicopter being simulated. A subjective test is required.		X	X	X	See Attachment 3 for further information regarding long-range navigation equipment.
3.c ..	Simulated airplane systems must operate as the helicopter systems would operate under normal, abnormal, and emergency operating conditions on the ground and in flight. A subjective test is required.		X	X	X	
3.d ..	The simulator must provide pilot controls with control forces and control travel that correspond to the simulated helicopter. The simulator must also react in the same manner as in the helicopter under the same flight conditions. An objective test is required.		X	X	X	
4. Instructor / Evaluator Facilities						

TABLE C1A.— MINIMUM SIMULATOR REQUIREMENTS—Continued

QPS requirements		Simulator levels				Information Notes
No.	General simulator requirements	A	B	C	D	
4.a ..	In addition to the flight crewmember stations, the simulator must have at least two suitable seats for the instructor/check airman and FAA inspector. These seats must provide adequate vision to the pilot's panel and forward windows. All seats other than flight crew seats need not represent those found in the helicopter but must be adequately secured to the floor and equipped with similar positive restraint devices. A subjective test is required.		X	X	X	The NSPM will consider alternatives to this standard for additional seats based on unique cockpit configurations.
4.b ..	The simulator must have controls that enable the instructor/evaluator to control all required system variables and insert all abnormal or emergency conditions into the simulated helicopter systems as described in the sponsor's FAA-approved training program, or as described in the relevant operating manual as appropriate. A subjective test is required.		X	X	X	
4.c ..	The simulator must have instructor controls for environmental conditions including wind speed and direction. A subjective test is required.		X	X	X	
4.d ..	The simulator must provide the instructor or evaluator the the ability to present ground and air hazards.			X	X	For example, another aircraft crossing the active runway and converging airborne traffic.
	A subjective test is required.					
5. Motion System						
5.a ..	The simulator must have motion (force) cues perceptible to the pilot that are representative of the motion in a helicopter. A subjective test is required.		X	X	X	For example, touchdown cues should be a function of the rate of descent (RoD) of the simulated helicopter.
5.b ..	The simulator must have a motion (force cueing) system with a minimum of three degrees of freedom (at least pitch, roll, and heave). An SOC is required.		X			
5.c ..	The simulator must have a motion (force cueing) system that produces cues at least equivalent to those of a six-degrees-of-freedom, synergistic platform motion system (i.e., pitch, roll, yaw, heave, sway, and surge). An SOC is required.			X	X	
5.d ..	The simulator must provide for the recording of the motion system response time. An SOC is required.		X	X	X	
5.e ..	The simulator must provide motion effects programming to include the following: (1) Runway rumble, oleo deflections, effects of ground speed, uneven runway, characteristics. (2) Buffets due to transverse flow effects. (3) Buffet during extension and retraction of landing gear. (4) Buffet due to retreating blade stall. (5) Buffet due to settling with power. (6) Representative cues resulting from touchdown. (7) Rotor vibrations. A subjective test is required for each.		X	X	X	
	(8) Tire failure dynamics. (9) Engine malfunction and engine damage. (10) Airframe ground strike. A subjective test is required for each.			X	X	
	(11) Motion vibrations that result from atmospheric disturbances.				X	For air turbulence, general purpose disturbance models that approximate demonstrable flight test data are acceptable.

TABLE C1A.— MINIMUM SIMULATOR REQUIREMENTS—Continued

QPS requirements		Simulator levels				Information Notes
No.	General simulator requirements	A	B	C	D	
5.f ...	The simulator must provide characteristic motion vibrations that result from operation of the helicopter, (for example, retreating blade stall, extended landing gear, settling with power) in so far as vibration marks an event or helicopter state, which can be sensed in the cockpit. A subjective test is required. An objective test is required.				X	The simulator should be programmed and instrumented in such a manner that the characteristic buffet modes can be measured and compared to helicopter data.
6. Visual System						
6.a ..	The simulator must have a visual system providing an out-of-the-cockpit view. A subjective test is required.		X	X	X	
6.b ..	The simulator must provide a continuous minimum collimated field of view of 75° horizontally and 30° vertically per pilot seat. Both pilot seat visual systems must be operable simultaneously. An SOC is required.		X			
6.c ..	The simulator must provide a continuous minimum collimated visual field of view of 150° horizontally and 40° vertically per pilot seat. Both pilot seat visual systems must be operable simultaneously. Horizontal field of view is centered on the zero degree azimuth line relative to the aircraft fuselange. An SOC is required.			X		Optimization of the visual field of view may be considered with respect to the specific helicopter cockpit cut-off angle.
6.d ..	The simulator must provide a continuous minimum collimated visual field of view of 180° horizontally and 60° vertically per pilot seat. Both pilot seat visual systems must be operable simultaneously. Horizontal field of view is centered on the zero degree azimuth line relative to the aircraft fuselage. An SOC is required. An objective test is required.				X	Optimization of the visual field of view may be considered with respect to the specific airplane cockpit cut-off angle.
6.e ..	The visual system must be free from optical discontinuities and artifacts that create non-realistic cues. A subjective test is required.		X	X	X	Non-realistic cues might include image "swimming" and image "roll-off," that may lead a pilot to make incorrect assessments of speed, acceleration and/or situational awareness.
6.f ...	The simulator must have operational landing lights for night scenes. Where used, dusk (or twilight) scenes require operational landing lights. A subjective test is required.		X	X	X	
6.g ..	The simulator must have instructor controls for the following: (1) Cloudbase. (2) Visibility in statute miles (kilometers) and runway visual range (RVR) in ft. (meters). (3) Airport or landing area selection. (4) Airport or landing area lighting. A subjective test is required.		X	X	X	
6.h ..	Each airport scene displayed must include the following: 1. Airport runways and taxiways. 2. Runway definition: a. Runway surface and markings. b. Lighting for the runway in use, including runway threshold, edge, centerline, touchdown zone, VASI (or PAPI), and approach lighting of appropriate colors, as appropriate. c. Taxiway lights. A subjective test is required.		X	X	X	

TABLE C1A.— MINIMUM SIMULATOR REQUIREMENTS—Continued

QPS requirements		Simulator levels				Information Notes
No.	General simulator requirements	A	B	C	D	
6.i ...	The distances at which runway features are visible, as measured from runway threshold to a helicopter aligned with the runway on an extended 3° glide slope must not be less than listed below: 1. Runway definition, strobe lights, approach lights, runway edge white lights and VASI or PAPI system lights from 5 statute miles (8 km) of the runway threshold. 2. Runway centerline lights and taxiway definition from 3 statute miles (4.8 km). 3. Threshold lights and touchdown zone lights from 2 statute miles (3.2 km). 4. Runway markings within range of landing lights for night scenes and as required by three (3) arc-minutes resolution on day scenes. A subjective test is required.		X	X	X	
6.j ...	The simulator must provide visual system compatibility with dynamic response programming. A subjective test is required.		X	X	X	
6.k ..	The simulator must show that the segment of the ground visible from the simulator cockpit is the same as from the airplane cockpit (within established tolerances) when at the correct airspeed, in the landing configuration, at a main wheel height of 100 feet (30 meters) above the touchdown zone. Data submitted must include at least the following: (1) Static helicopter dimensions as follows: (i) Horizontal and vertical distance from main landing gear (MLG) or landing skids to glideslope reception antenna. (ii) Horizontal and vertical distance from MLG or skids to pilot's eyepoint. (iii) Static cockpit cutoff angle. (2) Approach data as follows: (i) Identification of runway. (ii) Horizontal distance from runway threshold to glideslope intercept with runway. (iii) Glideslope angle. (iv) Helicopter pitch angle on approach. (3) Helicopter data for manual testing: (i) Gross weight. (ii) Helicopter configuration. (iii) Approach airspeed. The QTG must contain appropriate calculations and a drawing showing the pertinent data used to establish the helicopter location and the segment of the ground that is visible considering the helicopter attitude (cockpit cut-off angle) and a runway visual range of 1,200 feet or 350 meters. Simulator performance must be measured against the QTG calculations. Sponsors must provide this data for each simulator (regardless of previous qualification standards) to qualify the simulator for all precision instrument approaches. At the near end of the visual ground segment, lights and ground objects computed to be visible from the helicopter cockpit must be visible in the FFS. The far end of the visual ground segment must be at the computed end of the segment ±20% of the computed visible segment distance. An SOC is required. An objective test is required.		X	X	X	The test should be conducted in the landing configuration, trimmed for appropriate airspeed, at 100 ft (30m) above the touchdown zone, on glide slope with an RVR value set at 1,200 ft (350m). This will show the modeling accuracy of RVR, glideslope, and localizer for a given weight, configuration and speed within the helicopter's operational envelope for a normal appraoch and landing. If non-homogenous fog is used, the vertical variation in horizontal visibility should be described and be included in the slant range visibility calculation used in the computations.
6.1 ..	The simulator must provide visual cues necessary to assess rate of change of height, height AGL, as well as translational displacement and rates during takeoffs and landings. A subjective test is required.		X			

TABLE C1A.— MINIMUM SIMULATOR REQUIREMENTS—Continued

QPS requirements		Simulator levels				Information Notes
No.	General simulator requirements	A	B	C	D	
6.m	The simulator must have night and dusk (or twilight) visual scene capability, including general terrain characteristics and significant landmarks, free from apparent quantization. Dusk (or twilight) scene must enable identification of a visible horizon and general terrain characteristics. A subjective test is required.			X	X	Examples of general terrain characteristics are fields, roads, and bodies of water.
6.n ..	The simulator must provide visual cues necessary to assess rate of change of height, height AGL, as well as translational displacement and rates during takeoff, low altitude/low airspeed maneuvering, hover, and landing. A subjective test is required.			X	X	
6.o.	The simulator must provide for accurate portrayal of the visual environment relating to the simulator attitude. A subjective test is required.		X	X	X	Visual attitude vs. simulator attitude is a comparison of pitch and roll of the horizon as displayed in the visual scene compared to the display on the attitude indicator.
6.p ..	The simulator must provide for quick confirmation of visual system color, RVR, focus, and intensity. An SOC is required. A subjective test is required.			X	X	
6.q ..	The simulator must provide a minimum of three airport scenes including the following: 1. Surfaces on runways, taxiways, and ramps. 2. Lighting of approriate color for all runways, including runway threshold, edge, centerline, VASI (or PAPI), and approach lighting for the runway in use. 3. Airport taxiway lighting. 4. Ramps and buildings that correspond to the sponsor's Line Oriented scenarios, as appropriate. A subjective test is required.			X	X	
6.r ...	The simulator must be capable of producing at least 10 levels of occulting.. A subjective test is required.			X	X	
6.s ..	The fog simulator must be able to provide weather representations including the following: (1) Variable cloud density. (2) Partial obscuration of ground scenes; i.e., the effect of a scattered to broken cloud deck. (3) Gradual breakout. (4) Patchy fog. (5) The effect of fog on airport lighting The weather representations must be provided at and below an altitude of 2,000 ft (610 m) height above the airport and within a radius of 10 miles (16 km) from the airport. A subjective test is required.			X	X	
6.t ...	Night Visual Scenes. The simulator must provide night visual scenes with sufficient scene content to recognize the airport, the terrain, and major landmarks around the airport. The scene content must allow a pilot to successfully accomplish a visual landing. Night scenes, as a minimum, must provide presentations of sufficient surfaces with appropriate textural cues that include self-illuminated objects such as road networks, ramp lighting, and airport signage, to conduct a visual approach, a landing, and airport movement (taxi). Scenes must include a definable horizon and typical terrain characteristics such as fields, roads and bodies of water and surfaces illuminated by airplane landing lights.		X	X	X	

TABLE C1A.— MINIMUM SIMULATOR REQUIREMENTS—Continued

QPS requirements		Simulator levels				Information Notes
No.	General simulator requirements	A	B	C	D	
6.u ..	Dusk (Twilight) Visual Scenes. The simulator must provide dusk (or twilight) visual scenes with sufficient scene content to recognize the airport, the terrain, and major landmarks around the airport. The scene content must allow a pilot to successfully accomplish a visual landing. Dusk (or twilight) scenes, as a minimum, must provide full color presentations of reduced ambient intensity, sufficient surfaces with appropriate textural cues that include self-illuminated objects such as road networks, ramp lighting and airport signage, to conduct a visual approach, landing and airport movement (taxi). Scenes must include a definable horizon and typical terrain characteristics such as fields, roads and bodies of water and surfaces illuminated by representative aircraft lighting (e.g., landing lights). If provided, directional horizon lighting must have correct orientation and be consistent with surface shading effects. Total scene content must be comparable in detail to that produced by 10,000 visible textured surfaces and 15,000 visible lights with sufficient system capacity to display 16 simultaneously moving objects. An SOC is required.			X	X	
6.v ..	Night, Dusk (Twilight), and Daylight Visual Scenes. The simulator must have night, dusk (twilight), and daylight visual scenes with sufficient scene content to recognize the airport, the terrain, and major landmarks around the airport. The scene content must allow a pilot to successfully accomplish a visual landing. Any ambient lighting must not "washout" the displayed visual scene. Total scene content must be comparable in detail to that produced by 10,000 visible textured surfaces and 6,000 visible lights with sufficient system capacity to display 16 simultaneously moving objects. The visual display must be free of apparent quantization and other distracting visual effects while the simulator is in motion. **Note:** These requirements are applicable to any level of simulator equipped with a daylight visual system. An SOC is required. A subjective test is required. Objective tests are required.				X	
6.w	The simulator must provide operational visual scenes that portray physical relationships known to cause landing illusions to pilots. A subjective test is required.				X	For example: short runways, landing approaches over water, uphill or downhill runways, rising terrain on the approach path, unique topographic features.
6.x ..	The simulator must provide special weather representations of light, medium, and heavy precipitation near a thunderstorm on takeoff and during approach and landing. Representations need only be presented at and below an altitude of 2,000 ft. (610 m) above the airport surface and within 10 miles (16 km) of the airport. A subjective test is required.				X	
6.y.	The simulator must present visual scenes of wet and snow-covered runways, including runway lighting reflections for wet conditions, partially obsecured lights for snow conditions. A subjective test is required.				X	The NSPM will consider suitable alternative effects.
6.z ..	The simulator must present realistic color and directionality of all airport lighting. A subjective test is required.				X	

7. Sound System

TABLE C1A.— MINIMUM SIMULATOR REQUIREMENTS—Continued

QPS requirements		Simulator levels				Information Notes
No.	General simulator requirements	A	B	C	D	
7.a ..	The simulator must provide cockpit sounds that result from pilot actions that correspond to those that occur in the helicopter.		X	X	X	
7.b ..	Volume control, if installed, must have an indication of the sound level setting.		X	X	X	
7.c ..	The simulator must accurately simulate the sound of precipitation, windshield wipers, and other significant helicopter noises perceptible to the pilot during normal and abnormal operations, and include the sound of a crash (when the simulator is landed in an unusual attitude or in excess of the structural gear limitations); normal engine sounds; and the sounds of gear extension and retraction. An SOC is required. A subjective test is required.			X	X	
7.d ..	The simulator must provide realistic amplitude and frequency of cockpit noises and sounds. Simulator performance must be recorded, compared to amplitude and frequency of the same sounds recorded in the helicopter, and made a part of the QTG.				X	

Attachment 2 to Appendix C to Part 60—Simulator Objective Tests

Begin Information

1. Discussion.

(a) If relevant winds are present in the objective data, the wind vector (magnitude and direction) should be clearly noted as part of the data presentation, expressed in conventional terminology, and related to the runway being used for the test.

(b) The NSPM will not evaluate any simulator unless the required SOC indicates that the motion system is designed and manufactured to safely operate within the simulator's maximum excursion, acceleration, and velocity capabilities (see Motion System in the following table).

End Information

Begin QPS Requirements

1. Test requirements.

a. The ground and flight tests required for qualification are listed in Table of C2A, FFS Objective Tests. Computer generated simulator test results must be provided for each test except where an alternative test is specifically authorized by the NSPM. If a flight condition or operating condition is required for the test but does not apply to the helicopter being simulated or to the qualification level sought, it may be disregarded (e.g., an engine out missed approach for a single-engine helicopter, or a hover test for a Level B simulator). Each test result is compared against the validation data described in § 60.13 and in this appendix. Although use of a driver program designed to automatically accomplish the tests is encouraged for all simulators and required for Level C and Level D simulators, each test must be able to be accomplished manually while recording all appropriate parameters. The results must be produced on an appropriate recording device acceptable to the NSPM and must include simulator number, date, time, conditions, tolerances, and appropriate dependent variables portrayed in comparison to the validation data. Time histories are required unless otherwise indicated in Table C2A. All results must be labeled using the tolerances and units given.

b. Table C2A sets out the test results required, including the parameters, tolerances, and flight conditions for simulator validation. Tolerances are provided for the listed tests because mathematical modeling and acquisition/development of reference data are often inexact. All tolerances listed in the following tables are applied to simulator performance. When two tolerance values are given for a parameter, the less restrictive may be used unless otherwise indicated.

c. Certain tests included in this attachment must be supported with a Statement of Compliance and Capability (SOC). In Table C2A, requirements for SOCs are indicated in the ''Test Details'' column.

d. When operational or engineering judgment is used in making assessments for flight test data applications for simulator validity, such judgment must not be limited to a single parameter. For example, data that exhibit rapid variations of the measured parameters may require interpolations or a ''best fit'' data selection. All relevant parameters related to a given maneuver or flight condition must be provided to allow overall interpretation. When it is difficult or impossible to match simulator to helicopter data throughout a time history, differences must be justified by providing a comparison of other related variables for the condition being assessed.

e. It is not acceptable to program the FFS so that the mathematical modeling is correct only at the validation test points. Unless noted otherwise, simulator tests must represent helicopter performance and handling qualities at operating weights and centers of gravity (CG) typical of normal operation. If a test is supported by helicopter data at one extreme weight or CG, another test supported by helicopter data at mid-conditions or as close as possible to the other extreme must be included, except as may be authorized by the NSPM. Certain tests that are relevant only at one extreme CG or weight condition need not be repeated at the other extreme. Tests of handling qualities must include validation of augmentation devices.

f. When comparing the parameters listed to those of the helicopter, sufficient data must also be provided to verify the correct flight condition and helicopter configuration changes. For example, to show that control force is within ±0.5 pound (0.22 daN) in a static stability test, data to show the correct airspeed, power, thrust or torque, helicopter configuration, altitude, and other appropriate datum identification parameters must also be given. If comparing short period dynamics, normal acceleration may be used to establish a match to the helicopter, but airspeed, altitude, control input, helicopter configuration, and other appropriate data must also be given. All airspeed values must be properly annotated (e.g., indicated versus calibrated). In addition, the same variables must be used for comparison (e.g., compare inches to inches rather than inches to centimeters).

g. The QTG provided by the sponsor must clearly describe how the simulator will be set up and operated for each test. Each simulator subsystem may be tested independently, but overall integrated testing of the simulator must be accomplished to assure that the total simulator system meets the prescribed standards. A manual test procedure with explicit and detailed steps for completing each test must also be provided.

h. In those cases where the objective test results authorize a ''snapshot test'' or ''a series of snapshot test'' results in lieu of a time-history result, the sponsor or other data provider must ensure that a steady state condition exists at the instant of time captured by the ''snapshot.''

i. For previously qualified simulators, the tests and tolerances of this attachment may be used in subsequent continuing qualification evaluations for any given test if the sponsor has submitted a proposed MQTG revision to the NSPM and has received NSPM approval.

j. Motion System Tests:

(a) The minimum excursions, accelerations, and velocities for pitch, roll, and yaw must be measurable about a single, common reference point and must be achieved by driving one degree of freedom at a time.

(b) The minimum excursions, accelerations, and velocities for heave, sway, and surge may be measured about different but identifiable reference points and must also be achieved by driving one degree of freedom at a time.

k. Tests of handling qualities must include validation of augmentation devices. FFSs for highly augmented helicopters will be validated both in the unaugmented configuration (or failure state with the maximum permitted degradation in handling qualities) and the augmented configuration. Where various levels of handling qualities result from failure states, validation of the effect of the failure is necessary. For those performance and static handling qualities tests where the primary concern is control position in the unaugmented configuration, unaugmented data are not required if the design of the system precludes any affect on control position. In those instances where the unaugmented helicopter response is divergent and non-repeatable, it may not be feasible to meet the specified tolerances. Alternative requirements for testing will be mutually agreed upon by the sponsor and the NSPM on a case-by-case basis.

l. Some tests will not be required for helicopters using helicopter hardware in the simulator cockpit (*e.g.*, ''helicopter modular controller''). These exceptions are noted in Table C2A of this attachment. However, in these cases, the sponsor must provide a statement that the helicopter hardware meets the appropriate manufacturer's specifications and the sponsor must have supporting information to that fact available for NSPM review.

m. For objective test purposes, ''Near maximum'' gross weight is a weight chosen by the sponsor or data provider that is not less than the basic operating weight (BOW) of the helicopter being simulated plus 80% of the difference between the maximum certificated gross weight (either takeoff weight or landing weight, as appropriate for the test) and the BOW. ''Light'' gross weight is a weight chosen by the sponsor or data provider that is not more than 120% of the BOW of the helicopter being simulated or as limited by the minimum practical operating weight of the test helicopter. ''Medium'' gross weight is a weight chosen by the sponsor or data provider that is approximately ±10% of the average of the numerical values of the BOW and the maximum certificated gross weight. (Note: BOW is the empty weight of the aircraft plus the weight of the following: normal oil quantity; lavatory servicing fluid; potable water; required crewmembers and their baggage; and emergency equipment. (References: Advisory Circular 120–27, ''Aircraft Weight and Balance;'' and FAA–H–8083–1, ''Aircraft Weight and Balance Handbook.'').

End QPS Requirements

Begin QPS Requirements

TABLE C2A.—FULL FLIGHT SIMULATOR (FFS) OBJECTIVE TESTS

<<<QPS requirements>>>									<<Information>>
Test		Tolerance(s)	Flight condition	Test details	Simulator level				Notes
No.	Title				A	B	C	D	
1. Performance									
1.a	Engine Assessment.								
1.a.1	Start Operations..								
1.a.1.a	Engine start and acceleration (transient).	Light Off Time — ±10% or ±1 sec., Torque — ±5%, Rotor Speed — ±3%, Fuel Flow — ±10%, Gas Generator Speed — ±5%, Power Turbine Speed — ±5%, Gas Turbine Temp. — ±30°C.	Ground with the Rotor Brake Used and Not Used.	Record each engine start from the initiation of the start sequence to steady state idle and from steady state idle to operating RPM.		X	X	X	
1.a.1.b	Steady State Idle and Operating RPM conditions.	Torque — ±3%, Rotor Speed — ±1.5%, Fuel Flow — ±5%, Gas Generator Speed — ±2%, Power Turbine Speed — ±2%, Turbine Gas Temp. — ±20°C.	Ground	Record both steady state idle and operating RPM conditions.. May be a series of snapshot tests..		X	X	X	
1.a.2	Power Turbine Speed Trim.	±10% of total change of power turbine speed.	Ground	Record engine response to trim system actuation in both directions.		X	X	X	
1.a.3	Engine and Rotor Speed Governing.	Torque — ±5%, Rotor Speed — 1.5%.	Climb, descent	Record results using a step input to the collective. May be conducted concurrently with climb and descent performance tests.		X	X	X	
1.b	Surface Operations.								
1.b.1	Minimum Radius Turn	±3 ft. (0.9m) or 20% of helicopter turn radius.	Ground	If brakes are used, brake force must be matched to the helicopter flight test value.		X	X	X	

TABLE C2A.—FULL FLIGHT SIMULATOR (FFS) OBJECTIVE TESTS—Continued

<<<QPS requirements>>>									<<Information>>
Test		Tolerance(s)	Flight condition	Test details	Simulator level				Notes
No.	Title				A	B	C	D	
1.b.2	Rate of Turn vs. Pedal Deflection or Nosewheel Angle.	±10% or ±2°/sec. Turn Rate	Ground Takeoff			X	X	X	
1.b.3	Taxi	Pitch Angle — ±1.5°, Torque — ±3%, Longitudinal Control Position — ±5%, Lateral Control Position — ±5%, Dirrectional Control Position.	Ground	Record results for control position and pitch attitude during ground taxi for a specific ground speed, wind speed and direction, and density altitude.		X	X	X	
		±5%, Collective Control Position — ±5%.				X	X	X	
1.b.4	Brake Effectiveness	±10% of time and distance	Ground			X	X	X	
1.c	Takeoff .								
1.c.1	All Engines	Airspeed — ±3 kt, Altitude — ±20 ft (6.1m), Torque — ±3%, Rotor Speed — ±1.5%, Vertical Velocity — ±100 fpm (0.50m/sec) or 10%, Pitch Attitude — ±1.5°, Bank Attitude — ±2°, Heading — ±2°, Longitudinal Control Position — ±10%, Lateral Control Position — ±10%, Directional Control Position — ±10%, Collective Control Position — ±10%.	Ground/Takeoff and Initial Segment of Climb.	Record results of takeoff flight path as appropriate to helicopter model simulated (running takeoff for Level B, takeoff from a hover for Level C and D). For Level B, the criteria apply only to those segments at airspeeds above effective translational lift. Results must be recorded from the initiation of the takeoff to at least 200 ft (61m) AGL.		X	X	X	
1.c.2	One Engine Inoperative	Airspeed — ±3 kt, Altitude — ±20 ft (6.1m), Torque — ±3%, Rotor Speed — ±1.5%, Vertical Velocity — ±100 fpm (0.50m/sec) or 10%, Pitch Attitude — ±1.5°, Bank Attitude — ±2°, Heading — ±2°, Longitudinal Control Position — ±10%, Lateral Control Position — ±10%, Directional Control Position — ±10%, Collective Control Position — ±10%.	Ground/Takeoff; and Initial Segment of Climb.	Record takeoff flight path as appropriate to helicopter model simulated. Results must be recorded from the initiation of the takeoff to at least 200 ft (61m) AGL.		X	X	X	
1.d	Hover.								
	Performance	Torque — ±3%, Pitch Attitude — ±1.5°, Bank Attitude — ±1.5°, Longitudinal Control Position — ±5%, Lateral Control Position — ±5%, Directional Control Position — ±5%, Collective Control Position — ±5%,.	In Ground Effect (IGE); and Out of Ground Effect (OGE).	Record results for light and heavy gross weights. May be a series of snapshot tests.		X	X	X	
1.e	Vertical Climb.								
	Performance	Vertical Velocity — ±100 fpm (0.50 m/sec) or ±10%, Directional Control Position — ±5%, Collective Control Position — ±5%.	From OGE Hover	Record results for light and heavy gross weights. May be a series of snapshot tests.			X	X	
1.f	Level Flight.								

TABLE C2A.—FULL FLIGHT SIMULATOR (FFS) OBJECTIVE TESTS—Continued

<<<QPS requirements>>>									<<Information>>
Test		Tolerance(s)	Flight condition	Test details	Simulator level				Notes
No.	Title				A	B	C	D	
	Performance and Trimmed Flight Control Positions.	Torque — ±3%, Pitch Attitude — ±1.5°, Sideslip Angle — ±2°, Longitudinal Control Position — ±5%, Lateral Control Position — ±5%, Directional Control Position — ±5%, Collective Control Position — ±5%.	Cruise (Augmentation On and Off).	Record results for two gross weight and CG combinations with varying trim speeds throughout the airspeed envelope. May be a series of snapshot tests.		X	X	X	
1.g	Climb.								
	Performance and Trimmed Flight Control Positions.	Vertical Velocity — ±100 fpm (6.1m/sec) or ±10%, Pitch Attitude — ±1.5°, Sideslip Angle — ±2°, Longitudinal Control Position — ±5%, Lateral Control Position — ±5%, Directional Control Position — ±5%, Collective Control Position — ±5%.	All engines operating; One engine inoperative; Augmentation System(s) On and Off.	Record results for two gross weight and CG combinations. The data presented must be for normal climb power conditions. May be a series of snapshot tests.		X	X	X	
1.h	Descent.								
1.h.1	Descent Performance and Trimmed Flight Control Positions.	Torque — ±3%, Pitch Attitude — ±1.5°, Sideslip Angle — ±2°, Longitudinal Control Position — ±5%, Lateral Control Position — ±5%, Directional Control Position — ±5%, Collective Control Position — ±5%.	At or near 1,000 fpm rate of descent (RoD) at normal approach speed. Augmentation System(s) On and Off.	Results must be recorded for two gross weight and CG combinations. May be a series of snapshot tests.		X	X	X	
1.h.2	Autorotation Performance and Trimmed Flight Control Positions.	Torque — ±3%, Pitch Attitude — ±1.5°, Sideslip Angle — ±2°, Longitudinal Control Position — ±5%, Lateral Control Position — ±5%, Directional Control Position — ±5%, Collective Control Position — ±5% Vertical Velocity ±100 fpm or 19%, Rotor Speed ±1.5%.	Steady descents. Augmentation System(s) On and Off.	Record results for two gross weight conditions. Data must be recorded for normal operating RPM. (Rotor speed tolerance applies only if collective control position is full down.) May be a series of snapshot tests.		X	X	X	
1.i	Autorotation.								
	Entry	Rotor Speed—±3% Pitch Attitude ±2°Roll Attitude—±3° Yaw Attitude—±5° Airspeed—±5 kts. Vertical Velocity—±200 fpm (1.00 m/sec) or 10%.	Cruise or Climb	Record results of a rapid throttle reduction to idle. If the cruise condition is selected, comparison must be made for the maximum range airspeed. If the climb condition is selected, comparison must be made for the maximum rate of climb airspeed at or near maximum continuous power.		......	X	X	
1.j	Landing.								

TABLE C2A.—FULL FLIGHT SIMULATOR (FFS) OBJECTIVE TESTS—Continued

<<<QPS requirements>>>									<<Information>>
Test		Tolerance(s)	Flight condition	Test details	Simulator level				Notes
No.	Title				A	B	C	D	
1.j.1	All Engines	Airspeed—±3 kts., Altitude—±20 ft. (6.1m), Torque—±3%, Rotor Speed—±1.5%, Pitch Attitude—±1.5°, Bank Attitude—±1.5°, Heading—±2°, Longitudinal Control Position—±10%, Lateral Control Position—±10%, Directional Control Position—±10%, Collective Control Position—±10%.	Approach	Record results of the approach and landing profile as appropriate to the helicopter model simulated (running landing for Level B, or approach to a hover for Level C and D). For Level B, the criteria apply only to those segments at airspeeds above effective translational lift.		X	X	X	
1.j.2	One Engine Inoperative	Airspeed—±3 kts., Altitude—±20 ft. (6.1m), Torque—±3%, Rotor Speed—±1.5%, Pitch Attitude—±1.5°, Bank Attitude—±1.5°, Heading—±2°, Longitudinal Control Position—±10%, Lateral Control Position—±10%, Directional Control Position—±10%, Collective Control Position—±10%.	Approach	Record results for both Category A and Category B approaches and landing as appropriate to helicopter model simulated. For Level B, the criteria apply only to those segments at airspeeds above effective translational lift.		X	X	X	
1.j.3	Balked Landing	Airspeed—±3 kts., Altitude—±20 ft. (6.1 m), Torque—±3%, Rotor Speed—±1.5%, Pitch Attitude—±1.5°, Bank Attitude—±1.5°, Heading—±2°, Longitudinal Control Position—±10%, Lateral Control Position—±10%, Directional Control Position—±10%, Collective Control Position—±10%.	Approach	Record the results for the maneuver initiated from a stabilized approach at the landing decision point (LDP).		X	X	X	
1.j.4	Autorotational Landing	Torque—±3%, Rotor Speed—±3%, Vertical Velocity—±100 fpm (0.50 m/sec) or 10%, Pitch Attitude—±2°, Bank Attitude—±2°, Heading—±5°, Longitudinal Control Position—±10%, Lateral Control Position—±10%, Directional Control Position—±10%, Collective Control Position—±10%.	Landing	Record the results of an autorotational deceleration and landing from a stabilized autorotational descent, to touch down.			X	X	
2. Handling Qualities.									
2.a	Control System Mechanical Characteristic(s).								
	For simulators requiring Static or Dynamic tests at the controls (i.e., cyclic, collective, and pedal), special test fixtures will not be required during initial or upgrade evaluations if the sponsor's QTG/MQTG shows both test fixture results *and* the results of an alternative approach, such as computer plots produced concurrently showing satisfactory agreement. Repeat of the alternative method during the initial or upgrade evaluation would then satisfy this test requirement. For initial and upgrade evaluations, the control dynamic characteristics must be measured at and recorded directly from the cockpit controls, and must be accomplished in hover, climb, cruise, and autorotation.								Contact the NSPM for clarification of any issue regarding helicopters with reversible controls.
2.a.1	Cyclic	Breakout—±0.25 lbs. (0.112 daN) or 25%; Force—±1.0 lb. (0.224 daN) or 10%.	Ground; Static conditions. Trim On and Off. Friction Off Augmentation On and Off.	Record results for an uninterrupted control sweep to the stops. (This test does not apply if aircraft hardware modular controllers are used.).		X	X	X	

TABLE C2A.—FULL FLIGHT SIMULATOR (FFS) OBJECTIVE TESTS—Continued

<<<QPS requirements>>>									<<Information>>
Test		Tolerance(s)	Flight condition	Test details	Simulator level				Notes
No.	Title				A	B	C	D	
2.a.2	Collective/Pedals	Breakout—±0.5 lb. (0.224 daN) or 25%; Force—±1.0 lb. (0.224 daN) or 10%..	Ground; Static conditions. Trim On and Off. Friction Off. Augmentation On and Off.	Record results for an uninterrupted control sweep to the stops.		X	X	X	
2.a.3	Brake Pedal Force vs. Position.	±5 lbs. (2.224 daN) or 10%	Ground; Static conditions.	....		X	X	X	
2.a.4	Trim System Rate (all applicable systems).	Rate—±10%	Ground; Static conditions. Trim On, Friction Off.	The tolerance applies to the recorded value of the trim rate.		X	X	X	
2.a.5	Control Dynamics (all axes).	±10% of time for first zero crossing and ±10 (N+1)% of period thereafter, ±10% of amplitude of first overshoot, 20% of amplitude of 2nd and subsequent overshoots greater than 5% of initial displacement, ±1 overshoot.	Hover/Cruise, Trim On, Friction Off.	Results must be recorded for a normal control displacement in both directions in each axis.		......	X	X	Typically, control displacement of 25% to 50% is necessary for proper excitation. Control Dynamics for irreversible control systems may be evaluated in a ground/static condition. Additional information on control dynamics is found later in this attachment. “N” is the sequential period of a full cycle of oscillation.
2.a.6	Freeplay	±0.10 in	Ground; Static conditions.	Record and compare results for all controls.		X	X	X	
2.b	Low Airspeed Handling Qualities.								
2.b.1	Trimmed Flight Control Positions.	Torque—±3% Pitch Attitude—±1.5° Bank Attitude—±2° Longitudinal Control Position—±5% Lateral Control Position—±5% Directional Control Position—±5% Collective Control Position—±5%.	Translational Flight IGE—Sideward, rearward, and forward flight. Augmentation On and Off.	Record results for several airspeed increments to the translational airspeed limits and for 45 kts. forward airspeed.. May be a series of snapshot tests.			X	X	
2.b.2	Critical Azimuth	Torque—±3% Pitch Hover—Bank Attitude—±2°, Longitudinal Control Position—±5%, Lateral Control Position—±5%, Directional Control Position—±5%, Collective Control Position—±5%.	Stationary Hover. Augmentation On and Off.	Record results for three relative wind directions (including the most critical case) in the critical quadrant. May be a series of snapshot tests.			X	X	
2.b.3	Control Response.								
2.b.3.a	Longitudinal	Pitch Rate—±10% or ±2% sec. Pitch Attitude Change—±10% or 1.5°.	Hover. Agumentation On and Off.	Record results for a step control input. The Off-axis response must show correct trend for unaugmented cases.			X	X	
2.b.3.b	Lateral	Roll Rate—±10% or ±2% sec. Pitch Attitude Change—±10% or 1.5°.	Hover. Augmentation On and Off.	Record results for a step control input. The Off-axis response must show correct trend for unaugmented cases.			X	X	

TABLE C2A.—FULL FLIGHT SIMULATOR (FFS) OBJECTIVE TESTS—Continued

<<<QPS requirements>>>									<<Information>>
Test		Tolerance(s)	Flight condition	Test details	Simulator level				Notes
No.	Title				A	B	C	D	
2.b.3.c	Directional	Yaw Rate—±10% or ±2% sec. Heading Change—±10% or 2°.	Hover. Augmentation On and Off.	Record results for a step control input. The Off-axis response must show correct trend for unaugmented cases.			X	X	
2.b.3.d	Vertical	Normal Acceleration—±0.1 g	Hover control input. The Off-axis response must show correct trend for unaugmented cases.	Record results for a step.			X	X	
2.c	Longitudinal Handling Qualities.								
2.c.1	Control Response	Pitch Rate—±10% or ±2°/sec., Pitch Attitude Change—±10% or ±1.5°.	Cruise Augmentation On and Off.	Results must be recorded for two cruise airspeeds to include minimum power required speed. Record data for a step control input. The Off-axis response must show correct trend for unaugmented cases.		X	X	X	
2.c.2	Static Stability	Longitudinal Control Position: ±10% of change from trim or ±0.25 in. (6.3 mm) or Longitudinal Control Force: ±0.5 lb. (0.223 daN) or ±10%.	Cruise or Climb. Autorotation. Augmentation On and Off.	Record results for a minimum of two speeds on each side of the trim speed. May be a series of snapshot tests.		X	X	X	
2.c.3	Dynamic Stability.								
2.c.3.a	Long Term Response	±10% of calculated period, ±10% of time to ½ or double amplitude, or ±0.02 of damping ratio.	Cruise Augmentation On and Off.	Record results for three full cycles (6 overshoots after input completed) or that sufficient to determine time to ½ or double amplitude, whichever is less. For non-period responses, the time history must be matched.		X	X	X	
2.c.3.b	Short Term Response	±1.5° Pitch or ±2°/sec. Pitch Rate. ±0.1 g Normal Acceleration.	Cruise or Climb. Augmentation On and Off.	Record results for at least two airspeeds.		X	X	X	
2.c.4	Maneuvering Stability	Longitudinal Control Position—±10% of change from trim or ±0.25 in. (6.3mm) or Longitudinal Control Forces—±0.5 lb. (0.223 daN) or ±10%.	Cruise or Climb. Augmentation On and Off.	Record results for at least two airspeeds. The force may be shown as a cross plot for irreversible systems. May be a series of snapshot tests.		X	X	X	Typically, 30°–45° bank angle is necessary for adequate stability measurement.
2.c.5	Landing Gear Operating Times.	±1 sec	Takeoff (Retraction) Approach (Extension).		X	X	X	xl	
2.d	Lateral and Directional Handling Qualities.								
2.d.1	Control Response.								

TABLE C2A.—FULL FLIGHT SIMULATOR (FFS) OBJECTIVE TESTS—Continued

<<<QPS requirements>>>									<<Information>>
Test		Tolerance(s)	Flight condition	Test details	Simulator level				Notes
No.	Title				A	B	C	D	
2.d.1.a	Lateral	Roll Rate—±10% or ±3°/sec., Roll Attitude Change—±10% or ±3°.	Cruise Augmentation On and Off.	Record results for least two airspeeds, including the speed at or near the minimum power required airspeed. Record results for a step control input. The Off-axis response must show correct trend for unaugmented cases.		X	X	X	
2.d.1.b	Directional	Yaw Rate—±10% or ±2°/sec., Yaw Attitude Change—±10% or ±2°.	Cruise Augmentation On and Off.	Record data for at least two airspeeds, including the speed at or near the minimum power required airspeed. Record results for a step control input. The Off-axis response must show correct trend for unaugmented cases.		X	X	X	
2.d.2	Directional Static Stability.	Lateral Control Position—±10% of change from trim or ±0.25 in. (6.3mm) or Lateral Control Force—±0.5 lb. (0.223 daN) or 10%, Roll Attitude—±1.5, Directional Control Position—±10% of change from trim or ±0.25 in. (6.3mm) or Directional Control Force—±1 lb. (0.448 daN) or 10%., Longitudinal Control Position—±10% of change from trim or ±0.25 in. (6.3mm), Vertical Velocity—±100 fpm (0.50m/sec) or 10%.	Cruise; or Climb (may use Descent instead of Climb if desired), Augmentation On and Off.	Record results for at least two sideslip angles on either side of the trim point. The force may be shown as a cross plot for irreversible systems. May be a series of snapshot tests.		X	X	X	This is a steady heading sideslip test.
2.d.3	Dynamic Lateral and Directional Stability.								
2.d.3.a	Lateral-Directional Oscillations.	±0.5 sec. or ±10% of period, ±10% of time to ½ or double amplitude or ±0.02 of damping ratio, ±20% of ±1 sec. of time difference between peaks of bank and sideslip.	Cruise or Climb. Augmentation On/Off.	Record results for at least two airspeeds. The test must be initiated with a cyclic or a pedal doublet input. Record results for six full cycles (12 overshoots after input completed) or that sufficient to determine time to ½ or double amplitude, whichever is less. For non-periodic response, the time history must be matched.		X	X	X	
2.d.3.b	Spiral Stability	Correct Trend, ±2° bank or ±10% in 20 sec.	Cruise or Climb. Augmentation On and Off.	Record the results of a release from pedal only or cyclic only turns. Results must be recorded from turns in both directions.		X	X	X	

TABLE C2A.—FULL FLIGHT SIMULATOR (FFS) OBJECTIVE TESTS—Continued

<<<QPS requirements>>>									<<Information>>
Test		Tolerance(s)	Flight condition	Test details	Simulator level				Notes
No.	Title				A	B	C	D	
2.d.3.c	Adverse/Proverse Yaw ..	Correct Trend, ±2° transient sideslip angle.	Cruise or Climb. Augmentation On and Off.	Record the time history of initial entry into cyclic only turns, using only a moderate rate for cyclic input. Results must be recorded for turns in both directions.		X	X	X	
2. Handling Qualities.									
2.a	Control System								
3. Motion System.									
3.a	Motion Envelope.								
3.a.1	Pitch.								
3.a.1.a	Displacement—TBD°	....	....	....	......	X			
	±25°	....	....	....			X	X	
3.a.1.b	Velocity—TBD°/sec	....	....	....		X			
	±20°/sec	....	....	....			X	X	
3.a.1.c	Acceleration—TBD°/sec²	....	....	....		X			
	±100°/sec²	....	....	....		X	X		
3.a.2 3.a.2.a	Displacement—TBD°	....	....	....		X			
	±25°	....	....	....			X	X	
3.a.2.b	Velocity—TBD°/sec	....	....	....		X			
	±20°/sec	....	....	....			X	X	
3.a.2.c	Acceleration—TBD°/sec²	....	....	....		X	......		
	±100°/sec²	....	....	....			X	X	
3.a.3	Yaw								
3.a.3.a	Displacement −±25°	....	....	....			X	X	
3.a.3.b	Velocity—±20°/sec	....	....	....			X	X	
3.a.3.c	Acceleration—±100°/sec².	....	....	....			X	X	
3.a.4	Vertical	....	....	....					
3.a.4.a	Displacement—TBD in ..	....	....	....		X			
	±34 in.	....	....	....			X	X	
3.a.4.b	Velocity—TBD in	....	....	....		X			
	±24 in	....	....	....			X	X	
3.a.4.c	Acceleration—TBD g	....	....	....		X	......		
	±0.8 g	....	....	....			X	X	
3.A.5	Lateral								
	Displacement: ±45 in	....	....	....			X	X	
	Velocity: ±28 in/sec	....	....	....			X	X	
	Acceleration: ±0.6 g	....	....	....			X	X	
3.a.6	Longitudinal.								
	Displacement: ±34 in	....	....	....			X	X	

TABLE C2A.—FULL FLIGHT SIMULATOR (FFS) OBJECTIVE TESTS—Continued

<<<QPS requirements>>>									<<Information>>
Test		Tolerance(s)	Flight condition	Test details	Simulator level				Notes
No.	Title				A	B	C	D	
	Velocity: ±28 in/sec	....	....	....			X	X	
	Acceleration: ±0.6 g	....	....	....			X	X	
3.a.7	Initial Rotational Acceleration Ratio								
	All axes: TBD°/sec^2/sec	....	....	....		X			
	All axes: 300°/ sec^2/sec	....	....	....			X	X	
3.a.8	Initial Linear Acceleration Ratio.								
	Vertical: ±TBD g/sec	....	....	....		X			
	±6g/sec	....	....	....			X	X	
	Lateral: ±3g/sec	....	....	....			X	X	
	Longitudinal: ±3g/sec	....	....	....			X	X	
3.b	Frequency Response								
	Band, Hz Phase, deg. ...	Amplitude, Ratio, db, ...	....	....	......	X	X	X	
	0.10 to 0.5 −15 to −20	±2 .... ±2	....	....	......				
	0.51 to 1.0 −15 to −20	±4, ... ±4	....	....	......				
3.c	Leg Balance.								
	Leg Balance	1.5°	....	The phase shift between a datum jack and any other jack must be measured using a heave (vertical) signal of 0.5 Hz. at ±0.25 g.	......	X	X	X	
3.d	Turn Around.								
	Turn Around	0.05 g	....	The motion base must be driven sinusoidally in heave through a displacement of 6 inches (150mm) peak to peak at a frequency of 0.5 Hz. Deviation from the desired sinusoidal acceleration must be measured.		X	X	X	
4	Visual System Display Tests.								
4.a	Field of View.								

TABLE C2A.—FULL FLIGHT SIMULATOR (FFS) OBJECTIVE TESTS—Continued

<<<QPS requirements>>>									<<Information>>
Test		Tolerance(s)	Flight condition	Test details	Simulator level				Notes
No.	Title				A	B	C	D	
4.a.1	Continuous collimated visual field of view.	Minimum continuous collimated field of view providing 75° horizontal and 30° vertical field of view for each pilot simultaneously.	N/A	An SOC is required. Horizontal field of view is centered on the zero degree azimuth line relative to the aircraft fuselage.		X			A vertical field of view of 30° may be insufficient to meet visual ground segment requirements. Field of view may be measured using a visual test pattern filling the entire visual scene (all channels) with a matrix of black and white 5° squares. The installed alignment should be addressed in the SOC.
4.a.2	Continuous collimated visual field of view.	Minimum continuous collimated field of view providing 150° horizontal and 40° vertical field of view for each pilot simultaneously.	N/A/	An SOC is required. Horizontal field of view is centered on the zero degree azimuth line relative to the aircraft fuselage.			X		Field of view may be measured using a visual test pattern filling the entire visual scene (all channels) with a matrix of black and white 5° squares. The installed alignment should be addressed in the SOC.
4.a.3	Continuous collimated visual field of view.	Minimum continuous collimated field of view providing 180° horizontal and 60° vertical field of view for each pilot simultaneously.	N/A	An SOC is required. Horizontal field of view is centered on the zero degree azimuth line relative to the aircraft fuselage.				X	Field of view may be measured using a visual test pattern filling the entire visual scene (all channels) with a matrix of black and white 5° squares. The installed alignment should be addressed in the SOC.
4.c	Surface contrast ratio	Not less than 5:1	N/A	The ratio is calculated by dividing the brightness level of the center, bright square (providing at least 2 foot-lamberts or 7 cd/ms^2) by the brightness level of any adjacent dark square.				X	Measurements may be made using a 1° spot photometer and a raster drawn test pattern filling the entire visual scene (all channels) with a test pattern of black and white squares, 5 per square, with a white square in the center of each channel. During contrast ratio testing, simulator aft-cab and flight deck ambient light levels should be zero.

TABLE C2A.—FULL FLIGHT SIMULATOR (FFS) OBJECTIVE TESTS—Continued

<<<QPS requirements>>>									<<Information>>
Test		Tolerance(s)	Flight condition	Test details	Simulator level				Notes
No.	Title				A	B	C	D	
4.d	Highlight brightness	Not less than six (6) foot-lamberts (20 cd/m²).	N/A	Measure the brightness of the center, white square while superimposing a highlight on that white square. The use of calligraphic capabilities to enhance the raster brightness is acceptable; however, measuring light points is not acceptable.				X	Measurements may be made using a 1° spot photometer and a raster drawn test pattern filling the entire visual scene (all channels) with a test pattern of black and white squares, 5 per square, with a white square in the center of each channel.
4.e	Vernier resolution (surface resolution).	Not greater than 3 arc minutes	N/A	An SOC is required and must include the appropriate calculations and an explanation of those calculations.			X	X	
4.f	Light point size	Not greater than six (6) arc-minutes..	N/A	An SOC is required and must include the relevant calculations and an explanation of those calculations.			X	X	Light point size may be measured using a test pattern consisting of a centrally located single row of light points reduced in length until modulation is just discernible in each visual channel. A row of 48 lights will form a 4° angle or less.
4.g	Light point contrast ratio	Not less than 25:1	N/A	An SOC is required and must include the relevant calculations..			X	X	A 1° spot photometer may be used to measure a square of at least 1° filled with light points (where light point modulation is just discernible) and compare the results to the measured adjacent background. During contrast ratio testing, simulator aft-cab and flight deck ambient light levels should be zero.

Begin Information

2. Control Dynamics.

a. General. The characteristics of a helicopter flight control system have a major effect on the handling qualities. A significant consideration in pilot acceptability of a helicopter is the ''feel'' provided through the flight controls. Considerable effort is expended on helicopter feel system design so that pilots will be comfortable and will consider the helicopter desirable to fly. In order for a FFS to be representative, it should ''feel'' like the helicopter being simulated. Compliance with this requirement is determined by comparing a recording of the control feel dynamics of the FFS to actual helicopter measurements in the takeoff, cruise and landing configurations.

b. Recordings such as free response to an impulse or step function are classically used to estimate the dynamic properties of electromechanical systems. In any case, it is only possible to estimate the dynamic properties as a result of only being able to estimate true inputs and responses. Therefore, it is imperative that the best possible data be collected since close matching of the FFS control loading system to the helicopter system is essential. The required dynamic control tests are described in Table C2A of this attachment.

c. For initial and upgrade evaluations, the QPS requires that control dynamics characteristics be measured and recorded directly from the flight controls (Handling Qualities—Table C2A). This procedure is usually accomplished by measuring the free response of the controls using a step or impulse input to excite the system. The procedure should be accomplished in the takeoff, cruise and landing flight conditions and configurations.

d. For helicopters with irreversible control systems, measurements may be obtained on the ground if proper pitot-static inputs are provided to represent airspeeds typical of those encountered in flight. Likewise, it may be shown that for some helicopters, hover, climb, cruise, and autorotation have like effects. Thus, one may suffice for another. If either or both considerations apply, engineering validation or helicopter manufacturer rationale should be submitted as justification for ground tests or for eliminating a configuration. For FFSs requiring static and dynamic tests at the controls, special test fixtures will not be required during initial and upgrade evaluations if the QTG shows both test fixture results and the results of an alternate approach (*e.g.*, computer plots that were produced concurrently and show satisfactory agreement). Repeat of the alternate method during the initial evaluation would satisfy this test requirement.

(1) Control Dynamics Evaluations. The dynamic properties of control systems are often stated in terms of frequency, damping, and a number of other classical measurements. In order to establish a consistent means of validating test results for FFS control loading, criteria are needed that will clearly define the measurement interpretation and the applied tolerances. Criteria are needed for underdamped, critically damped and overdamped systems. In the case of an underdamped system with very light damping, the system may be quantified in terms of frequency and damping. In critically damped or overdamped systems, the frequency and damping are not readily measured from a response time history. Therefore, the following suggested measurements may be used:

(2) For Levels C and D simulators. Tests to verify that control feel dynamics represent the helicopter should show that the dynamic damping cycles (free response of the controls) match those of the helicopter within specified tolerances. The NSPM recognizes that several different testing methods may be used to verify the control feel dynamic response. The NSPM will consider the merits of testing methods based on reliability and consistency. One acceptable method of evaluating the response and the tolerance to be applied is described below for the underdamped and critically damped cases. A sponsor using this method to comply with the QPS requirements should perform the tests as follows:

e. Tolerances.

(1) Underdamped Response.

(a) Two measurements are required for the period, the time to first zero crossing (in case a rate limit is present) and the subsequent frequency of oscillation. It is necessary to measure cycles on an individual basis in case there are non-uniform periods in the response. Each period will be independently compared to the respective period of the helicopter control system and, consequently, will enjoy the full tolerance specified for that period.

(b) The damping tolerance will be applied to overshoots on an individual basis. Care should be taken when applying the tolerance to small overshoots since the significance of such overshoots becomes questionable. Only those overshoots larger than 5 percent of the total initial displacement should be considered significant. The residual band, labeled $T(A_d)$ on Figure C2A is ±5 percent of the initial displacement amplitude A_d from the steady state value of the oscillation. Only oscillations outside the residual band are considered significant. When comparing FFS data to helicopter data, the process should begin by overlaying or aligning the FFS and airplane steady state values and then comparing amplitudes of oscillation peaks, the time of the first zero crossing, and individual periods of oscillation. The FFS should show the same number of significant overshoots to within one when compared against the helicopter airplane data. The procedure for evaluating the response is illustrated in Figure C2A.

(2) Critically damped and Overdamped Response. overdamped response. Due to the nature of critically damped and overdamped responses (no overshoots), the time to reach 90 percent of the steady state (neutral point) value should be the same as the helicopter within ±10 percent. The simulator response must be critically damped also. Figure C2B illustrates the procedure.

(3) The following summarizes the tolerances:

$T(P_0)$ ±10% of P_0
$T(P_1)$ ±20% of P_1
$T(A)$ ±10% of A_1, ±20% of Subsequent Peaks
$T(A_d)$ ±10% of A_d = Residual Band
Overshoots ±1

(4) In the event the number of cycles completed outside of the residual band, and thereby significant, exceeds the number depicted in figure 1 of this attachment, the following tolerances (T) will apply:

$T(P_n)$ ±10%(n+1)% of P_n, where ''n'' is the next in sequence.

BILLING CODE 491073–P

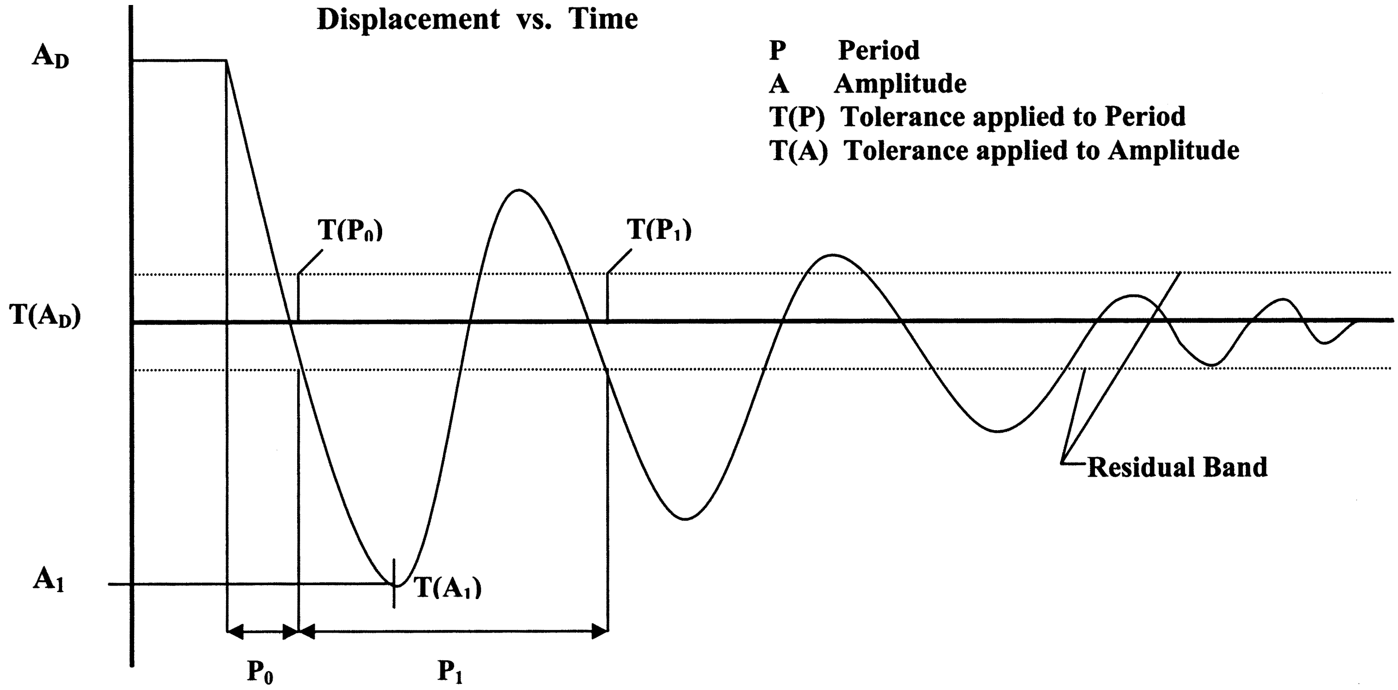


Figure C2A
Under-Damped Step Response

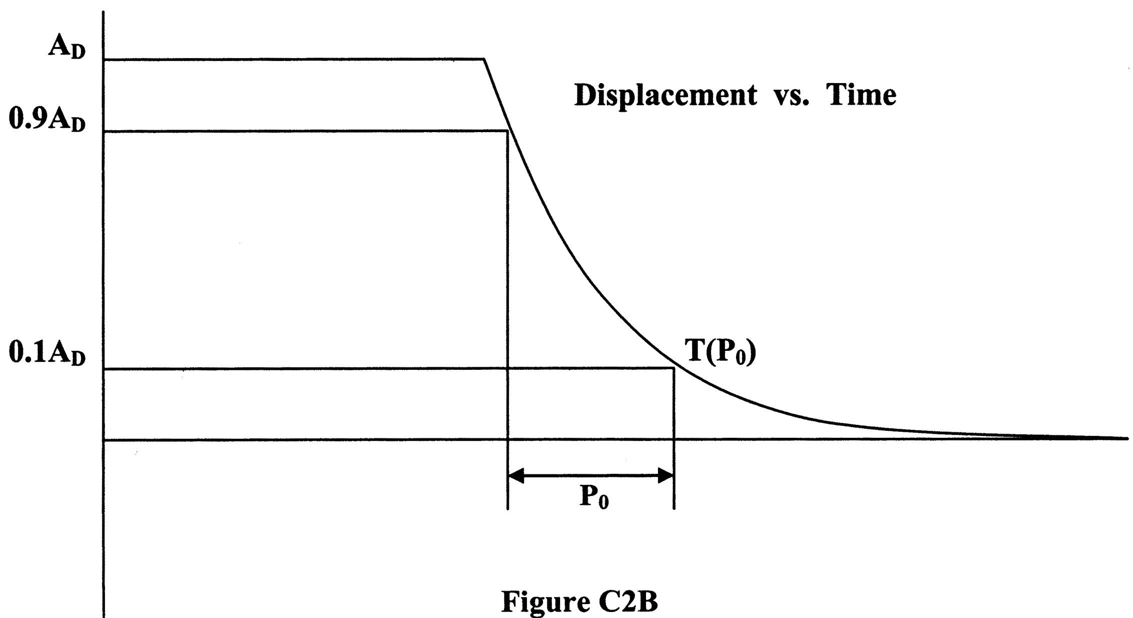


Figure C2B
Critically-Damped Step Response

3. Motion Cue Repeatability Testing.

a. The motion system characteristics in the Table C2A address basic system capability, but not pilot cueing capability. Motion systems will continue to be "tuned" subjectively until there is an objective procedure for determining the motion cues necessary to support pilot tasks and stimulate the pilot response that occurs in a helicopter for the same tasks. When a motion system is tuned, it is important to test the system to ensure that it continues to perform as originally qualified. Any motion performance change from the initially qualified baseline can be measured objectively.

b. Motion performance change should be assessed at least annually. An assessment may be conducted as follows:

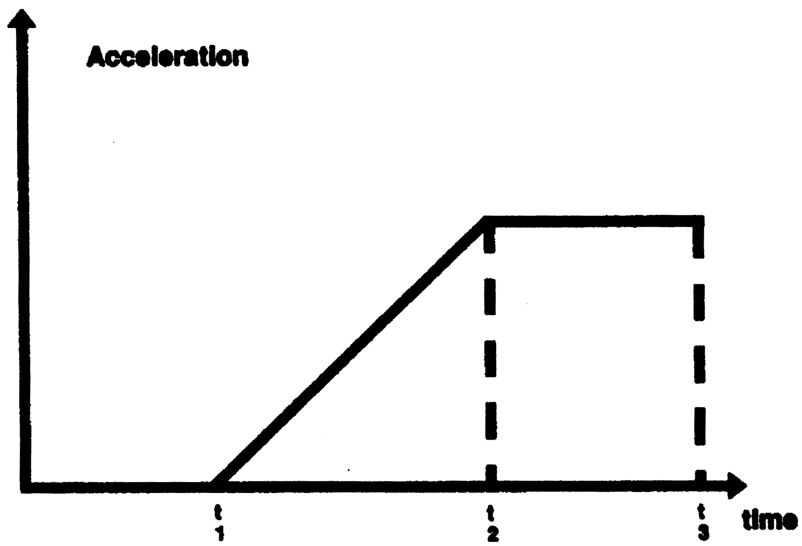
(1) Compare the current performance of the motion system to the initial recorded test data.

(2) Record the parameters of the motion drive algorithms and the jack position transducers.

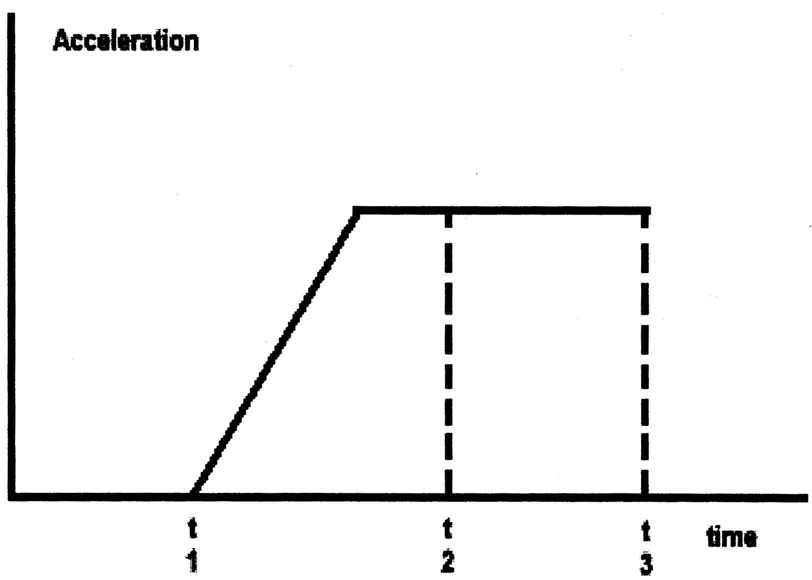
(3) Insert the test input signals at an appropriate point prior to the integrations in the equations of motion (see Figure C2C of this attachment).

(4) Adjust the characteristics of the test signal (see Figure C2D of this attachment) to ensure that the motion is exercised properly. Motion system manufactures suggest a range of approximately ⅔ of the maximum displacement capability in each axis with a time segment (T_0–T_1) of sufficient duration to ensure steady initial conditions.

Attachment 2 to Appendix C to Part 60—
Figure C2C. Acceleration Test Signals



Attachment 2 to Appendix C to Part 60—
Figure C2D. Test Signal Characteristics



NOTE: Motion system baseline performance repeatability tests should be rerun if the simulator weight changes for any reason (i.e., visual change, or structural change). The new results should be used for future comparison.

End Information

BILLING CODE 491073–C

Attachment 3 to Appendix C to Part 60—Simulator Subjective Evaluation

1. Discussion

Begin Information

a. The subjective tests provide a basis for evaluating the capability of the simulator to perform over a typical utilization period;

determining that the simulator competently simulates each required maneuver, procedure, or task; and verifying correct operation of the simulator controls, instruments, and systems. The items listed in the following Tables are for simulator evaluation purposes only. They must not be used to limit or exceed the authorizations for use of a given level of simulator as described on the Statement of Qualification or as may be approved by the TPAA. All items in the following paragraphs are subject to an examination.

b. The tests in Table A3A, Operations Tasks, in this attachment address pilot functions, including maneuvers and procedures (called flight tasks), and is divided by flight phases. The performance of these tasks by the NSPM includes an operational examination of the visual system and special effects. There are flight tasks included to address some features of advanced technology helicopters and innovative training programs.

c. The tests in Table A3A, Operations Tasks, and Table A3G, Instructor Operating Station, in this attachment addresses the overall function and control of the simulator including the various simulated environmental conditions; simulated helicopter system operation (normal, abnormal, and emergency); visual system displays; and special effects necessary to meet flight crew training, evaluation, or flight experience requirements.

d. All simulated helicopter systems functions will be assessed for normal and, where appropriate, alternate operations. Normal, abnormal, and emergency operations associated with a flight phase will be assessed during the evaluation of flight tasks or events within that flight phase. Simulated helicopter systems are listed separately under ''Any Flight Phase'' to ensure appropriate attention to systems checks. Operational navigation systems (including inertial navigation systems, global positioning systems, or other long-range systems) and the associated electronic display systems will be evaluated if installed. The NSP pilot will include in his report to the TPAA, the effect of the system operation and any system limitation.

e. Simulators demonstrating a satisfactory circling approach will be qualified for the circling approach maneuver and may be approved for such use by the TPAA in the sponsor's FAA-approved flight training program. To be considered satisfactory, the circling approach will be flown at maximum gross weight for landing, with minimum visibility for the helicopter approach category, and must allow proper alignment with a landing runway at least 90° different from the instrument approach course while allowing the pilot to keep an identifiable portion of the airport in sight throughout the maneuver (reference—14 CFR 91.175(e)).

f. At the request of the TPAA, the NSP Pilot may assess the simulator for a special aspect of a sponsor's training program during the functions and subjective portion of an evaluation. Such an assessment may include a portion of a Line Oriented Flight Training (LOFT) scenario or special emphasis items in the sponsor's training program. Unless directly related to a requirement for the qualification level, the results of such an evaluation would not affect the qualification of the simulator.

g. The NSPM acknowledges that there are previously qualified simulators with certain, early generation Computer Generated Image (CGI) visual systems, that are limited by either the capability of the Imgage Generator or the display system used. As a result, the NSPM has agreed to discuss the specific circumstances that may be determined to exist and has agreed to reach a mutually acceptable course of action to address these limitations beyond those that are listed in the QPS requirements of this table. The following are examples:

(1) Early CGI visual systems that are exempt from the necessity of including runway numbers as a part of the specific runway marking requirements are:

(a) Link NVS and DNVS.

(b) Novoview 2500 and 6000.

(c) FlightSafety VITAL series up to, and including, VITAL III, but not beyond.

(d) Redifusion SP1, SP1T, and SP2.

(2) Early CGI visual systems that are exempt from the necessity of including runway numbers except for those runways used for LOFT training sessions. These LOFT airport models require runway numbers but only for the specific runway end (one direction) used in the LOFT session. The systems required to display runway numbers only for LOFT scenes are:

(a) FlightSafety VITAL IV.

(b) Redifusion SP3 and SP3T.

(c) Link-Miles Image II.

(3) Previously qualified CGI and/or display systems that are incapable of generating blue lights, and therefore will not be required to have accurate taxi-way edge lighting are:

(a) Redifusion SP1 and SP1T.

(b) FlightSafety Vital IV.

(c) Link-Miles Image II and Image IIT

(d) XKD displays (even though the XKD image generator is capable of generating blue colored lights, the display cannot accommodate that color).

End Information

TABLE C3A.—FUNCTIONS AND SUBJECTIVE TESTS

<<< QPS requirements >>>					
No.	Operations tasks	Simulator level			
		A	B	C	D
Tasks in this table are subject to evaluation if appropriate for the helicopter simulated as indicated in the SOQ Configuration List and/or the level of simulator qualification involved. Items not installed or not functional on the simulator and, therefore, not appearing on the SOQ Configuration List, are not required to be listed as exceptions on the SOQ.					
1. Preparation For Flight					
1.a	Cockpit check: switches, indicators, systems, and equipment		X	X	X
2. APU/Engine start and run-up					
2.a	Normal start procedures		X	X	X
2.b	Alternate start procedures		X	X	X
2.c	Abnormal starts and shutdowns (e.g., hot start, hung start)		X	X	X
2.d	Rotor engagement		X	X	X
2.e	System checks		X	X	X
3. (Reserved)					
4. (Reserved)					

TABLE C3A.—FUNCTIONS AND SUBJECTIVE TESTS—Continued

<<< QPS requirements >>>					
No.	Operations tasks	Simulator level			
		A	B	C	D
5. (Reserved)					
6. Take-off					
6.a	Normal		X	X	X
6.a.1	From ground		X	X	X
6.a.2	From hover		X	X	X
6.a.2.a	Cat A		X	X	X
6.a.2.b	Cat B		X	X	X
6.a.3	Running		X	X	X
6.a.4	Crosswind/tailwind		X	X	X
6.a.5	Maximum performance		X	X	X
6.a.6	Instrument		X	X	X
6.a.7	(Reserved).				
6.a.8	(Reserved).				
6.a.9	(Reserved).				
6.a.10	(Reserved).				
6.b	Abnormal/emergency procedures		X	X	X
6.b.1	Takeoff with engine failure after critical decision point (CDP)		X	X	X
6.b.1.a	Cat A		X	X	X
6.b.1.b	Cat B		X	X	X
6.c	(Reserved).				
7. Climb					
7.a	Normal		X	X	X
7.b	(Reserved).				
7.c	(Reserved).				
7.d	One engine inoperative		X	X	X
8. Cruise					
8.a	Performance		X	X	X
8.b	Flying qualities		X	X	X
8.c	Turns		X	X	X
8.c.1	Timed		X	X	X
8.c.2	Normal		X	X	X
8.c.3	Steep		X	X	X
8.d	Accelerations and decelerations		X	X	X
8.e	High speed vibrations		X	X	X
8.f	(Reserved).				

TABLE C3A.—FUNCTIONS AND SUBJECTIVE TESTS—Continued

<<< QPS requirements >>>					
No.	Operations tasks	Simulator level			
		A	B	C	D
8.g	Abnormal/emergency procedures		X	X	X
8.g.1	Engine fire		X	X	X
8.g.2	Engine failure		X	X	X
8.g.3	Inflight engine shutdown and restart		X	X	X
8.g.4	Fuel governing system failures		X	X	X
8.g.5	Directional control malfunction		X	X	X
8.g.6	Hydraulic failure		X	X	X
8.g.7	Stability system failure		X	X	X
8.g.8	Rotor vibrations		X	X	X
9. Descent					
9.a	Normal		X	X	X
9.b	Maximum rate		X	X	X
9.c	(Reserved).				
10. Approach					
10.a	Non-precision		X	X	X
10.a.1	All engines operating		X	X	X
10.a.2	One or more engines inoperative		X	X	X
10.a.3	Approach procedures		X	X	X
10.a.3.a	NDB		X	X	X
10.a.3.b	VOR, RNAV, TACAN		X	X	X
10.a.3.c	ASR		X	X	X
10.a.3.d	(Reserved).				
10.a.3.e	Helicopter only		X	X	X
10.a.4	Missed approach		X	X	X
10.a.4.a	All engines operating		X	X	X
10.a.4.b	One or more engines inoperative		X	X	X
10.b	Precision		X	X	X
10.b.1	All engines operating		X	X	X
10.b.2	One or more engines inoperative		X	X	X
10.b.3	Approach procedures		X	X	X
10.b.3.a	PAR		X	X	X
10.b.3.b	MLS		X	X	X
10.b.3.c	ILS		X	X	X
10.b.3.c	(1) Manual (raw data)		X	X	X
10.b.3.c	(2) Flight director only		X	X	X

TABLE C3A.—FUNCTIONS AND SUBJECTIVE TESTS—Continued

<<< QPS requirements >>>					
No.	Operations tasks	Simulator level			
		A	B	C	D
10.b.3.c	(3) Autopilot coupled		X	X	X
10.b.3.c	—Cat I		X	X	X
10.b.3.c	—Cat II		X	X	X
10.b.4	Missed approach.				
10.b.4.a	All engines operating		X	X	X
10.b.4.b	One or more engines inoperative		X	X	X
10.b.4.c	Stability system failure		X	X	X
10.c	(Reserved).				
11. (Reserved)					
12. Any Flight Phase					
12.a	Helicopter and powerplant systems operation.				
12.a.1	Air conditioning		X	X	X
12.a.2	Anti-icing/deicing		X	X	X
12.a.3	Auxiliary power-plant		X	X	X
12.a.4	Communications		X	X	X
12.a.5	Electrical		X	X	X
12.a.6	Fire detection and suppression		X	X	X
12.a.7	Stabilizer		X	X	X
12.a.8	Flight controls		X	X	X
12.a.9	Fuel and oil		X	X	X
12.a.10	Hydraulic		X	X	X
12.a.11	Landing gear		X	X	X
12.a.12	Oxygen		X	X	X
12.a.13	Pneumatic		X	X	X
12.a.14	Powerplant		X	X	X
12.a.15	Flight control computers		X	X	X
12.a.16	Stability and control augmentation		X	X	X
12.b	Flight management and guidance system.				
12.b.1	Airborne radar		X	X	X
12.b.2	Automatic landing aids		X	X	X
12.b.3	Autopilot		X	X	X
12.b.4	Collision avoidance system		X	X	X
12.b.5	Flight data displays		X	X	X
12.b.6	Flight management computers		X	X	X
12.b.7	Heads-up displays		X	X	X

TABLE C3A.—FUNCTIONS AND SUBJECTIVE TESTS—Continued

<<< QPS requirements >>>					
No.	Operations tasks	Simulator level			
		A	B	C	D
12.b.8	Navigation systems		X	X	X
12.c	Airborne procedures.				
12.c.1	Holding		X	X	X
12.c.2	Air hazard avoidance		X	X	X
12.c.3	Retreating blade stall recovery		X	X	X
12.c.4	Mast bumping		X	X	X
13. Engine Shutdown and Parking					
13.a	Engine and systems operation		X	X	X
13.b	Parking brake operation		X	X	X
13.c	Rotor brake operation		X	X	X
13.d	Abnormal/emergency procedures		X	X	X

Table C3B [Reserved]

Table C3C [Reserved]

TABLE C3D.—FUNCTIONS AND SUBJECTIVE TESTS

<<< QPS requirements >>>					
Number	Instructor Operating Station (IOS) (As appropriate)	Simulator level			
		A	B	C	D
Functions in this table are subject to evaluation only if appropriate for the helicopter and/or the system is installed on the specific simulator.					
1. Simulator Power Switch(es)			X	X	X
2. Helicopter conditions					
2.a	Gross weight, center of gravity, fuel loading and allocation	....	X	X	X
2.b	Helicopter systems status	....	X	X	X
2.c.	Ground crew functions	....	X	X	X
3. Airports/Heliports					
3.a	Number and selection	....	X	X	X
3.b	Runway or landing area selection	....	X	X	X
3.c	Landing surface conditions (rough, smooth, icy, wet, dry, snow)	....	X	X	X
3.d	Preset positions	....	X	X	X
3.e	Lighting controls	....	X	X	X
4. Environmental controls					
4.a	(Reserved).				
4.b	(Reserved).				
4.c	Temperature	....	X	X	X
4.d	Climate conditions	....	X	X	X
4.e	Wind speed and direction	....	X	X	X
4.f	(Reserved)	....	....	....	

TABLE C3D.—FUNCTIONS AND SUBJECTIVE TESTS—Continued

<<< QPS requirements >>>					
Number	Instructor Operating Station (IOS) (As appropriate)	Simulator level			
		A	B	C	D
5. Helicopter system malfunctions (Insertion/deletion)		X	X	X	
6. Locks, Freezes, and Repositioning					
6.a	Problem (all) freeze/release	....	X	X	X
6.b	Position (geographic) freeze/release	....	X	X	X
6.c	Repositioning (locations, freezes, and releases)	....	X	X	X
6.d	Ground speed control	....	X	X	X
7. Remote IOS.		X	X	X	
8. Sound Controls. On/off/adjustment		X	X	X	
9. Motion/Control Loading System					
9.a	On/off/emergency stop	....	X	X	X
10. Observer Seats/Stations. Position/Adjustment/Positive restraint system		X	X	X	

Attachment 4 to Appendix C to Part 60—Sample Documents

Table of Contents

Title of Sample

BILLING CODE 491073–P

ATTACHMENT 4 TO APPENDIX C TO PART 60—

Figure A4A – Sample Letter , Request for Initial, Upgrade, or Reinstatement Evaluation

INFORMATION

Date _______

Charles A. Spillner
Manager, National Simulator Program
Federal Aviation Administration
100 Hartsfield Centre Parkway
Suite 400
Atlanta, GA 30354

Dear Mr. Spillner:

RE: Request for Initial/Upgrade Evaluation Date

This is to advise you of our intent to request an (initial or upgrade) evaluation of our (FSTD Manufacturer), (Aircraft Type/Level) Flight Simulation Training Device (FSTD), (FAA ID Number, if previously qualified), located in (City, State) at the (Facility) on (Proposed Evaluation Date). (The proposed evaluation date shall not be more than 180 days following the date of this letter.) The FSTD will be sponsored by (Name of Training Center/Air Carrier), FAA Designator (4 Letter Code). The FSTD will be sponsored under the following options: (Select One)

☐ The FSTD will be used within the sponsor's FAA approved training program and placed on the sponsor's Training/Operations Specifications; or

☐ The FSTD will be used for dry lease only in accordance with Paragraph 3b, FSTD Guidance Bulletin 03-08.

We agree to provide the formal request for the evaluation (*Ref: Appendix 4, AC 120-40B*) to your staff as follows: (check one)

☐ For QTG tests run at the factory, not later, than 45 days prior to the proposed evaluation date with the additional "1/3 on-site" tests provided not later than 14 days prior to the proposed evaluation date.

☐ For QTG tests run on-site, not later than 30 days prior to the proposed evaluation date.

We understand that the formal request will contain the following documents:

7. Sponsor's Letter of Request (*Company Compliance Letter*).
8. Principal Operations Inspector (POI) or Training Center Program Manager's (TCPM) endorsement.
9. Complete QTG.

If we are unable to meet the above requirements, we understand this may result in a significant delay, perhaps 45 days or more, in rescheduling and completing the evaluation.

(The sponsor should add additional comments as necessary).

Please contact (Name Telephone and Fax Number of Sponsor's Contact) to confirm the date for this initial evaluation. We understand a member of your National Simulator Program staff will respond to this request within 14 days.

A copy of this letter of intent has been provided to (Name), the Principal Operations Inspector (POI) and/or Training Center Program Manager (TCPM).

Sincerely,

Attachment: FSTD Information Form
cc: POI/TCPM

ATTACHMENT 4 TO APPENDIX C TO PART 60—
Figure A4B – Sample Letter , Request for Initial, Upgrade, or Reinstatement Evaluation
Attachment: FSTD Information Form
INFORMATION

Date: _____

Section 1. FSTD Information and Characteristics

Sponsor Name:	_____	**FSTD Location:**	
Address:	_____ _____	**Physical Address:**	_____ _____
City:	_____	**City:**	_____
State:	_____	**State:**	_____
Country:	_____	**Country:**	_____
ZIP:	_____	**ZIP:**	_____
Manager	_____		
Sponsor ID No: *(Four Letter FAA Designator)*	_____	**Nearest Airport:** *(Airport Designator)*	_____

Type of Evaluation Requested:			☐ **Initial** ☐ **Upgrade** ☐ **Recurrent** ☐ **Special** ☐ **Reinstatement**		
Qualification Basis: _____	☐ **A**	☐ **B**	☐ **Interim C**	☐ **C**	☐ **D**
	☐ **6**	☐ **7**	☐ **Provisional Status**		

Initial Qualification: (If Applicable)	**Date:** _____ **Level** _____	**Manufacturer's Identification/Serial No:**	_____
Upgrade Qualification: (If Applicable)	**Date:** _____ **Level** _____ MM/DD/YYYY	☐ **eQTG**	

Other Technical Information:

FAA FSTD ID No: (If Applicable)	_____	**FSTD Manufacturer:**	_____
Convertible FSTD:	☐**Yes:**	**Date of Manufacture:**	_____ MM/DD/YYYY
Related FAA ID No. (If Applicable)	_____ _____ _____	**Sponsor FSTD ID No:** _____	

Aircraft model/series: _____	**Source of aerodynamic model:** _____
Engine model(s) and data revision: _____	**Source of aerodynamic coefficient data:** _____
FMS identification and revision level: _____	**Aerodynamic data revision number:** _____
Visual system manufacturer/model: _____	**Visual system display:** _____
Flight control data revision: _____	**FSTD computer(s) identification:** _____
Motion system manufacturer/type: _____	

National Aviation Authority (NAA): (If Applicable)	_____		_____
NAA FSTD ID No:	_____	**Last NAA Evaluation Date:**	_____
NAA Qualification Level:	_____		
NAA Qualification Basis:	_____		

ATTACHMENT 4 TO APPENDIX C TO PART 60—

Figure A4B – Sample Letter , Request for Initial, Upgrade, or Reinstatement Evaluation

Attachment: FSTD Information Form

INFORMATION

Visual System Manufacturer and Type:	_____	**Motion System Manufacturer and Type:**	_____
Aircraft Make/Model/Series:	_____	**FSTD Seats Available:**	_____

Aircraft Equipment	**ENGINE TYPE(S):** _____	**Flight Instrumentation:** ☐ **EFIS** ☐ **HUD** ☐ **HGS** ☐ **EFVS** ☐ **TCAS** ☐ **GPWS** ☐ **Plain View** ☐ **GPS** ☐ **FMS Type:** _____ ☐ **WX Radar** ☐ **Other:** _____	Engine Instrumentation: ☐ **EICAS** ☐ **FADEC** ☐ **Other:** _____

Airport Models:	3.6.1 _____ *Airport Designator*	3.6.2_____ *Airport Designator*	3.6.3 _____ *Airport Designator*
Circle to Land:	3. 7.1 _____ *Airport Designator*	3. 7.2_____ *Approach*	3. 7.3 _____ *Landing Runway*
Visual Ground Segment	3.8.1 _____ *Airport Designator*	3.8 .2_____ *Approach*	3. 8.3 _____ *Landing Runway*

Section 2. Supplementary Information

FAA Training Program Approval Authority:		☐ **POI** ☐ **TCPM** ☐ **Other**: _____	
Name:	_____	**Office:**	_____
Tel:	_____	**Fax:**	_____
Email:	_____		

FSTD Scheduling Person:			
Name:	_____		
Address 1:	_____	**Address 2**	_____
City:	_____	**State:**	_____
ZIP:	_____	**Email:**	_____
Tel:	_____	**Fax:**	_____

FSTD Technical Contact:			
Name:	_____		
Address 1:	_____	**Address 2**	_____
City:	_____	**State:**	_____
ZIP:	_____	**Email:**	_____
Tel:	_____	**Fax:**	_____

Section 3. Training, Testing and Checking Considerations

Area/Function/Maneuver	Requested	Remarks
Private Pilot - Training / Checks: (142)	☐	_____
Commercial Pilot - Training /Checks:(142)	☐	_____
Multi-Engine Rating - Training / Checks (142)	☐	_____
Instrument Rating -Training / Checks (142)	☐	_____
Type Rating - Training / Checks (135/121/142)	☐	_____
Proficiency Checks (135/121/142)	☐	_____
CAT I: (RVR 2400/1800 ft. DH200 ft)	☐	_____

ATTACHMENT 4 TO APPENDIX C TO PART 60—
Figure A4B – Sample Letter , Request for Initial, Upgrade, or Reinstatement Evaluation
Attachment: FSTD Information Form
INFORMATION

CAT III * (lowest minimum) _____ RVR _____ ft. * *State CAT III (≤ 700 ft.), CAT IIIb (≤ 150 ft.), or CAT IIIc (0 ft.)*	☐	_____
Circling Approach	☐	_____
Windshear Training: (FSTD GB 03-05)	☐	_____
Windshear Training IAW 121.409d (121 Turbojets Only) (FSTD GB 03-05)	☐	_____
Generic Unusual Attitudes and Recoveries within the Normal Flight Envelope (FSTD GB 04-03)	☐	_____
Specific Unusual Attitudes Recoveries (HBAT 95-10) (FSTD GB 04-03)	☐	_____
Auto-coupled Approach/Auto Go Around	☐	_____
Auto-land / Roll Out Guidance	☐	_____
TCAS/ACAS I / II	☐	_____
WX-Radar	☐	_____
HUD (FSTD GB 03-02)	☐	_____
HGS (FSTD GB 03-02)	☐	
EFVS (FSTD GB 03-03)	☐	
Future Air Navigation Systems (HBAT 98-16A)	☐	_____
GPWS / EGPWS	☐	_____
ETOPS Capability	☐	_____
GPS	☐	_____
SMGCS	☐	_____
Helicopter Slope Landings	☐	_____
Helicopter External Load Operations	☐	_____
Helicopter Pinnacle Approach to Landings	☐	_____
Helicopter Night Vision Maneuvers	☐	_____
Helicopter Category A Takeoffs	☐	_____

ATTACHMENT 4 TO APPENDIX C TO PART 60—

Figure A4C – Sample Qualification Test Guide Cover Page
INFORMATION

SPONSOR NAME

SPONSOR ADDRESS

FAA QUALIFICATION TEST GUIDE

(SPECIFIC Helicopter MODEL)
for example
Farnsworth Z-100

(Type of Simulator)

(Simulator Identification Including Manufacturer, Serial Number, Visual System Used)

(Simulator Level)

(Qualification Performance Standard Used)

(Simulator Location)

FAA Initial Evaluation

Date: ____________

________________________ Date: __________
(Sponsor)

________________________ Date: __________
Manager, National
Simulator Program, FAA

ATTACHMENT 4 TO APPENDIX C TO PART 60—

Figure A4D – Sample Statement of Qualification - Certificate

INFORMATION

Federal Aviation Administration
National Simulator Program

Statement of Qualification

This is to certify that representatives of the National Simulator Program Completed an evaluation of the

Go-Fast Airlines
Farnsworth Z-100 Full Flight Simulator
FAA Identification Number 0999

And found it to meet the standards set forth in
AC 120-63

The Master Qualification Test Guide and the attached Configuration List and List of Qualified Tasks Provide the Qualification Basis for this device to operate at

Level D
Until March 30, 2009

Unless sooner rescinded or extended by the National Simulator Program Manager

February 15, 2008	*I. B. Checkin, Jr.*
(date)	(for the NSPM)

ATTACHMENT 4 TO APPENDIX C TO PART 60—

Figure A4E – Sample Statement of Qualification; Configuration List

INFORMATION

STATEMENT of QUALIFICATION
CONFIGURATION LIST

Date: _____			
Section 1. **FSTD Information and Characteristics**			
Sponsor Name:	_____	**FSTD Location:**	
Address:	_____ _____	**Physical Address:**	_____ _____
City:	_____	**City:**	_____
State:	_____	**State:**	_____
Country:	_____	**Country:**	_____
ZIP:	_____	**ZIP:**	_____
Manager	_____		
Sponsor ID No: *(Four Letter FAA Designator)*	_____	**Nearest Airport:** *(Airport Designator)*	_____

Type of Evaluation Requested:			☐ **Initial** ☐ **Upgrade** ☐ **Recurrent** ☐ **Special** ☐ **Reinstatement**		
Qualification Basis: _____	☐ **A**	☐ **B**	☐ **Interim C**	☐ **C**	☐ **D**
	☐ **6**	☐ **7**	☐ **Provisional Status**		

Initial Qualification: (If Applicable)	**Date:** _____ **Level** _____	**Manufacturer's Identification/Serial No:**	_____
Upgrade Qualification: (If Applicable)	**Date:** _____ **Level** _____ MM/DD/YYYY	☐ **eQTG**	

Other Technical Information:			
FAA FSTD ID No: (If Applicable)	_____	**FSTD Manufacturer:**	_____
Convertible FSTD:	☐**Yes:**	**Date of Manufacture:**	_____ MM/DD/YYYY
Related FAA ID No. (If Applicable)	_____ _____ _____	**Sponsor FSTD ID No:** _____	
Aircraft model/series: _____		**Source of aerodynamic model:** _____	
Engine model(s) and data revision: _____		**Source of aerodynamic coefficient data:** _____	
FMS identification and revision level: _____		**Aerodynamic data revision number:** _____	
Visual system manufacturer/model: _____		**Visual system display:** _____	
Flight control data revision: _____		**FSTD computer(s) identification:** _____	
Motion system manufacturer/type: _____			

National Aviation Authority (NAA): (If Applicable)	_____		_____
NAA FSTD ID No:	_____	**Last NAA Evaluation Date:**	_____
NAA Qualification Level:	_____		
NAA Qualification Basis:	_____		

ATTACHMENT 4 TO APPENDIX C TO PART 60—

Figure A4E – Sample Statement of Qualification; Configuration List

INFORMATION

Visual System Manufacturer and Type:	____	**Motion System Manufacturer and Type:**	____
Aircraft Make/Model/Series:	____	**FSTD Seats Available:**	____

Aircraft Equipment	**ENGINE TYPE(S):** ____	**Flight Instrumentation:** ☐ EFIS ☐ HUD ☐ HGS ☐ EFVS ☐ TCAS ☐ GPWS ☐ Plain View ☐ GPS ☐ FMS Type: ____ ☐ WX Radar ☐ Other: ____	Engine Instrumentation: ☐ EICAS ☐ FADEC ☐ Other: ____

Airport Models:	3.6.1 ____ *Airport Designator*	3.6.2____ *Airport Designator*	3.6.3 ____ *Airport Designator*
Circle to Land:	3. 7.1 ____ *Airport Designator*	3. 7.2____ *Approach*	3. 7.3 ____ *Landing Runway*
Visual Ground Segment	3.8.1 ____ *Airport Designator*	3.8 .2____ *Approach*	3. 8.3 ____ *Landing Runway*

Section 2. Supplementary Information

FAA Training Program Approval Authority:		☐ POI ☐ TCPM ☐ Other: ______	
Name:	____	**Office:**	____
Tel:	____	**Fax:**	____
Email:	____		

FSTD Scheduling Person:

Name:	____		
Address 1:	____	**Address 2**	____
City:	____	**State:**	____
ZIP:	____	**Email:**	____
Tel:	____	**Fax:**	____

FSTD Technical Contact:

Name:	____		
Address 1:	____	**Address 2**	____
City:	____	**State:**	____
ZIP:	____	**Email:**	____
Tel:	____	**Fax:**	____

Section 3. Training, Testing and Checking Considerations

Area/Function/Maneuver	**Requested**	**Remarks**
Private Pilot - Training / Checks: (142)	☐	____
Commercial Pilot - Training /Checks:(142)	☐	____
Multi-Engine Rating - Training / Checks (142)	☐	____
Instrument Rating -Training / Checks (142)	☐	____
Type Rating - Training / Checks (135/121/142)	☐	____
Proficiency Checks (135/121/142)	☐	____

ATTACHMENT 4 TO APPENDIX C TO PART 60—

Figure A4E – Sample Statement of Qualification; Configuration List

INFORMATION

CAT III * (lowest minimum) _____ RVR _____ ft. * *State CAT III (≤ 700 ft.), CAT IIIb (≤ 150 ft.), or CAT IIIc (0 ft.)*	☐	_____
Circling Approach	☐	_____
Windshear Training: (FSTD GB 03-05)	☐	_____
Windshear Training IAW 121.409d (121 Turbojets Only) (FSTD GB 03-05)	☐	_____
Generic Unusual Attitudes and Recoveries within the Normal Flight Envelope (FSTD GB 04-03)	☐	_____
Specific Unusual Attitudes Recoveries (HBAT 95-10) (FSTD GB 04-03)	☐	_____
Auto-coupled Approach/Auto Go Around	☐	_____
Auto-land / Roll Out Guidance	☐	_____
TCAS/ACAS I / II	☐	_____
WX-Radar	☐	_____
HUD (FSTD GB 03-02)	☐	_____
HGS (FSTD GB 03-02)	☐	
EFVS (FSTD GB 03-03)	☐	
Future Air Navigation Systems (HBAT 98-16A)	☐	_____
GPWS / EGPWS	☐	_____
ETOPS Capability	☐	_____
GPS	☐	_____
SMGCS	☐	_____
Helicopter Slope Landings	☐	_____
Helicopter External Load Operations	☐	_____
Helicopter Pinnacle Approach to Landings	☐	_____
Helicopter Night Vision Maneuvers	☐	_____
Helicopter Category A Takeoffs	☐	_____

ATTACHMENT 4 TO APPENDIX C TO PART 60—

Figure A4F – Sample Statement of Qualification – List of Qualified Tasks

INFORMATION

STATEMENT of QUALIFICATION
List of Qualified Tasks

Go Fast Airline Training -- Farnsworth Z-100 -- Level D -- FAA ID# 0999

The FSTD is qualified to perform all of the Maneuvers, Procedures, Tasks, and Functions Listed in Appendix A, Attachment 1, Table A1B, Minimum FSTD Requirements In Effect on [mm/dd/yyyy] except for the following listed Tasks or Functions.

Qualified for all tasks in Table C1B for which the sponsor has requested qualification, except for the following: 6.e. Environmental system. 6.f. Fire detection and extinguisher system. 7.b. In-flight fire and smoke removal. 7.d. Ditching.
Additional tasks for which this FSTD is qualified (i.e., in addition to the list in Table C1B) Enhanced Visual System

Attachment 4 to Appendix C to Part 60—
Figure A4G – Sample Continuing Qualification Evaluation Requirements Page
INFORMATION

Recurrent Evaluation Requirements ***Completed at conclusion of Initial Evaluation***	
Recurrent Evaluations to be conducted each _(fill in)__ months Allotting ______ hours of FTD time. Signed: ______________________________ NSPM / Evaluation Team Leader	Recurrent evaluations are due as follows: _(month)__ and __(month)_ and __(month)_ (enter or strike out, as appropriate) ____________________ Date

Revision: Based on (enter reasoning):	
Recurrent Evaluations are to be conducted each _(fill in)__ months. Allotting ______ hours. Signed: ______________________________ NSPM Evaluation Team Leader	Recurrent evaluations are due as follows: _(month)__ and __(month)_ and __(month)_ (enter or strike out, as appropriate) ____________________ Date

Revision: Based on (enter reasoning):	
Recurrent Evaluations are to be conducted each _(fill in)__ months. Allotting ______ hours. Signed: ______________________________ NSPM Evaluation Team Leader	Recurrent evaluations are due as follows: _(month)__ and __(month)_ and __(month)_ (enter or strike out, as appropriate) ____________________ Date

(Repeat as Necessary)

Index of Effective FSTD Directives Filed in this Section

Notification Number	Received From: (TPAA/NSPM)	Date of Notification	Date of Modification Completion

Continue as Necessary....

BILLING CODE 491073–C

Appendix D to Part 60—Qualification Performance Standards for Helicopter Flight Training Devices

Begin Information

This appendix establishes the standards for Helicopter Flight Training Device (FTD) evaluation and qualification at Level 4, Level 5, or Level 6. The Flight Standards Service, National Simulator Program Manager (NSPM), is responsible for the development, application, and implementation of the standards contained within this appendix. The procedures and criteria specified in this appendix will be used by the NSPM, or a person or persons assigned by the NSPM when conducting helicopter FTD evaluations.

Table of Contents

End Information

1. Introduction

Begin Information

a. This appendix contains background information as well as regulatory and informative material as described later in this section. To assist the reader in determining what areas are required and what areas are permissive, the text in this appendix is divided into two sections: ''QPS Requirements'' and ''Information.'' The QPS Requirements sections contain details regarding compliance with the part 60 rule language. These details are regulatory, but are found only in this appendix. The Information sections contain material that is advisory in nature, and designed to give the user general information about the regulation.

b. Related Reading References.

(1) 14 CFR part 60
(2) 14 CFR part 61.
(3) 14 CFR part 63.
(4) 14 CFR part 119.
(5) 14 CFR part 121.
(6) 14 CFR part 125
(7) 14 CFR part 135.
(8) 14 CFR part 141
(9) 14 CFR part 142
(10) Advisory Circular (AC) 120–28C, Criteria for Approval of Category III Landing Weather Minima.
(11) AC 120–29, Criteria for Approving Category I and Category II Landing Minima for part 121 operators.
(12) AC 120–35B, Line Operational Simulations: Line-Oriented Flight Training, Special Purpose Operational Training, Line Operational Evaluation.
(13) AC 120–41, Criteria for Operational Approval of Airborne Wind Shear Alerting and Flight Guidance Systems.
(14) AC 120–57A, Surface Movement Guidance and Control System (SMGS).
(15) AC 150/5300–13, Airport Design.
(16) AC 150/5340–1G, Standards for Airport Markings.
(17) AC 150/5340–4C, Installation Details for Runway Centerline Touchdown Zone Lighting Systems.
(18) AC 150/5390—2B, Heliport Design.
(19) AC 150/5340–19, Taxiway Centerline Lighting System.
(20) AC 150/5340–24, Runway and Taxiway Edge Lighting System.

(21) AC 150/5345–28D, Precision Approach Path Indicator (PAPI) Systems.

(22) International Air Transport Association document, ''Flight Simulator Design and Performance Data Requirements,'' as amended.

(23) AC 29–2B, Flight Test Guide for Certification of Transport Category Rotorcraft.

(24) AC 27–1A, Flight Test Guide for Certification of Normal Category Rotorcraft.

(25) International Civil Aviation Organization (ICAO) Manual of Criteria for the Qualification of Flight Simulators, as amended.

(26) Airplane Flight Simulator Evaluation Handbook, Volume I, as amended and Volume II, as amended, The Royal Aeronautical Society, London, UK.

(27) FAA Publication FAA–S–8081 series (Practical Test Standards for Airline Transport Pilot Certificate, Type Ratings, Commercial Pilot, and Instrument Ratings).

(28) The FAA Aeronautical Information Manual (AIM). An electronic version of the AIM is on the internet at *http://www.faa.gov/atpubs.*

End Information

---

2. Applicability (§§ 60.1 & 60.2)

There is no additional regulatory or informational material that applies to § 60.1, Applicability, or to § 60.2, Applicability of sponsor rules to person who are not sponsors and who are engaged in certain unauthorized activities.

3. Definitions (§ 60.3)

Begin Information

See appendix F for a list of definitions and abbreviations from part 1, part 60, and the QPS appendices of part 60.

End Information

---

4. Qualification Performance Standards (§ 60.4)

There is no additional regulatory or informational material that applies to § 60.4, Qualification Performance Standards.

5. Quality Management System (§ 60.5)

Begin Information

Additional regulatory material and informational material regarding Quality Management Systems for FTDs may be found in appendix E of this part.

End Information

---

6. Sponsor Qualification Requirements (§ 60.7)

Begin Information

a. The intent of the language in § 60.7(b) is to have a specific FTD, identified by the sponsor, used at least once in an FAA-approved flight training program for the helicopter simulated during the 12-month period described. The identification of the specific FTD may change from one 12-month period to the next 12-month period as long as that sponsor sponsors and uses at least one FTD at least once during the prescribed period. There is no minimum number of hours or minimum FTD periods required.

b. The following examples describe acceptable operational practices:

(1) Example One.

(a) A sponsor is sponsoring a single, specific FTD for its own use, in its own facility or elsewhere —this single FTD forms the basis for the sponsorship. The sponsor uses that FTD at least once in each 12-month period in that sponsor's FAA-approved flight training program for the helicopter simulated. This 12-month period is established according to the following schedule:

(i) If the FTD was qualified prior to October 30, 2007 the 12-month period begins on the date of the first continuing qualification evaluation conducted in accordance with § 60.19 after October 30, 2007 and continues for each subsequent 12-month period;

(ii) A device qualified on or after October 30, 2007 will be required to undergo an initial or upgrade evaluation in accordance with § 60.15. Once the initial or upgrade evaluation is complete, the first continuing qualification evaluation will be conducted within 6 months. The 12 month continuing qualification evaluation cycle begins on that date and continues for each subsequent 12-month period.

(b) There is no minimum number of hours of FTD use required.

(c) The identification of the specific FTD may change from one 12-month period to the next 12-month period as long as that sponsor sponsors and uses at least one FTD at least once during the prescribed period.

(2) Example Two.

(a) A sponsor sponsors an additional number of FTDs, in its facility or elsewhere. Each additionally sponsored FTD must be—

(i) Used by the sponsor in the sponsor's FAA-approved flight training program for the helicopter simulated (as described in § 60.7(d)(1));

OR

(ii) Used by another FAA certificate holder in that other certificate holder's FAA-approved flight training program for the helicopter simulated (as described in § 60.7(d)(1)). This 12-month period is established in the same manner as in example one.

OR

(iii) Provided a statement each year from a qualified pilot, (after having flown the helicopter not the subject FTD or another FTD, during the preceding 12-month period) stating that the subject FTD's performance and handling qualities represent the helicopter (as described in § 60.7(d)(2)). This statement is provided at least once in each 12-month period established in the same manner as in example one.

(b) There is no minimum number of hours of FTD use required.

(3) Example Three.

(a) A sponsor in New York (in this example, a Part 142 certificate holder) establishes ''satellite'' training centers in Chicago and Moscow.

(b) The satellite function means that the Chicago and Moscow centers must operate under the New York center's certificate (in accordance with all of the New York center's practices, procedures, and policies; *e.g.*, instructor and/or technician training/checking requirements, record keeping, QMS program).

(c) All of the FTDs in the Chicago and Moscow centers could be dry-leased (*i.e.*, the certificate holder does not have and use FAA-approved flight training programs for the FTDs in the Chicago and Moscow centers) because—

(i) Each FTD in the Chicago center and each FTD in the Moscow center is used at least once each 12-month period by another FAA certificate holder in that other certificate holder's FAA-approved flight training program for the helicopter (as described in § 60.7(d)(1));

OR

(ii) A statement is obtained from a qualified pilot (having flown the helicopter, not the subject FTD or another FTD during the preceding 12-month period) stating that the performance and handling qualities of each FTD in the Chicago and Moscow centers represents the helicopter (as described in § 60.7(d)(2)).

End Information

---

7. Additional Responsibilities of the Sponsor (§ 60.9)

Begin Information

The phrase ''as soon as practicable'' in § 60.9(a) means without unnecessarily disrupting or delaying beyond a reasonable time the training, evaluation, or experience being conducted in the FSTD.

End Information

---

8. FTD Use (§ 60.11)

There is no additional regulatory or informational material that applies to § 60.11, FTD Use.

9. FTD Objective Data Requirements (§ 60.13)

Begin QPS Requirements

a. Flight test data used to validate FTD performance and handling qualities must have been gathered in accordance with a flight test program containing the following:

(1) A flight test plan consisting of:

(a) The maneuvers and procedures required for aircraft certification and simulation programming and validation.

(b) For each maneuver or procedure—

(i) The procedures and control input the flight test pilot and/or engineer used.

(ii) The atmospheric and environmental conditions.

(iii) The initial flight conditions.

(iv) The helicopter configuration, including weight and center of gravity.

(v) The data to be gathered.

(vi) All other information necessary to recreate the flight test conditions in the FTD.

(2) Appropriately qualified flight test personnel.

(3) An understanding of the accuracy of the data to be gathered using appropriate alternative data sources, procedures, and instrumentation that is traceable to a recognized standard as described in Attachment 2, Table D2F.

(4) Appropriate and sufficient data acquisition equipment or system(s), including appropriate data reduction and analysis methods and techniques, as would be acceptable to the FAA's Aircraft Certification Service.

b. The data, regardless of source, must be presented:

(1) In a format that supports the FTD validation process;

(2) In a manner that is clearly readable and annotated correctly and completely;

(3) With resolution sufficient to determine compliance with the tolerances set forth in Attachment 2, Table D2A appendix.

(4) With any necessary guidance information provided; and

(5) Without alteration, adjustments, or bias; however the data may be re-scaled, digitized, or otherwise manipulated to fit the desired presentation.

c. After completion of any additional flight test, a flight test report must be submitted in support of the validation data. The report must contain sufficient data and rationale to support qualification of the FTD at the level requested.

d. As required by § 60.13(f), the sponsor must notify the NSPM when it becomes aware that an addition to or a revision of the flight related data or helicopter systems related data is available if this data is used to program and operate a qualified FTD. The data referred to in this sub-section are those data that are used to validate the performance, handling qualities, or other characteristics of the aircraft, including data related to any relevant changes occurring after the type certification is issued. This notification must be made within 10 working days.

End QPS Requirements

Begin Information

e. The FTD sponsor is encouraged to maintain a liaison with the manufacturer of the aircraft being simulated (or with the holder of the aircraft type certificate for the aircraft being simulated if the manufacturer is no longer in business), and if appropriate, with the person having supplied the aircraft data package for the FTD in order to facilitate the notification described in this paragraph.

f. It is the intent of the NSPM that for new aircraft entering service, at a point well in advance of preparation of the Qualification Test Guide (QTG), the sponsor should submit to the NSPM for approval, a descriptive document (a validation data roadmap) containing the plan for acquiring the validation data, including data sources. This document should clearly identify sources of data for all required tests, a description of the validity of these data for a specific engine type and thrust rating configuration, and the revision levels of all avionics affecting the performance or flying qualities of the aircraft. Additionally, this document should provide other information such as the rationale or explanation for cases where data or data parameters are missing, instances where engineering simulation data are used, or where flight test methods require further explanations. It should also provide a brief narrative describing the cause and effect of any deviation from data requirements. The aircraft manufacturer may provide this document.

g. There is no requirement for any flight test data supplier to submit a flight test plan or program prior to gathering flight test data. However, the NSPM notes that inexperienced data gatherers often provide data that is irrelevant, improperly marked, lacking adequate justification for selection. Other problems include inadequate information regarding initial conditions or test maneuvers. The NSPM has been forced to refuse these data submissions as validation data for an FTD evaluation. It is for this reason that the NSPM recommends that any data supplier not previously experienced in this area review the data necessary for programming and for validating the performance of the FTD and discuss the flight test plan anticipated for acquiring such data with the NSPM well in advance of commencing the flight tests.

h. In those cases where the objective test results authorize a ''snapshot test'' or a ''series of snapshot tests'' results in lieu of a time-history result, Attachment 2 requires the sponsor or other data provider to ensure that a steady state condition exists at the instant of time captured by the ''snapshot.'' This is often verified by showing that a steady state condition existed from some period of time during which the snap shot is taken. The time period most frequently used is 5 seconds prior through 2 seconds following the instant of time captured by the snap shot. This paragraph is primarily addressing the source data and the method by which the data provider ensures that the steady state condition for the snap shot is representative.

i. The NSPM will consider, on a case-by-case basis, whether or not to approve supplemental validation data derived from flight data recording systems such as a Quick Access Recorder or Flight Data Recorder.

End Information

10. Special Equipment and Personnel Requirements for Qualification of the FTD (§ 60.14)

Begin Information

a. In the event that the NSPM determines that special equipment or specifically qualified persons will be required to conduct an evaluation, the NSPM will make every attempt to notify the sponsor at least one (1) week, but in no case less than 72 hours, in advance of the evaluation. Examples of special equipment include flight control measurement devices, accelerometers, or oscilloscopes. Examples of specially qualified personnel include individuals specifically qualified to install or use any special equipment when its use is required.

b. Examples of a special evaluation include an evaluation conducted after an FTD is moved; at the request of the TPAA; or as a result of comments received from FTD users that raise questions regarding the continued qualification or use of the FTD.

End Information

11. Initial (and Upgrade) Qualification Requirements (§ 60.15)

Begin QPS Requirement

a. In order to be qualified at a particular qualification level, the FTD must:

(1) Meet the general requirements listed in Attachment 1;

(2) Meet the objective testing requirements listed in Attachment 2 (Level 4 FTDs do not require objective tests); and

(3) Satisfactorily accomplish the subjective tests listed in Attachment 3.

b. The request described in § 60.15(a) must include all of the following:

(1) A statement that the FTD meets all of the applicable provisions of this part and all applicable provisions of the QPS.

(2) A confirmation that the sponsor will forward to the NSPM the statement described in § 60.15(b) in such time as to be received no later than 5 business days prior to the scheduled evaluation and may be forwarded to the NSPM via traditional or electronic means.

(3) Except for a Level 4 FTD, a qualification test guide (QTG), acceptable to the NSPM, that includes all of the following:

(a) Objective data obtained from aircraft testing or another approved source.

(b) Correlating objective test results obtained from the performance of the FTD as prescribed in the applicable QPS.

(c) The result of FTD subjective tests prescribed in the applicable QPS.

(d) A description of the equipment necessary to perform the evaluation for initial qualification and the continuing qualification evaluations.

c. The QTG described in paragraph a(3) of this section, must provide the documented proof of compliance with the FTD objective tests in Attachment 2,Table D2A of this appendix.

d. The QTG is prepared and submitted by the sponsor, or the sponsor's agent on behalf of the sponsor, to the NSPM for review and approval, and must include, for each objective test:

(1) Parameters, tolerances, and flight conditions;

(2) Pertinent and complete instructions for conducting automatic and manual tests;

(3) A means of comparing the FTD test results to the objective data;

(4) Any other information as necessary to assist in the evaluation of the test results;

(5) Other information appropriate to the qualification level of the FTD.

e. The QTG described in paragraphs (a)(3) and (b) of this section, must include the following:

(1) A QTG cover page with sponsor and FAA approval signature blocks (see Attachment 4, Figure D4C, for a sample QTG cover page).

(2) A continuing qualification evaluation requirements page. This page will be used by

the NSPM to establish and record the frequency with which continuing qualification evaluations must be conducted and any subsequent changes that may be determined by the NSPM in accordance with § 60.19. See Attachment 4, Figure D4G, for a sample Continuing Qualification Evaluation Requirements page.

(3) An FTD information page that provides the information listed in this paragraph, if applicable (see Attachment 4, Figure D4B, for a sample FTD information page). For convertible FTDs, the sponsor must submit a separate page for each configuration of the FTD.

(a) The sponsor's FTD identification number or code.

(b) The helicopter model and series being simulated.

(c) The aerodynamic data revision number or reference.

(d) The engine model(s) and its data revision number or reference.

(e) The flight control data revision number or reference.

(f) The flight management system identification and revision level.

(g) The FTD model and manufacturer.

(h) The date of FTD manufacture.

(i) The FTD computer identification.

(j) The visual system model and manufacturer, including display type.

(k) The motion system type and manufacturer, including degrees of freedom.

(4) A Table of Contents.

(5) A log of revisions and a list of effective pages.

(6) List of all relevant data references.

(7) A glossary of terms and symbols used (including sign conventions and units).

(8) Statements of compliance and capability (SOCs) with certain requirements. SOCs must provide references to the sources of information that show the capability of the FTD to comply with the requirement, a rationale explaining how the referenced material is used, mathematical equations and parameter values used, and the conclusions reached; *i.e.,* that the FTD complies with the requirement. Refer to the ''General FTD Requirements'' column, Table D1A, in Attachment 1, or in the ''Alternative Data Sources, Procedures, and Instrumentation'' column, Table D2F, in Attachment 2, to see when SOCs are required.

(9) Recording procedures or equipment required to accomplish the objective tests.

(10) The following information for each objective test designated in Attachment 2, as applicable to the qualification level sought:

(a) Name of the test.

(b) Objective of the test.

(c) Initial conditions.

(d) Manual test procedures.

(e) Automatic test procedures (if applicable).

(f) Method for evaluating FTD objective test results.

(g) List of all relevant parameters driven or constrained during the automatic test(s).

(h) List of all relevant parameters driven or constrained during the manual test(s).

(i) Tolerances for relevant parameters.

(j) Source of Validation Data (document and page number).

(k) Copy of the Validation Data (if located in a separate binder, a cross reference for the identification and page number for pertinent data location must be provided).

(l) FTD Objective Test Results as obtained by the sponsor. Each test result must reflect the date completed and must be clearly labeled as a product of the device being tested.

f. A convertible FTD is addressed as a separate FTD for each model and series helicopter to which it will be converted and for the FAA qualification level sought. The NSPM will conduct an evaluation for each configuration. If a sponsor seeks qualification for two or more models of a helicopter type using a convertible FTD, the sponsor must provide a QTG for each helicopter model, or a supplemented QTG for each helicopter model. The NSPM will conduct evaluations for each helicopter model.

g. The form and manner of presentation of objective test results in the QTG must include the following:

(1) The sponsor's FTD test results must be recorded in a manner acceptable to the NSPM, that allows easy comparison of the FTD test results to the validation data (*e.g.,* use of a multi-channel recorder, line printer, cross plotting, overlays, transparencies).

(2) FTD results must be labeled using terminology common to helicopter parameters as opposed to computer software identifications.

(3) Validation data documents included in a QTG may be photographically reduced only if such reduction will not alter the graphic scaling or cause difficulties in scale interpretation or resolution.

(4) Scaling on graphical presentations must provide the resolution necessary to evaluate the parameters shown in Attachment 2, Table D2A of this appendix.

(5) Tests involving time histories, data sheets (or transparencies thereof) and FTD test results must be clearly marked with appropriate reference points to ensure an accurate comparison between FTD and helicopter with respect to time. Time histories recorded via a line printer are to be clearly identified for cross-plotting on the helicopter data. Over-plots must not obscure the reference data.

h. The sponsor may elect to complete the QTG objective and subjective tests at the manufacturer's facility or at the sponsor's training facility. If the tests are conducted at the manufacturer's facility, the sponsor must repeat at least one-third of the tests at the sponsor's training facility in order to substantiate FTD performance. The QTG must be clearly annotated to indicate when and where each test was accomplished. Tests conducted at the manufacturer's facility and at the sponsor's training facility must be conducted after the FTD is assembled with systems and sub-systems functional and operating in an interactive manner. The test results must be submitted to the NSPM.

i. The sponsor must maintain a copy of the MQTG at the FTD location.

j. All FTDs for which the initial qualification is conducted after October 30, 2013 must have an electronic MQTG (eMQTG) including all objective data obtained from helicopter testing, or another approved source (reformatted or digitized), together with correlating objective test results obtained from the performance of the FTD (reformatted or digitized) as prescribed in this appendix. The eMQTG must also contain the general FTD performance or demonstration results (reformatted or digitized) prescribed in this appendix, and a description of the equipment necessary to perform the initial qualification evaluation and the continuing qualification evaluations. The eMQTG must include the original validation data used to validate FTD performance and handling qualities in either the original digitized format from the data supplier or an electronic scan of the original time-history plots that were provided by the data supplier. A copy of the eMQTG must be provided to the NSPM.

k. All other FTDs (not covered in subparagraph ''j'') must have an electronic copy of the MQTG by and after October 30, 2013. A copy of the eMQTG must be provided to the NSPM. This may be provided by an electronic scan presented in a Portable Document File (PDF), or similar format acceptable to the NSPM.

End QPS Requirements

Begin Information

l. Only those FTDs that are sponsored by a certificate holder as defined in appendix F will be evaluated by the NSPM. However, other FTD evaluations may be conducted on a case-by-case basis as the Administrator deems appropriate, but only in accordance with applicable agreements.

m. The NSPM will conduct an evaluation for each configuration, and each FTD must be evaluated as completely as possible. To ensure a thorough and uniform evaluation, each FTD is subjected to the general FTD requirements in Attachment 1, the objective tests listed in Attachment 2, and the subjective tests listed in Attachment 3 of this appendix. The evaluations described herein will include, but not necessarily be limited to the following:

(1) Helicopter responses, including longitudinal and lateral-directional control responses (see Attachment 2 of this appendix);

(2) Performance in authorized portions of the simulated helicopter's operating envelope, to include tasks evaluated by the NSPM in the areas of surface operations, takeoff, climb, cruise, descent, approach and landing, as well as abnormal and emergency operations (see Attachment 2 of this appendix);

(3) Control checks (see Attachment 1 and Attachment 2 of this appendix);

(4) Cockpit configuration (see Attachment 1 of this appendix);

(5) Pilot, flight engineer, and instructor station functions checks (see Attachment 1 and Attachment 3 of this appendix);

(6) Helicopter systems and sub-systems (as appropriate) as compared to the helicopter simulated (see attachment 1 and attachment 3 of this appendix);

(7) FTD systems and sub-systems, including force cueing (motion), visual, and aural (sound) systems, as appropriate (see Attachment 1 and Attachment 2 of this appendix); and

(8) Certain additional requirements, depending upon the qualification level sought, including equipment or circumstances that may become hazardous to the occupants. The sponsor may be subject to Occupational Safety and Health Administration requirements.

n. The NSPM administers the objective and subjective tests, which includes an examination of functions. The tests include a qualitative assessment of the FTD by an NSP pilot. The NSP evaluation team leader may assign other qualified personnel to assist in accomplishing the functions examination and/or the objective and subjective tests performed during an evaluation when required.

(1) Objective tests provide a basis for measuring and evaluating FTD performance and determining compliance with the requirements of this part.

(2) Subjective tests provide a basis for:

(a) Evaluating the capability of the FTD to perform over a typical utilization period;

(b) Determining that the FTD satisfactorily simulates each required task;

(c) Verifying correct operation of the FTD controls, instruments, and systems; and

(d) Demonstrating compliance with the requirements of this part.

o. The tolerances for the test parameters listed in Attachment 2 of this appendix reflect the range of tolerances acceptable to the NSPM for FTD validation and are not to be confused with design tolerances specified for FTD manufacture. In making decisions regarding tests and test results, the NSPM relies on the use of operational and engineering judgment in the application of data (including consideration of the way in which the flight test was flown and way the data was gathered and applied) data presentations, and the applicable tolerances for each test.

p. In addition to the scheduled continuing qualification evaluation, each FTD is subject to evaluations conducted by the NSPM at any time without prior notification to the sponsor. Such evaluations would be accomplished in a normal manner (*i.e.,* requiring exclusive use of the FTD for the conduct of objective and subjective tests and an examination of functions) if the FTD is not being used for flight crewmember training, testing, or checking. However, if the FTD were being used, the evaluation would be conducted in a non-exclusive manner. This non-exclusive evaluation will be conducted by the FTD evaluator accompanying the check airman, instructor, Aircrew Program Designee (APD), or FAA inspector aboard the FTD along with the student(s) and observing the operation of the FTD during the training, testing, or checking activities.

q. Problems with objective test results are handled as follows:

(1) If a problem with an objective test result is detected by the NSP evaluation team during an evaluation, the test may be repeated or the QTG may be amended.

(2) If it is determined that the results of an objective test do not support the qualification level requested but do support a lower level, the NSPM may qualify the FTD at a lower level.

r. After an FTD is successfully evaluated, the NSPM issues a statement of qualification (SOQ) to the sponsor, The NSPM recommends the FTD to the TPAA, who will approve the FTD for use in a flight training program. The SOQ will be issued at the satisfactory conclusion of the initial or continuing qualification. However, it is the sponsor's responsibility to obtain TPAA approval prior to using the FTD in an FAA-approved flight training program.

s. Under normal circumstances, the NSPM establishes a date for the initial or upgrade evaluation within ten (10) working days after determining that a complete QTG is acceptable. Unusual circumstances may warrant establishing an evaluation date before this determination is made. A sponsor may schedule an evaluation date as early as 6 months in advance. However, there may be a delay of 45 days or more in rescheduling and completing the evaluation if the sponsor is unable to meet the scheduled date. See Attachment 4, Figure D4A, Sample Request for Initial, Upgrade, or Reinstatement Evaluation.

t. The numbering system used for objective test results in the QTG should closely follow the numbering system set out in Attachment 2, FTD Objective Tests, Table D2A.

u. Contact the NSPM or visit the NSPM Web site for additional information regarding the preferred qualifications of pilots used to meet the requirements of § 60.15(d).

v. Examples of the exclusions for which the FTD might not have been subjectively tested by the sponsor or the NSPM and for which qualification might not be sought or granted, as described in § 60.15(g)(6), include approaches to and departures from slopes and pinnacles.

End Information

---

12. Additional Qualifications for Currently Qualified FTDs (§ 60.16)

There is no additional regulatory or informational material that applies to § 60.16, Additional Qualifications for a Currently Qualified FTD.

13. Previously Qualified FTDs (§ 60.17)

Begin QPS Requirements

a. In instances where a sponsor plans to remove an FTD from active status for a period of less than two years, the following procedures apply:

(1) The NSPM must be notified in writing and the notification must include an estimate of the period that the FTD will be inactive;

(2) Continuing Qualification evaluations will not be scheduled during the inactive period;

(3) The NSPM will remove the FTD from the list of qualified FSTDs on a mutually established date not later than the date on which the first missed continuing qualification evaluation would have been scheduled;

(4) Before the FTD is restored to qualified status, it must be evaluated by the NSPM. The evaluation content and the time required to accomplish the evaluation is based on the number of continuing qualification evaluations and sponsor-conducted quarterly inspections missed during the period of inactivity.

(5) The sponsor must notify the NSPM of any changes to the original scheduled time out of service;

b. FTDs qualified prior to October 30, 2007, are not required to meet the general FTD requirements, the objective test requirements, and the subjective test requirements of Attachments 1, 2, and 3, respectively, of this appendix.

c. [Reserved]

End QPS Requirements

Begin Information

d. Other certificate holders or persons desiring to use an FTD may contract with FTD sponsors to use FTDs previously qualified at a particular level for a helicopter type and approved for use within an FAA-approved flight training program. Such FTDs are not required to undergo an additional qualification process, except as described in § 60.16.

e. Each FTD user must obtain approval from the appropriate TPAA to use any FTD in an FAA-approved flight training program.

f. The intent of the requirement listed in § 60.17(b), for each FTD to have a Statement of Qualification within 6 years, is to have the availability of that statement (including the configuration list and the limitations to authorizations) to provide a complete picture of the FTD inventory regulated by the FAA. The issuance of the statement will not require any additional evaluation or require any adjustment to the evaluation basis for the FTD.

g. Downgrading of an FTD is a permanent change in qualification level and will necessitate the issuance of a revised Statement of Qualification to reflect the revised qualification level, as appropriate. If a temporary restriction is placed on an FTD because of a missing, malfunctioning, or inoperative component or on-going repairs, the restriction is not a permanent change in qualification level. Instead, the restriction is temporary and is removed when the reason for the restriction has been resolved.

h. It is not the intent of the NSPM to discourage the improvement of existing simulation (*e.g.,* the ''updating'' of a control loading system, or the replacement of the IOS with a more capable unit) by requiring the ''updated'' device to meet the qualification standards current at the time of the update. Depending on the extent of the update, the NSPM may require that the updated device be evaluated and may require that an evaluation include all or a portion of the elements of an initial evaluation. However, the standards against which the device would be evaluated are those that are found in the MQTG for that device.

i. The NSPM will determine the evaluation criteria for an FTD that has been removed from active status for a prolonged period. The criteria will be based on the number of continuing qualification evaluations and quarterly inspections missed during the period of inactivity. For example, if the FTD were out of service for a 1 year period, it would be necessary to complete the entire

QTG, since all of the quarterly evaluations would have been missed. The NSPM will also consider how the FTD was stored, whether parts were removed from the FTD and whether the FTD was disassembled.

j. The FTD will normally be requalified using the FAA-approved MQTG and the criteria that was in effect prior to its removal from qualification. However, inactive periods of 2 years or more will require re-qualification under the standards in effect and current at the time of requalification.

End Information

14. Inspection, Continuing Qualification Evaluation, and Maintenance Requirements (§ 60.19).

Begin QPS Requirement

a. The sponsor must conduct a minimum of four evenly spaced inspections throughout the year. The objective test sequence and content of each inspection in this sequence must be developed by the sponsor and must be acceptable to the NSPM.

b. The description of the functional preflight inspection must be contained in the sponsor's QMS.

c. Record "functional preflight" in the FTD discrepancy log book or other acceptable location, including any item found to be missing, malfunctioning, or inoperative.

End QPS Requirements

Begin Information

d. The sponsor's test sequence and the content of each quarterly inspection required in § 60.19(a)(1) should include a balance and a mix from the objective test requirement areas listed as follows:

(1) Performance.

(2) Handling qualities.

(3) Motion system (where appropriate).

(4) Visual system (where appropriate).

(5) Sound system (where appropriate).

(6) Other FTD systems.

e. If the NSP evaluator plans to accomplish specific tests during a normal continuing qualification evaluation that requires the use of special equipment or technicians, the sponsor will be notified as far in advance of the evaluation as practical; but not less than 72 hours. Examples of such tests include latencies and control sweeps.

f. The continuing qualification evaluations described in § 60.19(b) will normally require 4 hours of FTD time. However, flexibility is necessary to address abnormal situations or situations involving aircraft with additional levels of complexity (e.g., computer controlled aircraft). The sponsor should anticipate that some tests may require additional time. The continuing qualification evaluations will consist of the following:

(1) Review of the results of the quarterly inspections conducted by the sponsor since the last scheduled continuing qualification evaluation.

(2) A selection of approximately 8 to 15 objective tests from the MQTG that provide an adequate opportunity to evaluate the performance of the FTD. The tests chosen will be performed either automatically or manually and should be able to be conducted within approximately one-third (1⁄3) of the allotted FTD time.

(3) A subjective evaluation of the FTD to perform a representative sampling of the tasks set out in attachment 3 of this appendix. This portion of the evaluation should take approximately two-thirds (2⁄3) of the allotted FTD time.

(4) An examination of the functions of the FTD may include the motion system, visual system, sound system as applicable, instructor operating station, and the normal functions and simulated malfunctions of the simulated helicopter systems. This examination is normally accomplished simultaneously with the subjective evaluation requirements.

g. The requirement established in § 60.19(b)(4) regarding the frequency of NSPM-conducted continuing qualification evaluations for each FTD is typically 12 months. However, the establishment and satisfactory implementation of an approved QMS for a sponsor will provide a basis for adjusting the frequency of evaluations to exceed 12-month intervals.

End Information

---

15. Logging FTD Discrepancies (§ 60.20).

There is no additional regulatory or informational material that applies to § 60.20. Logging FTD Discrepancies.

16. Interim Qualification of FTDs for New Helicopter Types or Models (§ 60.21).

There is no additional regulatory or informational material that applies to § 60.21, Interim Qualification of FTDs for New Helicopter Types or Models.

17. Modifications to FTDs (§ 60.23).

Begin QPS Requirements

a. The notification described in § 60.23(c)(2) must include a complete description of the planned modification, with a description of the operational and engineering effect the proposed modification will have on the operation of the FTD and the results that are expected with the modification incorporated.

b. Prior to using the modified FTD:

(1) All the applicable objective tests completed with the modification incorporated, including any necessary updates to the MQTG (*e.g.,* accomplishment of FSTD Directives) must be acceptable to the NSPM; and

(2) The sponsor must provide the NSPM with a statement signed by the MR that the factors listed in § 60.15(b) are addressed by the appropriate personnel as described in that section.

End QPS Requirements

Begin Information

c. FSTD Directives are considered modification of an FTD. See Attachment 4, Figure D4H for a sample index of effective FSTD Directives.

End Information

---

18. Operation With Missing, Malfunctioning, or Inoperative Components (§ 60.25).

Begin Information

a. The sponsor's responsibility with respect to § 60.25(a) is satisfied when the sponsor fairly and accurately advises the user of the current status of an FTD, including any missing, malfunctioning, or inoperative (MMI) component(s).

b. If the 29th or 30th day of the 30-day period described in § 60.25(b) is on a Saturday, a Sunday, or a holiday, the FAA will extend the deadline until the next business day.

c. In accordance with the authorization described in § 60.25(b), the sponsor may develop a discrepancy prioritizing system to accomplish repairs based on the level of impact on the capability of the FTD. Repairs having a larger impact on the FTD's ability to provide the required training, evaluation, or flight experience will have a higher priority for repair or replacement.

End Information

---

19. Automatic Loss of Qualification and Procedures for Restoration of Qualification (§ 60.27).

Begin Information

If the sponsor provides a plan for how the FTD will be maintained during its out-of-service period (*e.g.,* periodic exercise of mechanical, hydraulic, and electrical systems; routine replacement of hydraulic fluid; control of the environmental factors in which the FTD is to be maintained.) there is a greater likelihood that the NSPM will be able to determine the amount of testing that is required for requalification.

End Information

---

20. Other Losses of Qualification and Procedures for Restoration of Qualification (§ 60.29).

Begin Information

If the sponsor provides a plan for how the FTD will be maintained during its out-of-service period (*e.g.,* periodic exercise of mechanical, hydraulic, and electrical systems; routine replacement of hydraulic fluid; control of the environmental factors in which the FTD is to be maintained.) there is a greater likelihood that the NSPM will be able to determine the amount of testing that is required for requalification.

End Information

21. Recordkeeping and Reporting (§ 60.31).

Begin QPS Requirements

a. FTD modifications can include hardware or software changes. For FTD modifications involving software programming changes, the record required by § 60.31(a)(2) must consist of the name of the aircraft system software, aerodynamic model, or engine model change, the date of the change, a summary of the change, and the reason for the change.

b. If a coded form for record keeping is used, it must provide for the preservation and retrieval of information with appropriate security or controls to prevent the inappropriate alteration of such records after the fact.

End QPS Requirements

---

22. Applications, Logbooks, Reports, and Records: Fraud, Falsification, or Incorrect Statements (§ 60.33).

There are no additional QPS requirements or informational material that apply to § 60.33, Applications, Logbooks, Reports, and Records: Fraud, Falsification, or Incorrect Statements.

23. [Reserved].

24. Levels of FTD.

Begin Information

a. The following is a general description of each level of FTD. Detailed standards and tests for the various levels of FTDs are fully defined in Attachments 1 through 3 of this appendix.

(1) *Level 4.* A device that may have an open helicopter-specific flight deck area, or an enclosed helicopter-specific cockpit and at least one operating system with air/ground logic (no aerodynamic programming required).

(2) *Level 5.* A device that may have an open helicopter-specific flight deck area, or an enclosed helicopter-specific cockpit and a generic aerodynamic program with at least one operating system and control loading that is representative of the simulated helicopter only at an approach speed and configuration.

(3) *Level 6.* A device that has an enclosed helicopter-specific cockpit and aerodynamic program with all applicable helicopter systems operating and control loading that is representative of the simulated helicopter throughout its ground and flight envelope and significant sound representation.

End Information

---

25. FSTD Qualification on the Basis of a Bilateral Aviation Safety Agreement (BASA) (§ 60.37).

Begin Information

There are no additional QPS requirements or informational material that apply to § 60.37, FSTD Qualification on the Basis of a Bilateral Aviation Safety Agreement (BASA).

End Information

Attachment 1 to Appendix D to Part 60—General FTD Requirements

---

Begin QPS Requirements

1. Requirements

a. Certain requirements included in this appendix must be supported with a Statement of Compliance and Capability (SOC), which may include objective and subjective tests. The SOC will confirm that the requirement was satisfied, and describe how the requirement was met. The requirements for SOCs and tests are indicated in the ''General FTD Requirements'' column in Table D1A of this appendix.

b. Table D1A describes the requirements for the indicated level of FTD. Many devices include operational systems or functions that exceed the requirements outlined in this section. In any event, all systems will be tested and evaluated in accordance with this appendix to ensure proper operation.

End QPS Requirements

Begin Information

2. Discussion

a. This attachment describes the general requirements for qualifying Level 4 through Level 6 FTDs. The sponsor should also consult the objectives tests in Attachment 2 and the examination of functions and subjective tests listed in Attachment 3 to determine the complete requirements for a specific level FTD.

b. The material contained in this attachment is divided into the following categories:

(1) General Cockpit Configuration.
(2) Programming.
(3) Equipment Operation.
(4) Equipment and facilities for instructor/evaluator functions.
(5) Motion System.
(6) Visual System.
(7) Sound System.

c. Table D1A provides the standards for the General FTD Requirements.

End Information

TABLE D1A.—MINIMUM FTD REQUIREMENTS

<<<QPS requirements >>>					<<Information>> Notes
No.	General FTD requirements	FTD Level			
		4	5	6	
1. General Cockpit Configuration					

TABLE D1A.—MINIMUM FTD REQUIREMENTS

<<<QPS requirements >>>					<<Information>> Notes
No.	General FTD requirements	FTD Level			
		4	5	6	
1.a	The FTD must have a cockpit that is a replica of the helicopter, or set purposes, the of helicopters simulated with controls, equipment, observable cockpit indicators, circuit breakers, and bulkheads properly located, functionally accurate and replicating the helicopter or set of helicopters. The direction of movement of controls and switches must be identical to that in the helicopters or set of helicopters. Crewmember seats must afford the capability for the occupant to be able to achieve the design ''eye position'' for specific helicopters, or to approximate such a position for a generic set of helicopters.			X	For FTD purposes, the cockpit consists of all that space forward of a cross section of the fuselage at the most extreme aft setting of the pilots' seats including additional, required crewmember duty stations and those required bulkheads aft of the pilot seats.

TABLE D1A.—MINIMUM FTD REQUIREMENTS—Continued

<<<QPS requirements >>>					<<Information>> Notes
No.	General FTD requirements	FTD Level			
		4	5	6	
2.b	The FTD must have equipment (i.e., instruments, panels, systems, and controls) simulated sufficiently for the authorized training/checking events to be accomplished. The installed equipment, must be locted in a spatially correct configuration, and may be in a cockpit or an open flight deck area. Actuation of this equipment must replicate the appropriate function in the helicopter.	X	X		
3.c	Circuit breakers must function accurately when they are involved in operating procedures or malfunctions requiring or involving flight crew response. Level 6 devices must have installed circuit breakers properly located in the FTD cockpit.		X	X	
4. Programming					
4.a	The FTD must provide the proper effect of aerodynamic changes for the combinations of drag and thrust normally encountered in flight. This must include the effect of change in helicopter attitude, thrust, drag, altitude, temperature, and configuration. Level 6 additionally requires the effects of changes in gross weight and center of gravity. Level 5 requires only generic aerodynamic programming.		X	X	
4.b	The FTD must have computer (analog or digital) capability (i.e., capacity, accuracy, resolution, and dynamic response) needed to meet the qualification level sought.	X	X	X	
4.c	The FTD hardware and programming must be updated within 6 months of any helicopter modifications or data releases (or any such modification or data releases applicable to the set of helicopters) unless, with prior coordination, the NSPM authorizes otherwise.	X	X	X	

TABLE D1A.—MINIMUM FTD REQUIREMENTS—Continued

<<<QPS requirements >>>					<<Information>> Notes
No.	General FTD requirements	FTD Level			
		4	5	6	
4.d	Related responses of the cockpit instruments (and the visual and motion systems, if installed and training, testing, or checking credits are being sought) must be coupled closely to provide integrated sensory cues. The instruments (and the visual and motion systems, if installed, and training, testing, or checking credits are being sought) must respond to abrupt input at the pilot's position within the allotted time, but not before the time, when the helicopter or set of helicopters would respond under the same conditions. (If a visual system is installed and training, testing, or checking credits are sought, the visual scene changes from steady state disturbance must occur within the appropriate system dynamic response limt but not before the instrument response (and not before the motion system onset if a motion system is installed)). A demonstration is required and must simultaneously record: The analog out put from the pilot's control column, wheel, and pedals; and the output signal to the pilot's attitude indicator. These recordings must be compared to helicopter response data in the following configurations: Takeoff, cruise, and approach or landing. The results must be recorded in the QTG. Additionally, if a visual system is installed and training, testing, or checking credit are sought, the output signal to the visual system disply (including visual system analog delays must be recorded); and if a motion system is installed and training, testing, or checking credits are sought, the output from an accelerometer attached to the motion system platform located at an acceptable location near the pilots' seates is also required.	......	X	X	
5. Equipment Operation					
5.a	All relevant instrument indications involved in the simulation of the helicopter (or set of helicopters) must automatically respond to control movement or external disturbances to the simulated helicopter or set of helicopters; e.g., turbulence or winds.		X	X	
5.b	Navigation equipment must be installed and operate within the tolerances applicable for the helicopter or set of helicopters. Level 5 only needs that navigation equipment necesary to fly an instrument approach. Level 6 must also include communication equipment (inter-phone and air/ground) like that in the helicopter, or set of helicopters, and, if appropriate to the operation being conducted, an oxygen mask microphone system.		X	X	
5.c	Installed systems must simulate the applicable helicopter (or set of helicopters) system operation both on the ground and in flight. At least one helicopter system must be represented. Systems must be operative to the extent that applicable normal, abnormal, and emergency operating procedures included in the sponor's training programs can be accomplished. Level 6 must simulate all applicable helicopter flight, navigation, and systems operation. Level 5 must have functional flight and navigational controls, displays, and instrumentation.	X	X	X	
5.d	The lighting environment for panels and instruments must be sufficient for the operation being conducted.	X	X	X	

TABLE D1A.—MINIMUM FTD REQUIREMENTS—Continued

<<<QPS requirements >>>					<<Information>> Notes
No.	General FTD requirements	FTD Level			
		4	5	6	
5.e	The FTD must provide control forces and control travel that correspond to the replicated helicopter or set of helicopters. Control forces must react in the same manner as in the helicopter or set of helicopters under the same flight conditions.			X	
5.f	The FTD must provide control forces and control travel of sufficient precision to manually fly an instrument approach. The control forces must react in the same manner as in the helicopter or set of helicopters under the same flight conditions.		X		
6. Instructor or Evaluator Facilities					
6.a	In addition to the flight crewmember stations, suitable seating arrangements for an instructor/check airman and FAA Inspector must be available. These seats must provide adequate view of crewmember's panel(s).	X	X	X	These seats need not be a replica of an aircraft seat and may be as simple as an office chair placed in an appropriate position.
6.b	The FTD must have instructor controls that permit activation of norma, abnormal, and emergency conditions, as may be appropriate. Once activated, proper system operation must result from system management by the crew and not require input from the instructor controls.	X	X	X	
7. Motion System					
7.a	The FTD may have a motion system; if desired, although it is not required. If installed, the motion system operation may not be distracting. The motion system standards set out in QPS FAA–S–120–40C for at least Level A simulators is acceptable.	X	X	X	
8. Visual System					
8.a	The FTD may have a visual system; if desired, although it is not required. If a visual system is installed, it must meet the following criteria: (1) Sinle channel, uncollimated display is acceptable. (2) Minimum field of view: 18° vertical/24° horizontal for the pilot flying. (3) Maximum paralax error: 10° per pilot. (4) Scene content may not be distracting. (5) Minimum distance from the pilot's eye position to the surface of a direct view display may not be less than the distance to any front panel instrument. (6) Minimum resolution of 5 arc-min. for both computed and displayed pixel size. (7) Maximum latency or through-put must not exceed 300 milliseconds. A statement of capability is required. A demonstration of latency or through-put is required. Visual system standards set out in QPS FAA–S–120–40C, for at least Level A simulators is acceptable. However, if additional authorizations (training, testing, or checking credits) are sought that require the use of a visual systems, the Level A simulator visual system standards apply.	X	X	X	
9. Sound System					
9.a	The FTD must simulate significant cockpit sounds resulting from pilot actions that correspond to those heard in the helicopter.			X	

Attachment 2 to Appendix D to Part 60—Flight Training Device (FTD) Objective Tests

Begin QPS Requirements

1. Test Requirements

a. The ground and flight tests required for qualification are listed in Table D2A Objective Evaluation. Computer generated FTD test results must be provided for each test except where an alternate test is specifically authorized by the NSPM. If a flight condition or operating condition is required for the test but does not apply to the helicopter being simulated or to the qualification level sought, it may be disregarded (*e.g.*, engine out climb capability for a single-engine helicopter). Each test result is compared against the validation data described in § 60.13, and in appendix B. The results must be produced on an appropriate recording device acceptable to the NSPM and must include FTD number, date, time, conditions, tolerances, and appropriate dependent variables portrayed in comparison to the validation data. Time histories are required unless otherwise indicated in Table D2A. All results must be labeled using the tolerances and units given.

b. Table D2A in this attachment sets out the test results required, including the parameters, tolerances, and flight conditions for FTD validation. Tolerances are provided for the listed tests because mathematical modeling and acquisition and development of reference data are often inexact. All tolerances listed in the following tables are applied to FTD performance. When two tolerance values are given for a parameter, the less restrictive may be used unless otherwise indicated.

c. Certain tests included in this attachment must be supported with a Statement of Compliance and Capability (SOC). In Table D2A, requirements for SOCs are indicated in the ''Test Details'' column.

d. When operational or engineering judgment is used in making assessments for flight test data applications for FTD validity, such judgment must not be limited to a single parameter. For example, data that exhibit rapid variations of the measured parameters may require interpolations or a ''best fit'' data section. All relevant parameters related to a given maneuver or flight condition must be provided to allow overall interpretation. When it is difficult or impossible to match FTD to helicopter data throughout a time history, differences must be justified by providing a comparison of other related variables for the condition being assessed.

e. It is not acceptable to program the FTD so that the mathematical modeling is correct only at the validation test points. Unless noted otherwise, tests must represent helicopter performance and handling qualities at operating weights and centers of gravity (CG) typical of normal operation. If a test is supported by aircraft data at one extreme weight or CG, another test supported by aircraft data at mid-conditions or as close as possible to the other extreme is necessary. Certain tests that are relevant only at one extreme CG or weight condition need not be repeated at the other extreme. The results of the tests for Level 6 are expected to be indicative of the device's performance and handling qualities throughout all of the following:

(1) The helicopter weight and CG envelope;

(2) The operational envelope; and

(3) Varying atmospheric ambient and environmental conditions—including the extremes authorized for the respective helicopter or set of helicopters.

f. When comparing the parameters listed to those of the helicopter, sufficient data must also be provided to verify the correct flight condition and helicopter configuration changes. For example, to show that control force is within the parameters for a static stability test, data to show the correct airspeed, power, thrust or torque, helicopter configuration, altitude, and other appropriate datum identification parameters must also be given. If comparing short period dynamics, normal acceleration may be used to establish a match to the helicopter, but airspeed, altitude, control input, helicopter configuration, and other appropriate data must also be given. If comparing landing gear change dynamics, pitch, airspeed, and altitude may be used to establish a match to the helicopter, but landing gear position must also be provided. All airspeed values must be properly annotated (*e.g.*, indicated versus calibrated). In addition, the same variables must be used for comparison (*e.g.*, compare inches to inches rather than inches to centimeters).

g. The QTG provided by the sponsor must clearly describe how the FTD will be set up and operated for each test. Each FTD subsystem may be tested independently, but overall integrated testing of the FTD must be accomplished to assure that the total FTD system meets the prescribed standards. A manual test procedure with explicit and detailed steps for completing each test must also be provided.

h. In those cases where the objective test results authorize a ''snapshot test'' or a ''series of snapshot test'' results in lieu of a time-history result, the sponsor or other data provider must ensure that a steady state condition exists at the instant of time captured by the ''snapshot.''

i. For previously qualified FTDs, the tests and tolerances of this attachment may be used in subsequent continuing qualification evaluations for any given test if the sponsor has submitted a proposed MQTG revision to the NSPM and has received NSPM approval.

j. Tests of handling qualities must include validation of augmentation devices. FTDs for highly augmented helicopters will be validated both in the unaugmented configuration (or failure state with the maximum permitted degradation in handling qualities) and the augmented configuration. Where various levels of handling qualities result from failure states, validation of the effect of the failure is necessary. For those performance and static handling qualities tests where the primary concern is control position in the unaugmented configuration, unaugmented data are not required if the design of the system precludes any affect on control position. In those instances where the unaugmented helicopter response is divergent and non-repeatable, it may not be feasible to meet the specified tolerances. Alternative requirements for testing will be mutually agreed upon by the sponsor and the NSPM on a case-by-case basis.

k. Some tests will not be required for helicopters using helicopter hardware in the FTD cockpit (*e.g.*, ''helicopter modular controller''). These exceptions are noted in Section 2 ''Handling Qualities'' in Table D2A of this attachment. However, in these cases, the sponsor must provide a statement that the helicopter hardware meets the appropriate manufacturer's specifications and the sponsor must have supporting information to that fact available for NSPM review.

l. For objective test purposes, ''Near maximum'' gross weight is a weight chosen by the sponsor or data provider that is not less than the basic operating weight (BOW) of the helicopter being simulated plus 80% of the difference between the maximum certificated gross weight (either takeoff weight or landing weight, as appropriate for the test) and the BOW. ''Light'' gross weight is a weight chosen by the sponsor or data provider that is not more than 120% of the BOW of the helicopter being simulated or as limited by the minimum practical operating weight of the test helicopter. ''Medium'' gross weight is a weight chosen by the sponsor or data provider that is approximately ±10% of the average of the numerical values of the BOW and the maximum certificated gross weight. (**Note:** BOW is the empty weight of the aircraft plus the weight of the following: Normal oil quantity; lavatory servicing fluid; potable water; required crewmembers and their baggage; and emergency equipment. (References: Advisory Circular 120–27, ''Aircraft Weight and Balance;'' and FAA–H–8083–1, ''Aircraft Weight and Balance Handbook.'').

TABLE D2A.—FLIGHT TRAINING DEVICE (FTD) OBJECTIVE TESTS

<<< QPS Requirements >>> Test No.	Title	Tolerances	Flight conditions	Test details	FTD Level 5	FTD Level 6	<< Information >> Notes
1. Performance							
1.a Engine Assessment							
1.a.1	Start Operations						
1.a.1.a	Engine start and acceleration (transient).	Light Off Time—±10% or ±1 sec.Torque—±5%Rotor Speed—±3% Fuel Flow—±10% Gas Generator Speed—±5% Power TurbineSpeed—±5% Gas TurbineTemp.—±30°C.	Ground with the Rotor Brake Used and Not Used.	Record each engine start from the initiation of the start sequence to steady state idle and from steady state idle to operating RPM.		X	
1.a.1.b	Steady State Idle and Operating RPM conditions.	Torque—±3% Rotor Speed—±1.5% Fuel Flow—±5% Gas Generator Speed—±2% Power Turbine Speed—±2% Turbine Gas Temp.—±20°C.	Ground	Record both steady state idle and operating RPM conditions. May be a series of snapshot tests.	X	X	
1.a.2	Power Turbine Speed Trim.	±10% of total change of power turbine speed.	Ground	Record engine response to trim system actuation in both directions.		X	
1.a.3	Engine and Rotor Speed Governing.	Torque—±5% Rotor Speed—±1.5%.	1) Climb 2) Descent	Record results using a step input to the collective. May be conducted concurrently with climb and descent performance tests.		X	
1.b. In Flight							
	Performance and Trimmed Flight Control Positions.	Torque—±3% Pitch Attitude—±1.5° Sideslip Angle—±2° Longitudinal Control Position—±5% Lateral Control Position—±5% Directional Control Position—±5% Collective Control Position—±5%.	Cruise (Augmentation On and Off).	Record results for two gross weight CG combinations with varying trim speeds throughout the airspeed envelope. May be a series of snapshot tests.	X	X	
1.c. Climb							
	Performance and Trimmed Flight Control Positions.	Verticle Velocity—±100 fpm (61m/sec) or ±10% Pitch Attitude—±1.5° Sideslip Angle—±2° Longitudinal Control Position—±5% Lateral Control Position—±5% Directional Control Position—±5% Collective Control Position—±5%.	All engines operating. One engine inoperative. Augmentation System(s) On and Off.	Record results for two gross weight and CG combinations. The data presented must be for normal climb power conditions. May be a series of snapshot tests.	X	X	
1.d Descent							
1.d.1	Descent Performance and Trimmed Flight Control Positions.	Torque—±3% Pitch Attitude—±1.5° Sideslip Angle—±2° Longitudinal Control Position—±5%.	At or near 1,000 fpm rate of descent (RoD) at normal approach speed.	Record results for two gross weight and CG combinations. May be a series of snapshot tests.	X	X	

TABLE D2A.—FLIGHT TRAINING DEVICE (FTD) OBJECTIVE TESTS—Continued

<<< QPS Requirements >>>		Tolerances	Flight conditions	Test details	FTD Level		<< Information >>
Test							
No.	Title				5	6	Notes
		Lateral Control Position—±5% Directional Control Position—±5% Collective Control Position—±5%.	Augmentati on System(s) On and Off.	....			
1.d.2	Autorotation Performance and Trimmed Flight Control Positions.	Torque—±3% Pitch Attitude—±1.5° Sideslip Angle—±2° Longitudinal Control Position—±5% Lateral Control Position—±5% Directional Control Position—±5% Collective Control Position—±5%.	Steady descents. Augmentation System(s) On and Off.	Record results for two gross weight conditions. Data must be recorded for normal operating RPM. (Rotor speed tolerance applies only if collective control position is full down.) Data must be recorded for speeds from approximately 50 kts. through at least maximum glide distance airspeed. May be a series of snapshot tests.	X	X	
1.e. Autorotation							
	Entry	Rotor Speed—±3% Pitch Attitude±2° Roll Attitude—±3° Yaw Attitude—±5° Airspeed—±5 kts. Vertical Velocity—±200 fpm (1.00 m/sec) or 10%.	1) Cruise; or 2) Climb.	Record results of a rapid throttle reduction to idle. If accomplished in cruise, results must be for the maximum range airspeed. If accomplished in climb, results must be for the maximum rate of climb airspeed at or near maximum continuous power..		X	
2. Handling Qualities.							
2.a.	Start [here] Contro 1 System Mechanical Characteristics.	Contact the NSPM for clarification of any issue regarding helicopters with reversible controls.	....	....			
2.a.1.	Cyclic	Breakout—±0.25lbs. (0.112 daN) or 25%. Force—±1.0 lb. (0.224 daN) or 10%.	Ground; Static conditions. Trim On and Off. Friction Off Augmentation On and off.	Record results for an uninterrupted control sweep to the stops. (This test does not apply if aircraft hardware modular controllers are used.).	X	X	
2.a.2.	Collective and Pedals	Breakout—±0.5 lb. (0.224 daN) or 25%. Force —±1.0 lb. (0.224 daN) or 10%.	Ground; Static conditions. Trim On and Off. Friction Off Augmentation and On and Off.	Record results for an uninterrupted control sweep to the stops.	X	X	

TABLE D2A.—FLIGHT TRAINING DEVICE (FTD) OBJECTIVE TESTS—Continued

<<< QPS Requirements >>>					FTD Level		<< Information >>
Test		Tolerances	Flight conditions	Test details	5	6	Notes
No.	Title						
	....	....	....	....			
2.a.3.	Brake Pedal Force vs. Position..	±5 lbs. (2.224 daN) or 10% ..	Ground; Static conditions..	....	X	X	
2.a.4.	Trim System Rate (all applicable systems).	Rate—±10%	Ground; Static conditions. Trim On Friction Off.	The tolerance applies to the recorded value of the trim rate.	X	X	
2.a.5.	Control Dynamics (all axes).	±10% of time for first zero crossing and ±10 (N+1)% of period thereafter. ±10% of amplitude of first overshoot. ±20% of amplitude of 2nd and subsequent overshoots greater than 5% of initial displacement ±1 overshoot.	Hover/Cruise Trim On Friction Off.	Results must be recorded for a normal control displacement in both directions in each axis (approximately 255 to 50% of full throw).		X	Control Dynamics for irreversible control systems may be evaluated in a ground/static condtion. Refer to paragraph 3 of this attachment for additional information. "N" is the sequential period of a full cycle of oscillation.
2.a.6	Freeplay	±0.10 in	Ground; Static conditions.	Record and compare results for all controls.	X	X	
2.b. Longitudinal Handling Qualities.							
2.b.1	Control Response	Pitch Rate—±10% or ±2/sec. Pitch Attitude Change—±10% or ±1.5°.	Cruise Augmentation On and Off.	Results must be recorded for two cruise airspeeds to include minimum power required speed Record data for a step control input. The Off-axis response must show correct trend for unaugmented cases.	X	X	
2.b.2	Static Stability	Longitudinal Control Position: ±10% of change from trim or ±0.25 in. (6.3 mm) or Longitudinal Control Force: ±0.5 lb. (0.223 daN) or ±10%.	Cruise or Climb. Autorotation. Augmentation On and Off.	Record results for a minimum of two speeds on each side of the trim speed. May be a series of snapshot tests.	X	X	
2.b.3	Dynamic Stability						
2.b.3.a. ..	Long Term Response	±10% of calculated period. ±10% of time to ½ or double amplitude, or ±0.02 of damping ratio.	Cruise Augmentation On and Off.	Record results for three full cycles (6 overshoots after input completed) or that sufficient to determine time to ½ double or amplitude, whichever is less. For non-periodic responses, the time history must be matched.	X	X	

TABLE D2A.—FLIGHT TRAINING DEVICE (FTD) OBJECTIVE TESTS—Continued

<<< QPS Requirements >>>					FTD Level		<< Information >>
Test		Tolerances	Flight conditions	Test details			Notes
No.	Title				5	6	
2.b.3.b	Short Term Response	±1.5° Pitch or ±2/sec. Pitch Rate. ±0.1 g Normal Acceleration.	Cruise or Climb. Augmentation On and Off.	Record results for at least two airspeeds.		X	
2.b.4	Maneuvering Stability	Longitudinal Control Position—±10% of change from trim or ±0.25 in. (6.3mm) or Longitudinal Control Forces—±0.5 lb. (0.223 daN) or ±10%.	Cruise or Climb. Augmentation On and Off.	Record results for at least two airspeeds. Record results for Approximately 30°–45° bank angle. The force may be shown as a cross plot for irreversible systems. May be a series of snapshot tests.		X	
2.b.5	Landing Gear Operating Times.	±1 sec	Takeoff (Retraction) Approach (Extension).		X	X	
2.c. Lateral and Directional Handling Qualities.							
2.c.1	Control Response						
2.c.1.a	Lateral	Roll Rate—±10% or ±3°/sec. Roll Attitude Change—±10% or ±3°.	Cruise Augmentation On and Off.	Record results for at least two airspeeds, including the speed at or near the minimum power required airspeed. Record results for a step control input. The Off-axis response must show correct trend for unaugmented cases.	X	X	
2.c.1.b	(b) Directional	Yaw Rate—±10% or ±2°/sec. Yaw Attitude Change—±10% or ±2°.	Cruise Augmentation On and Off.	Record data for at least two Airspeeds, including the speed at or near the minimum power required airspeed Record results for a step control input. The Off-axis response must show correct trend for unaugmented cases.	X	X	

TABLE D2A.—FLIGHT TRAINING DEVICE (FTD) OBJECTIVE TESTS—Continued

<<< QPS Requirements >>>		Tolerances	Flight conditions	Test details	FTD Level		<< Information >>
Test							Notes
No.	Title				5	6	
2.c.2.	Directional Static Stability.	Lateral Control Position—±10% of change from trim or ±0.25 in. (6.3mm) or Lateral Control Force—±0.5 lb. (0.223 daN) or 10%. Roll Attitude—±1.5.. Directional Control Position—±10% of change from trim or ±0.25 in. (6.3mm) or Directional Control Force—±1 lb. (0.448 daN) or 10%.. Longitudinal Control Position—±10% of change from trim or ±0.25 in. (6.3mm). Vertical Velocity—±100 fpm (0.50m/sec) or 10%.	1) Cruise; or 2) Climb (may use Descent instead of Climb if desired). Augmentation On and Off..	Record results for at least two sideslip angles on either side of the trim point.. The force may be shown as a cross plot for irreversible systems.. May be a series of snapshot test..	X	X	This is a steady heading sideslip test.
2.c.3.	Dynamic Lateral and Directional Stability.						
2.c.3.a.	Lateral-Directional Oscillations.	±0.5 sec. or ±10% of period. ±10% of time to ½ or double amplitude or ±0.02 of damping ratio. ±20% or ±1 sec of time difference between peaks of bank and sideslip.	Cruise or Climb. Augmentation On/Off.	Record results for at least two airspeeds.. The test must be initiated with a cyclic or a pedal doublet input. Record results for six full cycles (12 overshoots after input completed) or that sufficient to determine time to ½ or double amplitude, whichever is less. For non-periodic response, the time history must be matched.	X	X	
2.c.3.b.	Spiral Stability	Correct Trend, ±2 bank or ±10% in 20 sec.	Cruise or Climb. Augmentation On and Off.	Record the results of a release from pedal only or cyclic only turns. Results must be recorded from turns in both directions.	X	X	
2.c.3.c.	Adverse/Proverse Yaw	Correct Trend, ±2 transient sideslip angle.	Cruise or Climb. Augmentation On and Off.	Record the time history of initial entry into cyclic only turns, using only a moderate rate for cyclic input. Results must be recorded for turns in both directions.	X	X	

3. Control Dynamics

Begin Information

a. The characteristics of a helicopter flight control system have a major effect on the handling qualities. A significant consideration in pilot acceptability of a helicopter is the "feel" provided through the cockpit controls. Considerable effort is expended on helicopter feel system design in order to deliver a system with which pilots will be comfortable and consider the helicopter desirable to fly. In order for an FTD to be representative, it too must present the pilot with the proper feel; that of the respective helicopter.

b. Recordings such as free response to an impulse or step function are classically used to estimate the dynamic properties of electromechanical systems. In any case, it is only possible to estimate the dynamic properties as a result of only being able to estimate true inputs and responses. Therefore, it is imperative that the best possible data be collected since close matching of the FTD control loading system to the helicopter systems is essential. Control feel dynamic tests are described in the Table of Objective Tests in this appendix. Where accomplished, the free response is measured after a step or pulse input is used to excite the system.

c. For initial and upgrade evaluations, it is required that control dynamic characteristics be measured at and recorded directly from the cockpit controls. This procedure is usually accomplished by measuring the free response of the controls using a step or pulse input to excite the system. The procedure must be accomplished in hover, climb, cruise, and autorotation. For helicopters with irreversible control systems, measurements may be obtained on the ground. Proper pitot-static inputs (if appropriate) must be provided to represent airspeeds typical of those encountered in flight.

d. It may be shown that for some helicopters, climb, cruise, and autorotation have like effects. Thus, some tests for one may suffice for some tests for another. If either or both considerations apply, engineering validation or helicopter manufacturer rationale must be submitted as justification for ground tests or for eliminating a configuration. For FTDs requiring static and dynamic tests at the controls, special test fixtures will not be required during initial and upgrade evaluations if the sponsor's QTG shows both test fixture results and the results of an alternative approach, such as computer plots which were produced concurrently and show satisfactory agreement. Repeat of the alternative method during the initial evaluation would then satisfy this test requirement.

e. Control Dynamics Evaluations. The dynamic properties of control systems are often stated in terms of frequency, damping, and a number of other classical measurements which can be found in texts on control systems. In order to establish a consistent means of validating test results for FTD control loading, criteria are needed that will clearly define the interpretation of the measurements and the tolerances to be applied. Criteria are needed for both the underdamped system and the overdamped system, including the critically damped case. In the case of an underdamped system with very light damping, the system may be quantified in terms of frequency and damping. In critically damped or overdamped systems, the frequency and damping is not readily measured from a response time history. Therefore, some other measurement must be used.

f. Tests to verify that control feel dynamics represent the helicopter must show that the dynamic damping cycles (free response of the control) match that of the helicopter within specified tolerances. The method of evaluating the response and the tolerance to be applied are described below for the underdamped and critically damped cases.

g. Tolerances.

(1) Underdamped Response.

(a) Two measurements are required for the period, the time to first zero crossing (in case a rate limit is present) and the subsequent frequency of oscillation. It is necessary to measure cycles on an individual basis in case there are nonuniform periods in the response. Each period will be independently compared to the respective period of the helicopter control system and, consequently, will enjoy the full tolerance specified for that period.

(b) The damping tolerance will be applied to overshoots on an individual basis. Care must be taken when applying the tolerance to small overshoots since the significance of such overshoots becomes questionable. Only those overshoots larger than 5 percent of the total initial displacement will be considered significant. The residual band, labeled $T(A_d)$ on Figure 1 of this attachment is ±5 percent of the initial displacement amplitude, A_d, from the steady state value of the oscillation. Oscillations within the residual band are considered insignificant. When comparing simulator data to helicopter data, the process would begin by overlaying or aligning the simulator and helicopter steady state values and then comparing amplitudes of oscillation peaks, the time of the first zero crossing, and individual periods of oscillation. To be satisfactory, the simulator must show the same number of significant overshoots to within one when compared against the helicopter data. The procedure for evaluating the response is illustrated in Figure 1 of this attachment.

(2) Critically Damped and Overdamped Response. Due to the nature of critically damped responses (no overshoots), the time to reach 90 percent of the steady state (neutral point) value must be the same as the helicopter within ±10 percent. The simulator response must be critically damped also. Figure 2 of this attachment illustrates the procedure.

(3)(a) The following summarizes the tolerances, T, for an illustration of the referenced measurements. (See Figures 1 and 2, above)

$T(P_0)$ ±10% of P_0
$T(P_1)$ ±20% of P_1
$T(A)$ ±10% of A_1, ±20% of Subsequent Peaks
$T(A_d)$ ±10% of A_d = Residual Band
Overshoots ±1

(b) In the event the number of cycles completed outside of the residual band, and thereby significant, exceeds the number depicted in figure 1, the following tolerances (T) will apply:

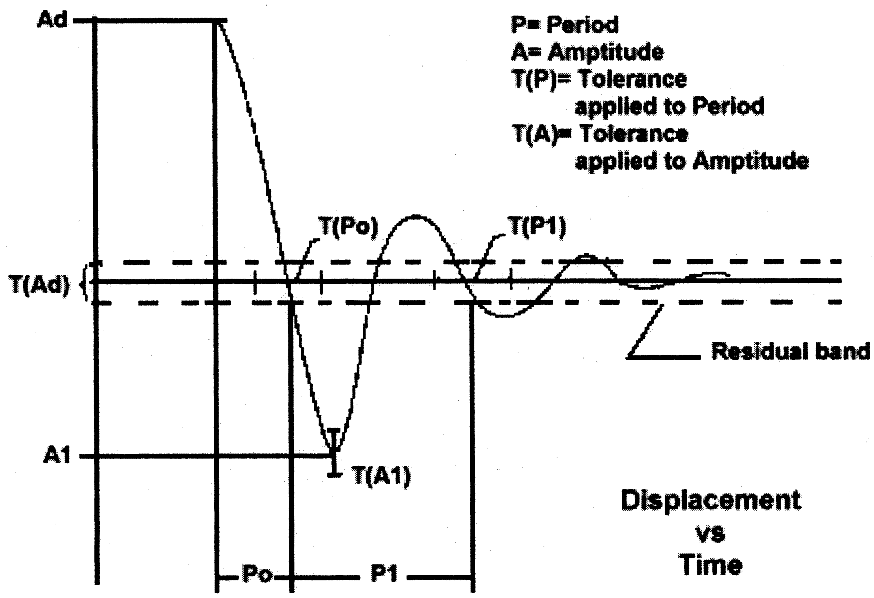
$T(P_n)$ ±10%(n+1)% of P_n, where ''n'' is the next in sequence.

End Information

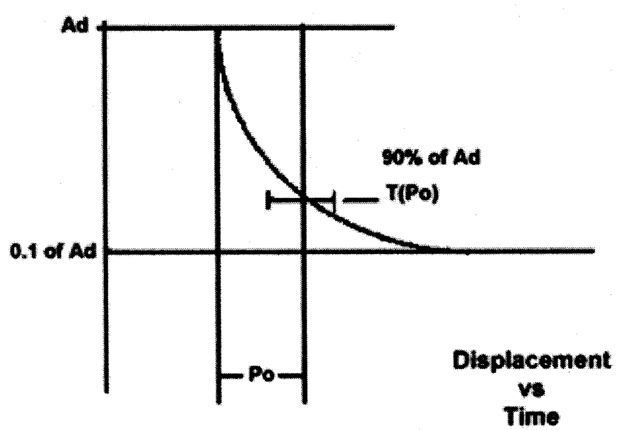
✖

BILLING CODE 491073–P

Attachment 2 to Appendix D to Part 60—
Figure 1. Under-Damped Step Response



Attachment 2 to Appendix D to Part 60—
Figure 2. Critically-Damped Step Response



BILLING CODE 491073–C

Attachment 3 to Appendix D to Part 60—Flight Training Device (FTD) Subjective Evaluation

1. Discussion

Begin Information

a. The subjective tests and the examination of functions provide a basis for evaluating the capability of the FTD to perform over a typical utilization period; determining that the FTD satisfactorily meets the appropriate training/testing/checking objectives and competently simulates each required maneuver, procedure, or task; and verifying correct operation of the FTD controls, instruments, and systems. The items in the list of operations tasks are for FTD evaluation purposes only. They must not be used to limit or exceed the authorizations for use of a given level of FTD as found in the Practical Test Standards or as may be approved by the TPAA. All items in the following paragraphs are subject to an examination of function.

b. The List of Operations Tasks addressing pilot functions and maneuvers is divided by flight phases. All simulated helicopter systems functions will be assessed for normal and, where appropriate, alternate operations. Normal, abnormal, and emergency operations associated with a flight phase will be assessed during the evaluation of maneuvers or events within that flight phase.

c. Systems to be evaluated are listed separately under ''Any Flight Phase'' to ensure appropriate attention to systems checks. Operational navigation systems (including inertial navigation systems, global positioning systems, or other long-range systems) and the associated electronic display systems will be evaluated if installed. The NSP pilot will include in his report to the TPAA, the effect of the system operation and any system limitation.

d. At the request of the TPAA, the NSP Pilot may assess the FTD for a special aspect of a sponsor's training program during the functions and subjective portion of an evaluation. Such an assessment may include a portion of a Line Oriented Flight Training (LOFT) scenario or special emphasis items in the sponsor's training program. Unless directly related to a requirement for the qualification level, the results of such an evaluation would not necessarily affect the qualification of the FTD.

End Information

TABLE D3A.—TABLE OF FUNCTIONS AND SUBJECTIVE TESTS LEVEL 6 FTD

<<< QPS Requirements >>>	
No.	Operations tasks
Tasks in this table are subject to evaluation if appropriate for the helicopter simulated as indicated in the SOQ Configuration List and/or for a Level 6 FTD. Items not installed or not functional on the FTD and, therefore, not appearing on the SOQ Configuration List, are not required to be listed as exceptions on the SOQ.	
1. Preflight Procedures	
1.a	Preflight Inspection (Cockpit Only) switches, indicators, systems, and equipment.
1.b	APU/Engine start and run-up.
1.b.1	Normal start procedures.
1.b.2	Alternate start procedures.
1.b.3	Abnormal starts and shutdowns.
1.b.4	Rotor engagement.
1.b.5	System checks.
2. Takeoff and Departure Phase	
2.a	instrument
2.b	Takeoff with engine failure after critical decision point (CDP).
3. Climb	
3.a	Normal.
3.b	One engine inoperative.
4. Inflight Maneuvers	
4.	Performance.
4.b	Flying qualities.
4.c	Turns.
4.c.1	Timed.
4.c.2	Normal.
4.c.3	Steep.
4.d	Accelerations and decelerations.
4.e	Abnormal/emergency procedures.
4.e.1	Engine fire.
4.e.2	Engine failure.
4.e.3	In-flight engine shutdown (and restart, if applicable).
4.e.4	Fuel governing system failures (e.g., FADEC malfunction).
4.e.5	Directional control malfunction (restricted to the extent that the maneuver may not terminate in a landing).
4.e.6	Hydraulic failure.
4.e.7	Stability augmentation system failure.
5. Instrument Procedures	
5.a	Holding.
5.b	Precision Instrument Approach.
5.b.1	All engines operating.
5.b.2	One or more engines inoperative.
5.b.3	Approach procedures:
5.b.4	PAR.
5.b.5	ILS.
5.b.6	Manual (raw data).
5.b.7	Flight director only.
5.b.8	Autopilot* and flight director (if appropriate) coupled.
5.c	Non-precision Instrument Approach.
5.c	Normal—All engines operating.
5.c	One or more engines inoperative.
5.c	Approach procedures:
5.c.1	NDB.
5.c.2	VOR, RNAV, TACAN, GPS.
5.c.3	ASR.
5.c.4	Helicopter only.
5.d	Missed Approach.
5.d.1	All engines operating.
5.d.2	One or more engines inoperative.

TABLE D3A.—TABLE OF FUNCTIONS AND SUBJECTIVE TESTS LEVEL 6 FTD—Continued

<<< QPS Requirements >>>	
No.	Operations tasks
5.d.3	Stability augmentation system failure.
6. Normal and Abnormal Procedures (any phase of flight)	
6.a	Helicopter and powerplant systems operation (as applicable).
6.a.1	Anti-icing/deicing systems.
6.a.2	Auxiliary power-plant.
6.a.3	Communications.
6.a.4	Electrical system.
6.a.5	Environmental system.
6.a.6	Fire detection and suppression.
6.a.7	Flight control system.
6.a.8	Fuel system.
6.a.9	Engine oil system.
6.a.10	Hydraulic system.
6.a.11	Landing gear.
6.a.12	Oxygen.
6.a.13	Pneumatic.
6.a.14	Powerplant.
6.a.15	Flight control computers.
6.a.16	Stability augmentation and control augmentation system(s).
6.b	Flight management and guidance system (as applicable).
6.b.1	Airborne radar.
6.b.2	Automatic landing aids.
6.b.3	Autopilot*.
6.b.4	Collision avoidance system.
6.b.5	Flight data displays.
6.b.6	Flight management computers.
6.b.7	Navigation systems.
7. Postflight Procedures	
7.a	Parking and Securing.
7.b	Engine and systems operation.
7.c	Parking brake operation.
7.d	Rotor brake operation.
7.e	Abnormal/emergency procedures.
8. Instructor Operating Station (IOS), as appropriate	
8.a	Power Switch(es).
8.b.1	Helicopter conditions.
8.b.2	Gross weight, center of gravity, fuel loading and allocation, etc.
8.b.3	Helicopter system status.
8.b.4	Ground crew functions (e.g., ext. power).
8.c	Airports and landing areas.
8.c.1	Number and selection.
8.c.2	Runway or landing area selection.
8.c.3	Preset positions (e.g., ramp, over FAF).
8.c.4	Lighting controls.
8.d	Environmental controls.
8.d.1	Temperature.
8.d.2	Climate conditions (e.g., ice, rain).
8.d.3	Wind speed and direction.
8.e	Helicopter system malfunctions.
8.e.1	Insertion/deletion.
8.e.2	Problem clear.
8.f	Locks, Freezes, and Repositioning.
8.f.1	Problem (all) freeze/release.
8.f.2	Position (geographic) freeze/release.
8.f.3	Repositioning (locations, freezes, and releases).
8.f.4	Ground speed control.
8.g	Sound Controls. On/off / adjustment.
8.h	Control Loading System (as applicable On/off/emergency stop.)
8.i	Observer Stations.
8.i.1	Position.
8.i.2	Adjustments.

* "Autopilot" means attitude retention mode of operation.

TABLE D3B—TABLE OF FUNCTIONS AND SUBJECTIVE TESTS
Level 5 FTD

<<< QPS Requirements >>>	
Item No.	Operations tasks
Tasks in this table are subject to evaluation if appropriate for the helicopter simulated as indicated in the SOQ Configuration List and/or for a Level 5 FTD. Items not installed or not functional on the FTD and, therefore, not appearing on the SOQ Configuration List, are not required to be listed as exceptions on the SOQ.	
1. Preflight Procedures	
1.a. Preflight Inspection (Cockpit Only) switches, indicators, systems, and equipment.	
1.b.	APU/Engine start and run-up.
1.b.1. ...	Normal start procedures.
1.b.2. ...	Alternate start procedures.
1.b.3. ...	Abnormal starts and shutdowns.
2. Climb	
2.a. Normal.	
3. Inflight Maneuvers	
3.a. Performance.	
3.b. Turns, Normal.	
4. Instrument Procedures	
4.a. Coupled instrument approach maneuvers (as applicable for the systems installed).	
5. Normal and Abnormal Procedures (any phase of flight)	
5.a. Normal system operation (Installed systems).	
5.b. Abnormal/Emergency system operation (installed systems).	
6. Postflight Procedures	
6.a. Parking and Securing.	
6.b. Engine and systems operation.	
6.c. Parking brake operation.	
6.d. Rotor brake operation.	
6.e. Abnormal/emergency procedures.	
7. Instructor Operating Station (IOS), as appropriate	
7.a. Power Switch(es).	
7.b. Preset positions (ground; air)	
7.c. Helicopter system malfunctions.	
7.c.1. ...	Insertion / deletion.
7.c.2. ...	Problem clear.
7.d. Control Loading System (as applicable On / off / emergency stop.	
7.e.	Observer Stations.
7.e1.	Position.
7.e.2. ...	Adjustments.

TABLE D3C.—TABLE OF FUNCTIONS AND SUBJECTIVE TESTS
Level 4 FTD

<<< QPS Requirements >>>	
Item number	Operations tasks
Tasks in this table are subject to evaluation if appropriate for the helicopter simulated as indicated in the SOQ Configuration List and/or for a Level 4 FTD. Items not installed or not functional on the FTD and, therefore, not appearing on the SOQ Configuration List, are not required to be listed as exceptions on the SOQ.	
1. Preflight Procedures.	
1.a. Preflight Inspection (Cockpit Only) switches, indicators, systems, and equipment.	
1.b. APU/Engine start and run-up.	
1.b.1. ...	Normal start procedures.
1.b.2. ...	Alternate start procedures.
1.b.3. ...	Abnormal starts and shutdowns.
2. Normal and Abnormal Procedures (any phase of flight).	
2.a. Normal system operation (Installed systems).	
2.b. Abnormal/Emergency system operation (installed systems).	
3. Postflight Procedures.	
3.a. Parking and Securing.	
3.b. Engine and systems operation.	
3.c. Parking brake operation.	
4. Instructor Operating Station (IOS), as appropriate.	
4.a. Power Switch(es).	
4.b. Preset positions (ground; air)	
4.c. Helicopter system malfunctions.	
4.c.1. ...	Insertion / deletion.
4.c.2. ...	Problem clear.

Attachment 4 to Appendix D to Part 60—Sample Documents

Table of Contents

BILLING CODE 491073–P

Attachment 4 to Appendix D to Part 60—

Figure D4A – Sample Letter, Request for Initial, Upgrade, or Reinstatement Evaluation
INFORMATION

Date _______

Mr. Charles A. Spillner
Manager, National Simulator Program
Federal Aviation Administration
100 Hartsfield Centre Parkway
Suite 400
Atlanta, GA 30354

Dear Mr. Spillner:

RE: Request for Initial/Upgrade Evaluation Date

This is to advise you of our intent to request an (initial or upgrade) evaluation of our (FSTD Manufacturer), (Aircraft Type/Level) Flight Simulation Training Device (FSTD), (FAA ID Number, if previously qualified), located in (City, State) at the (Facility) on (Proposed Evaluation Date). (The proposed evaluation date shall not be more than 180 days following the date of this letter.) The FSTD will be sponsored by (Name of Training Center/Air Carrier), FAA Designator (4 Letter Code). The FSTD will be sponsored under the following options: (Select One)

☐ The FSTD will be used within the sponsor's FAA approved training program and placed on the sponsor's Training/Operations Specifications; or

☐ The FSTD will be used for dry lease only in accordance with Paragraph 3b, FSTD Guidance Bulletin 03-08.

We agree to provide the formal request for the evaluation (*Ref: Appendix 4, AC 120-40B*) to your staff as follows: (check one)

☐ For QTG tests run at the factory, not later, than 45 days prior to the proposed evaluation date with the additional "1/3 on-site" tests provided not later than 14 days prior to the proposed evaluation date.

☐ For QTG tests run on-site, not later than 30 days prior to the proposed evaluation date.

We understand that the formal request will contain the following documents:

10. Sponsor's Letter of Request (*Company Compliance Letter*).
11. Principal Operations Inspector (POI) or Training Center Program Manager's (TCPM) endorsement.
12. Complete QTG.

If we are unable to meet the above requirements, we understand this may result in a significant delay, perhaps 45 days or more, in rescheduling and completing the evaluation.

(The sponsor should add additional comments as necessary).

Please contact (Name Telephone and Fax Number of Sponsor's Contact) to confirm the date for this initial evaluation. We understand a member of your National Simulator Program staff will respond to this request within 14 days.

A copy of this letter of intent has been provided to (Name), the Principal Operations Inspector (POI) and/or Training Center Program Manager (TCPM).

Sincerely,

Attachment: FSTD Information Form
cc: POI/TCPM

ATTACHMENT 4 TO APPENDIX D TO PART 60—
Figure D4B – Sample Letter , Request for Initial, Upgrade, or Reinstatement Evaluation
Attachment: FSTD Information Form
INFORMATION

Date: _____			
Section 1. FSTD Information and Characteristics			
Sponsor Name:	_____	**FSTD Location:**	
Address:	_____ _____	**Physical Address:**	_____ _____
City:	_____	**City:**	_____
State:	_____	**State:**	_____
Country:	_____	**Country:**	_____
ZIP:	_____	**ZIP:**	_____
Manager	_____		
Sponsor ID No: *(Four Letter FAA Designator)*	_____	**Nearest Airport:** *(Airport Designator)*	_____

Type of Evaluation Requested:			☐ **Initial** ☐ **Upgrade** ☐ **Recurrent** ☐ **Special** ☐ **Reinstatement**		
Qualification Basis: _____	☐ **A**	☐ **B**	☐ **Interim C**	☐ **C**	☐ **D**
	☐ **6**	☐ **7**	☐ **Provisional Status**		

Initial Qualification: (If Applicable)	**Date:** _____ **Level** _____	**Manufacturer's Identification/Serial No:**	_____
Upgrade Qualification: (If Applicable)	**Date:** _____ **Level** _____ MM/DD/YYYY	☐ **eQTG**	
Other Technical Information:			
FAA FSTD ID No: (If Applicable)	_____	**FSTD Manufacturer:**	_____
Convertible FSTD:	☐**Yes:**	**Date of Manufacture:**	_____ MM/DD/YYYY
Related FAA ID No. (If Applicable)	_____ _____ _____	**Sponsor FSTD ID No:** _____	
Aircraft model/series: _____		**Source of aerodynamic model:** _____	
Engine model(s) and data revision: _____		**Source of aerodynamic coefficient data:** _____	
FMS identification and revision level: _____		**Aerodynamic data revision number:** _____	
Visual system manufacturer/model: _____		**Visual system display:** _____	
Flight control data revision: _____		**FSTD computer(s) identification:** _____	
Motion system manufacturer/type: _____			

National Aviation Authority (NAA): (If Applicable)	_____		_____
NAA FSTD ID No:	_____	**Last NAA Evaluation Date:**	_____
NAA Qualification Level:	_____		
NAA Qualification Basis:	_____		

ATTACHMENT 4 TO APPENDIX D TO PART 60—

Figure D4B – Sample Letter , Request for Initial, Upgrade, or Reinstatement Evaluation

Attachment: FSTD Information Form

INFORMATION

Visual System Manufacturer and Type:	_____	**Motion System Manufacturer and Type:**	_____
Aircraft Make/Model/Series:	_____	**FSTD Seats Available:**	_____

Aircraft Equipment	**ENGINE TYPE(S):** _____	**Flight Instrumentation:** ☐ EFIS ☐ HUD ☐ HGS ☐ EFVS ☐ TCAS ☐ GPWS ☐ Plain View ☐ GPS ☐ FMS Type: _____ ☐ WX Radar ☐ Other: _____	Engine Instrumentation: ☐ **EICAS** ☐ **FADEC** ☐ **Other:** _____

Airport Models:	3.6.1 _____ *Airport Designator*	3.6.2_____ *Airport Designator*	3.6.3 _____ *Airport Designator*
Circle to Land:	3. 7.1 _____ *Airport Designator*	3. 7.2_____ *Approach*	3. 7.3 _____ *Landing Runway*
Visual Ground Segment	3.8.1 _____ *Airport Designator*	3.8 .2_____ *Approach*	3. 8.3 _____ *Landing Runway*

Section 2. Supplementary Information

FAA Training Program Approval Authority:		☐ **POI** ☐ **TCPM** ☐ **Other:** ______	
Name:	_____	**Office:**	_____
Tel:	_____	**Fax:**	_____
Email:	_____		

FSTD Scheduling Person:			
Name:	_____		
Address 1:	_____	**Address 2**	_____
City:	_____	**State:**	_____
ZIP:	_____	**Email:**	_____
Tel:	_____	**Fax:**	_____

FSTD Technical Contact:			
Name:	_____		
Address 1:	_____	**Address 2**	_____
City:	_____	**State:**	_____
ZIP:	_____	**Email:**	_____
Tel:	_____	**Fax:**	_____

ATTACHMENT 4 TO APPENDIX D TO PART 60—
Figure D4B – Sample Letter , Request for Initial, Upgrade, or Reinstatement Evaluation
Attachment: FSTD Information Form
INFORMATION

Section 3. Training, Testing and Checking Considerations		
Area/Function/Maneuver	**Requested**	**Remarks**
Private Pilot - Training / Checks: (142)	☐	_____
Commercial Pilot - Training /Checks:(142)	☐	_____
Multi-Engine Rating - Training / Checks (142)	☐	_____
Instrument Rating -Training / Checks (142)	☐	_____
Type Rating - Training / Checks (135/121/142)	☐	_____
Proficiency Checks (135/121/142)	☐	_____
CAT I: (RVR 2400/1800 ft. DH200 ft)	☐	_____
CAT II: (RVR 1200 ft. DH 100 ft)	☐	_____
CAT III * (lowest minimum) _____ RVR _____ ft. * *State CAT III (≤ 700 ft.), CAT IIIb (≤ 150 ft.), or CAT IIIc (0 ft.)*	☐	_____
Circling Approach	☐	_____
Windshear Training: (FSTD GB 03-05)	☐	_____
Windshear Training IAW 121.409d (121 Turbojets Only) (FSTD GB 03-05)	☐	_____
Generic Unusual Attitudes and Recoveries within the Normal Flight Envelope (FSTD GB 04-03)	☐	_____
Specific Unusual Attitudes Recoveries (HBAT 95-10) (FSTD GB 04-03)	☐	_____
Auto-coupled Approach/Auto Go Around	☐	_____
Auto-land / Roll Out Guidance	☐	_____
TCAS/ACAS I / II	☐	_____
WX-Radar	☐	_____
HUD (FSTD GB 03-02)	☐	_____
HGS (FSTD GB 03-02)	☐	
EFVS (FSTD GB 03-03)	☐	
Future Air Navigation Systems (HBAT 98-16A)	☐	_____
GPWS / EGPWS	☐	_____
ETOPS Capability	☐	_____
GPS	☐	_____
SMGCS	☐	_____
Helicopter Slope Landings	☐	_____
Helicopter External Load Operations	☐	_____
Helicopter Pinnacle Approach to Landings	☐	_____
Helicopter Night Vision Maneuvers	☐	_____
Helicopter Category A Takeoffs	☐	_____

Attachment 4 to Appendix D to Part 60—
Figure D4C – Sample Qualification Test Guide Cover Page

INFORMATION

SPONSOR NAME

SPONSOR ADDRESS

FAA QUALIFICATION TEST GUIDE

(SPECIFIC HELICOPTER MODEL)

(*for example*)

(Vertiflite AB-320)

(FTD Identification Including Manufacturer, Serial Number, Visual System Used)

(FTD Level)

(Qualification Performance Standard Used)

(FTD Location)

FAA Initial Evaluation

Date: ____________

_____________________________________ Date: __________
(Sponsor)

_____________________________________ Date: __________
Manager, National Simulator Program, FAA

Attachment 4 to Appendix D to Part 60—
Figure D4D – Sample Statement of Qualification - Certificate

INFORMATION

Federal Aviation Administration
National Simulator Program

Statement of Qualification

This is to certify that representatives of the National Simulator Program
Completed an evaluation of the

Go-Fast Training Center
Vertiflite AB-320 Flight Training Device
FAA Identification Number 889

And found it to meet the standards set forth in
Part 60, Appendix D
Qualification Performance Standards

The Master Qualification Test Guide and the attached
Configuration List and List of Qualified Tasks
Provide the Qualification Basis for this device to operate at
Level 6
Until December 31, 2008

Unless sooner rescinded or extended by the National Simulator Program Manager

November 15, 2007	*I. B. Checkin, Jr.*
(date)	(for the NSPM)

Attachment 4 to Appendix D to Part 60—
Figure D4E – Sample Statement of Qualification – Configuration List
INFORMATION

Date: _____

Section 1. FSTD Information and Characteristics

Sponsor Name:	_____	**FSTD Location:**	
Address:	_____ _____	**Physical Address:**	_____ _____
City:	_____	**City:**	_____
State:	_____	**State:**	_____
Country:	_____	**Country:**	_____
ZIP:	_____	**ZIP:**	_____
Manager	_____		
Sponsor ID No: *(Four Letter FAA Designator)*	_____	**Nearest Airport:** *(Airport Designator)*	_____

Type of Evaluation Requested:			☐ Initial ☐ Upgrade ☐ Recurrent ☐ Special ☐ Reinstatement		
Qualification Basis: _____	☐ A	☐ B	☐ Interim C	☐ C	☐ D
	☐ 6	☐ 7	☐ Provisional Status		

Initial Qualification: (If Applicable)	**Date:** _____ **Level** _____	**Manufacturer's Identification/Serial No:**	_____
Upgrade Qualification: (If Applicable)	**Date:** _____ **Level** _____ MM/DD/YYYY	☐ **eQTG**	

Other Technical Information:			
FAA FSTD ID No: (If Applicable)	_____	**FSTD Manufacturer:**	_____
Convertible FSTD:	☐**Yes:**	**Date of Manufacture:**	_____ MM/DD/YYYY
Related FAA ID No. (If Applicable)	_____ _____ _____	**Sponsor FSTD ID No:** _____	
Aircraft model/series: _____		**Source of aerodynamic model:** _____	
Engine model(s) and data revision: _____		**Source of aerodynamic coefficient data:** _____	
FMS identification and revision level: _____		**Aerodynamic data revision number:** _____	
Visual system manufacturer/model: _____		**Visual system display:** _____	
Flight control data revision: _____		**FSTD computer(s) identification:** _____	
Motion system manufacturer/type: _____			

National Aviation Authority (NAA): (If Applicable)	_____		_____
NAA FSTD ID No:	_____	**Last NAA Evaluation Date:**	_____
NAA Qualification Level:	_____		
NAA Qualification Basis:	_____		

Attachment 4 to Appendix D to Part 60—
Figure D4E – Sample Statement of Qualification – Configuration List
INFORMATION

Visual System Manufacturer and Type:	_____	**Motion System Manufacturer and Type:**	_____
Aircraft Make/Model/Series:	_____	**FSTD Seats Available:**	_____

Aircraft Equipment	**ENGINE TYPE(S):** _____	**Flight Instrumentation:** ☐ **EFIS** ☐ **HUD** ☐ **HGS** ☐ **EFVS** ☐ **TCAS** ☐ **GPWS** ☐ **Plain View** ☐ **GPS** ☐ **FMS Type:** _____ ☐ **WX Radar** ☐ **Other:** _____	Engine Instrumentation: ☐ **EICAS** ☐ **FADEC** ☐ **Other:** _____

Airport Models:	3.6.1 _____ *Airport Designator*	3.6.2_____ *Airport Designator*	3.6.3 _____ *Airport Designator*
Circle to Land:	3. 7.1 _____ *Airport Designator*	3. 7.2_____ *Approach*	3. 7.3 _____ *Landing Runway*
Visual Ground Segment	3.8.1 _____ *Airport Designator*	3.8 .2_____ *Approach*	3. 8.3 _____ *Landing Runway*

Section 2. Supplementary Information

FAA Training Program Approval Authority:		☐ **POI** ☐ **TCPM** ☐ **Other:** ______	
Name:	_____	**Office:**	_____
Tel:	_____	**Fax:**	_____
Email:	_____		

FSTD Scheduling Person:			
Name:	_____		
Address 1:	_____	**Address 2**	_____
City:	_____	**State:**	_____
ZIP:	_____	**Email:**	_____
Tel:	_____	**Fax:**	_____

FSTD Technical Contact:			
Name:	_____		
Address 1:	_____	**Address 2**	_____
City:	_____	**State:**	_____
ZIP:	_____	**Email:**	_____
Tel:	_____	**Fax:**	_____

Section 3. Training, Testing and Checking Considerations

Area/Function/Maneuver	**Requested**	**Remarks**
Private Pilot - Training / Checks: (142)	☐	_____
Commercial Pilot - Training /Checks:(142)	☐	_____
Multi-Engine Rating - Training / Checks (142)	☐	_____
Instrument Rating -Training / Checks (142)	☐	_____
Type Rating - Training / Checks (135/121/142)	☐	_____
Proficiency Checks (135/121/142)	☐	_____
CAT I: (RVR 2400/1800 ft. DH200 ft)	☐	_____

Attachment 4 to Appendix D to Part 60—
Figure D4E – Sample Statement of Qualification – Configuration List
INFORMATION

CAT III * (lowest minimum) _____ RVR _____ ft. * *State CAT III (≤ 700 ft.), CAT IIIb (≤ 150 ft.), or CAT IIIc (0 ft.)*	☐	_____
Circling Approach	☐	_____
Windshear Training: (FSTD GB 03-05)	☐	_____
Windshear Training IAW 121.409d (121 Turbojets Only) (FSTD GB 03-05)	☐	_____
Generic Unusual Attitudes and Recoveries within the Normal Flight Envelope (FSTD GB 04-03)	☐	_____
Specific Unusual Attitudes Recoveries (HBAT 95-10) (FSTD GB 04-03)	☐	_____
Auto-coupled Approach/Auto Go Around	☐	_____
Auto-land / Roll Out Guidance	☐	_____
TCAS/ACAS I / II	☐	_____
WX-Radar	☐	_____
HUD (FSTD GB 03-02)	☐	_____
HGS (FSTD GB 03-02)	☐	
EFVS (FSTD GB 03-03)	☐	
Future Air Navigation Systems (HBAT 98-16A)	☐	_____
GPWS / EGPWS	☐	_____
ETOPS Capability	☐	_____
GPS	☐	_____
SMGCS	☐	_____
Helicopter Slope Landings	☐	_____
Helicopter External Load Operations	☐	_____
Helicopter Pinnacle Approach to Landings	☐	_____
Helicopter Night Vision Maneuvers	☐	_____
Helicopter Category A Takeoffs	☐	_____

Attachment 4 to Appendix D to Part 60—
Figure D4F – Sample Statement of Qualification – List of Qualified Tasks
INFORMATION

STATEMENT of QUALIFICATION
LIST of QUALIFIED TASKS

Go-Fast Training Center Vertiflite AB-320 -- Level C -- FAA ID# 888

The FTD is qualified to perform all of the Maneuvers, Procedures, Tasks, and Functions Listed in Appendix D, Attachment 1, Table D1B, Minimum FTD Requirements In Effect on [mm/dd/yyyy] except for the following listed Tasks or Functions.

(*Example*)

Excepted Tasks:

6.f. Fire Detection and Extinguisher System.
7.d Ditching.

Excepted Simulator Systems:

Remote IOS

Additional Qualified Tasks or Functions in addition to those listed in appendix D, Attachment 3, Table D1B, Minimum FTD Requirements.

(None)

Recurrent Evaluation Requirements ***Completed at conclusion of Initial Evaluation***	
Recurrent Evaluations to be conducted each _(fill in)__ months Allotting ______ hours of FTD time. Signed: ________________________________ NSPM / Evaluation Team Leader	Recurrent evaluations are due as follows: _(month)__ and __(month)_ and __(month)_ (enter or strike out, as appropriate) ______________________ Date

Revision: Based on (enter reasoning):	
Recurrent Evaluations are to be conducted each _(fill in)__ months. Allotting ______ hours. Signed: ________________________________ NSPM Evaluation Team Leader	Recurrent evaluations are due as follows: _(month)__ and __(month)_ and __(month)_ (enter or strike out, as appropriate) ______________________ Date

(Repeat as Necessary)

Index of Effective FSD Directives
Filed in this Section

Notification Number	**Received From: (TPAA/NSPM)**	**Date of Notification**	**Date of Modification Completion**

Continue as Necessary....

BILLING CODE 491073–C

Appendix E to Part 60—Qualification Performance Standards for Quality Management Systems for Flight Simulation Training Devices

Begin QPS Requirements

a. Not later than October 30, 2008 each current sponsor of an FSTD must submit to the NSPM a proposed Quality Management System (QMS) program as described in this

QPS appendix. The NSPM will review the program in order of receipt and notify the sponsor within 90 days of beginning the review regarding the acceptability of the program including any required adjustments. Within 6 months of the notification of acceptability, the sponsor must implement the program, conduct internal audit(s), make any required program adjustments as a result of any internal audit, and have the NSPM initial audit scheduled.

b. For first-time FSTD sponsors, not later than 120 days prior to the date scheduled for the initial FSTD evaluation, the sponsor must submit to the NSPM the proposed QMS program as described in this QPS appendix. The NSPM will review the program and notify the sponsor within 90 days of beginning the review regarding the acceptability of the program including any required adjustments. Within 6 months of the notification of acceptability, the sponsor must implement the program, conduct internal audit(s), make any required program adjustments as a result of any internal audit, and have the NSPM initial audit scheduled.

c. The Director of Operations for a Part 119 certificate holder, the Chief Instructor for a Part 141 certificate holder, or the equivalent for a Part 142 or Flight Engineer School sponsor must designate a management representative who has the responsibility and authority to establish and modify the sponsor's policies, practices, and procedures regarding the QMS program for the recurring qualification and the day-to-day use of each FSTD.

d. The minimum content required for an acceptable QMS is found in Table E1. The policies, processes, and/or procedures described in this table must be maintained in a Quality Manual and will serve as the basis for the following:

(1) The sponsor-conducted initial and on-going periodic assessments;

(2) The NSPM-conducted initial and on-going periodic assessments; and

(3) The continuing surveillance and analysis by the NSPM of the sponsor's performance and effectiveness in providing a satisfactory FSTD for use on a regular basis.

End QPS Requirements

Begin Information

e. When a person sponsors an FSTD maintained by a person other than a U.S. certificate holder, the sponsor remains responsible for the QMS program for that FSTD; however—

(1) If that FSTD is maintained under a qualification by a non-FAA regulatory authority and that authority and the NSPM have agreed to accept each other's simulator evaluations (*e.g.*, under a Bilateral Aviation Safety Agreement (BASA) and associated Simulator Implementation Procedures (SIP), such as the JAA of Europe), no additional requirements are necessary for QMS programs.

(2) If that FSTD is maintained under qualification of a regulatory authority where there is no BASA/SIP or that authority and the NSPM have not agreed to accept each other's qualification programs, the NSPM request additional information regarding those aspects of the sponsor's QMS program for maintaining the qualification standards for the FSTD.

End Information

Begin QPS Requirements

TABLE E1.—MINIMUM REQUIREMENTS FOR SATISFACTORY FSTD QUALITY MANAGEMENT SYSTEM

Number	QPS requirement	Information (Reference)
E1.1.	A QMS manual that sets out the policies, processes, and/or procedures outlined in this table.	§ 60.5(a).
E1.2.	A policy, process, and/or procedure specifying how the sponsor will identify deficiencies in the QMS.	§ 60.5(b).
E1.3.	A policy, process, and/or procedure specifying how the sponsor will document how the QMS program will be changed to address deficiencies when found.	§ 60.5(b).
E1.4.	A policy, process, and/or procedure specifying how the sponsor will address proposed program changes (for programs that do not meet the minimum requirements as notified by the NSPM) to the NSPM and receive approval prior to their implementation.	§ 60.5(c).
E1.5.	A policy, process, and/or procedure specifying how the sponsor will document that at least one FSTD is used within the sponsor's FAA-approved flight training program for the aircraft or set of aircraft at least once within the 12-month period following the initial/upgrade evaluation conducted by the NSP and at least once within each subsequent 12-month period thereafter.	§ 60.7(b)(5).
E1.6.	A policy, process, and/or procedure specifying how the sponsor will document that at least one FSTD is used within the sponsor's FAA-approved flight training program for the aircraft or set of aircraft at least once within the 12-month period following the first continuing qualification evaluation conducted by the NSP and at least once within each subsequent 12-month period thereafter.	§ 60.7(b)(6).
E1.7.	A policy, process, and/or procedure specifying how the sponsor will obtain an annual written statement from a qualified pilot (after having flown the subject aircraft or set of aircraft during the preceding 12-month period) that the performance and handling qualities of the subject FSTD represents the subject aircraft or set of aircraft (within the normal operating envelope). Required only if the subject FSTD is not used in the sponsor's FAA-approved flight training program for the aircraft or set of aircraft at least once within the preceding 12-month period.	§ 60.5(b)(7) and § 60.7(d)(2).
E1.8.	A policy, process, and/or procedure specifying how independent feedback(from persons recently completing training, evaluation, or obtaining flight experience; instructors and check airmen using the FSTD for training, evaluation or flight experience sessions; and FSTD technicians and maintenance personnel) will be received and addressed by the sponsor regarding the FSTD and its operation.	§ 60.9(b)(1).
E1.9.	A policy, process, and/or procedure specifying how and where the FSTDStatement of Qualification will be posted, or accessed by an appropriate terminal or display, in or adjacent to the FSTD.	§ 60.9(b)(2).
E1.10.	A policy, process, and/or procedure specifying how the sponsor's management representative (MR) is selected and identified by name to the NSPM.	§ 60.9(c) and appendix E, paragraph(d).
E1.11.	A policy, process, and/or procedure specifying the MR authority and responsibility for the following:	
E1.11.a.	Monitoring the on-going qualification of assigned FSTDs to ensure all matters regarding FSTD qualification are being carried out as provided for in 14 CFR part 60.	
E1.11.b.	Ensuring that the QMS is properly established, implemented, and maintained by overseeing the QMS policies, practices, and/or procedures and by and modifying when and where necessary.	§ 60.9(c)(2), (3), and (4).
E1.11.c.	Regularly briefing sponsor's management on the status of the on-going FSTD qualification program and the effectiveness and efficiency of the QMS.	

TABLE E1.—MINIMUM REQUIREMENTS FOR SATISFACTORY FSTD QUALITY MANAGEMENT SYSTEM—Continued

Number	QPS requirement	Information (Reference)
E1.11.d.	Serving as the primary contact point for all matters between the sponsor and the NSPM regarding the qualification of assigned FSTDs.	
E1.11.e.	Delegating the MR assigned duties to an individual at each of the sponsor's locations, when/if/where appropriate.	
E1.12.	A policy, process, and/or procedure specifying how the sponsor will:.	
E1.12.a.	Ensure that the data made available to the NSPM (the validation data package) includes the aircraft manufacturer's flight test data (or other data approved by the NSPM) and all relevant data developed after the type certificate was issued (e.g., data developed in response to an airworthiness directive) if such data results from a change in performance, handling qualities, functions, or other characteristics of the aircraft that must be considered for flight crewmember training, evaluation, or for meeting experience requirements of this chapter;	§ 60.13; QPS appendices A, B, C, and D.
E1.12.b.	Notify the NSPM within 10 working days of becoming aware that an addition to or a revision of the flight related data or airplane systems related data is available if this data is used to program and/or operate a qualified FSTD; and	
E1.12.c.	Maintain a liaison with the manufacturer of the aircraft being simulated (or with the holder of the aircraft type certificate for the aircraft being simulated if the manufacturer is no longer in business), and if appropriate, with the person having supplied the aircraft data package for the FFS for the purposes of receiving notification of data package changes.	
E1.13.	A policy, process, and/or procedure specifying how the sponsor will make available all special equipment and qualified personnel needed to accomplish or assist in the accomplishment of tests during initial, continuing qualification, or special evaluations.	§ 60.14.
E1.14.	A policy, process, and/or procedure specifying how the sponsor will submit to the NSPM a request to evaluate the FSTD for initial qualification at a specific level and simultaneously request the TPAA forward a concurring letter to the NSPM; including how the MR will use qualified personnel to confirm the following:	
E1.14.a.	That the performance and handling qualities of the FSTD represents those of the aircraft or set of aircraft within the normal operating envelope;	§ 60.15(a)–(d); § 60.15(b); § 60.15(b)(i); § 60.15(b)(ii); § 60.15(b)(iii).
E1.14.b.	The FSTD systems and sub-systems(including the simulated aircraft systems) functionally represent those in the aircraft or set of aircraft; and	
E1.14.c.	The cockpit represents the configuration of the specific type or aircraft make, model, and series aircraft being simulated, as appropriate.	
E1.15.	A policy, process, and/or procedure specifying how, for an initial evaluation, all of the subjective tests and all of the objective tests are accomplished at the sponsor's training facility, except as provided for in the applicable QPS.	§ 60.15(e).
E1.16.	A policy, process, and/or procedure specifying how, after the NSPM completes the evaluation for initial qualification, the sponsor will update the QTG with the results of the FAA-witnessed tests and demonstrations together with the results of all the objective tests and demonstrations described in the applicable QPS.	§ 60.15(h).
E1.17.	A policy, process, and/or procedure specifying how the sponsor will make the MQTG available to the NSPM upon request.	§ 60.15(i).
E1.18.	A policy, process, and/or procedure specifying how the sponsor will and apply to the NSPM for additional qualification(s) to the Statement of Qualification.	§ 60.16(a); § 60.16(a)(1)(i); § 60.16(a)(1)(ii).
E1.19.	A policy, process, and/or procedure specifying how the sponsor accomplishes all applicable QPS Attachment 2 objective tests each year in a minimum of four evenly spaced inspections as specified in the applicable QPS.	§ 60.19(a)(1) QPS appendices A, B, C, or D.
E1.20.	A policy, process, and/or procedure specifying how the sponsor completes and records a functional preflight check of the FSTD within the preceding 24 hours of FSTD use, including a description of the functional preflight.	§ 60.19(a)(2) QPS appendices A, B, C, or D.
E1.21.	A policy, process, and/or procedure specifying how the sponsor schedules with the NSPM continuing qualification evaluations not later than 60 days before the evaluation is due.	§ 60.19(b)(2).
E1.22.	A policy, process, and/or procedure specifying how the sponsor ensures that the FSTD has received a continuing qualification evaluation at the interval as described in the respective MQTG, allowing for the 1-month grace period before or after the calendar month required.	§ 60.19(b)(5)–(6).
E1.23.	A policy, process, and/or procedure describing that when a discrepancy is discovered the following is recorded in the FSTD discrepancy log:	
E1.23.a.	A description of each discrepancy is entered and remains in the log until the discrepancy is corrected; and	§ 60.19(c); § 60.19(c)(2)(i); § 60.19(c)(2)(ii).
E1.23.b.	A description of the corrective action taken for each discrepancy, the identity of the individual taking the action, and the date that action is taken.	§ 60.19(c)(2)(iii).
E1.24.	A policy, process, and/or procedure specifying how the discrepancy log is kept in a form and manner acceptable to the Administrator and is kept in or adjacent to the FSTD. (An electronic log that may be accessed by an appropriate terminal or display in or adjacent to the FSTD is satisfactory.)	
E1.25.	A policy, process, and/or procedure that requires each instructor, check airman, or representative of the Administrator conducting training, evaluation, or flight experience, and each person conducting the preflight inspection, who discovers a discrepancy, including any missing, malfunctioning, or inoperative components in the FSTD, to write or cause to be written a description of that discrepancy into the discrepancy log at the end of the FSTD preflight or FSTD use session.	§ 60.20.

TABLE E1.—MINIMUM REQUIREMENTS FOR SATISFACTORY FSTD QUALITY MANAGEMENT SYSTEM—Continued

Number	QPS requirement	Information (Reference)
E1.26.	A policy, process, and/or procedure specifying how the sponsor will (if operating an FSTD based on an interim qualification), within twelve months of the release of the final aircraft data package by the aircraft manufacturer (but no later than two years after the issuance of the interim qualification status the sponsor) apply for initial qualification based on the final aircraft data package approved by the aircraft manufacturer.	§ 60.21(c).
E1.27.	A policy, process, and/or procedure specifying how the sponsor determines whether an FSTD change qualifies as a modification as described in 14 CFR part 60.	§ 60.23(a)(1)–(2).
E1.28.	A policy, process, and/or procedure specifying how the sponsor will ensure the FSTD is modified in accordance with any FSTD Directive regardless of the original qualification basis.	§ 60.23(b).
E1.29.	A policy, process, and/or procedure specifying how, if an FSTD change is determined to be a modification as defined in 14 CFR part 60, the sponsor will notify the NSPM and TPAA of their intent to use the modified FSTD and to ensure that the modified FSTD will not be used prior to:	
E1.29.a.	Twenty-one days since the sponsor notified the NSPM and the TPAA of the proposed modification and the sponsor has not received any response from either the NSPM or the TPAA; or	§ 60.23(c)(1)(i),(ii), and (iv).
E1.29.b.	Twenty-one days since the sponsor notified the NSPM and the TPAA of the proposed modification and one has approved the proposed modification and the other has not responded; or	
E1.29.c.	The FSTD successfully completing any evaluation the NSPM may require in accordance with the standards for an evaluation for initial qualification or any part thereof before the modified FSTD is placed in service.	
E1.30	A policy, process, and/or procedure specifying how, after an FSTD modification is approved by the NSPM, the sponsor will:	
E1.30.a.	Post an addendum to the Statement of Qualification until such time as a permanent, updated statement is received from the NSPM and posted;	§ 60.23(d)–(e).
E1.30.b.	Update the MQTG with current objective test results and appropriate objective data for each affected objective test or other MQTG section that is affected by the modification; and	
E1.30.c.	File in the MQTG the direction to make the modification and the record of the modification completion.	
E1.31.	A policy, process, and/or procedure specifying how the sponsor will track the length of time a component has been missing, malfunctioning, or inoperative (MMI), including:	
E1.31.a.	How the sponsor will post a list of MMI components in or adjacent to the FSTD; and	§ 60.25(b)–(c), and QPS appendices A, B, C, or D.
E1.31.b.	How the sponsor will notify the NSPM if the MMI has not been repaired or replaced within 30 days.*	
E1.32.	A policy, process, and/or procedure specifying how the sponsor will notify the NSPM and how the sponsor will seek requalification of the FSTD if the FSTD is moved and reinstalled in a different location.	§ 60.27(a)(3).
E1.33.	A policy, process, and/or procedure specifying how the sponsor will maintain control of the following: (The sponsor must specify how these records are maintained in plain language form or in coded form; but if the coded form is used, the sponsor must specify how the preservation and retrieval of information will be conducted.)	
E1.33.a.	The MQTG and each amendment thereto;	§ 60.31.
E1.33.b.	A record of all FSTD modifications required by this part since the issuance of the original Statement of Qualification;	
E1.33.c.	Results of the qualification evaluations (initial and each upgrade) since the issuance of the original Statement of Qualification;	
E1.33.d.	Results of the objective tests conducted in accordance with this part for a period of 2 years;	
E1.33.e.	Results of the previous three continuing qualification evaluations, or the continuing qualification evaluations from the previous 2 years, whichever covers a longer period;	
E1.33.f.	Comments obtained in accordance with Section 60.9(b);	
E1.33.g.	A record of all discrepancies entered in the discrepancy log over the previous 2 years, including the following:	
E1.33.g.1.	A list of the components or equipment that were or are missing, malfunctioning, or inoperative;	
E1.33.g.2.	The action taken to correct the discrepancy;	
E1.33.g.3.	The date the corrective action was taken; and	
E1.33.g.4.	The identity of the person determining that the discrepancy has been corrected.	

*Note 1.—If the sponsor has an approved discrepancy prioritization system, this item is satisfied by describing how discrepancies are prioritized, what actions are taken, and how the sponsor will notify the NSPM if the MMI has not been repaired or replaced within the specified timeframe.

End QPS Requirements

Begin Information

f. Table E2 contains a sample Assessment Tool that the NSPM will use when conducting the desk assessment of a sponsor's request for initial evaluation of the required elements of a QMS program.

g. Table E3 contains a sample Assessment Tool that the NSPM will use when conducting the on-site practical evaluation of a sponsor's request for initial and continuing evaluation of the required elements of a QMS program.

h. Table E4 contains a sample Assessment Tool that the NSPM will use when conducting the desk assessment of a sponsor's request for initial evaluation of the voluntary elements of a QMS program.

i. Table E5 contains a sample Assessment Tool that will be used by the NSPM when conducting the on-site practical evaluation of a sponsor's request for initial and continuing evaluation of the voluntary elements of a QMS program.

j. Additional Information.

(1) In addition to specifically designated QMS evaluations, the NSPM will evaluate the sponsor's QMS program as part of regularly scheduled FSTD continuing qualification evaluations and no-notice FSTD evaluations, focusing in part on the effectiveness and viability of the QMS program and its contribution to the overall capability of the FSTD to meet the requirements of this part.

(2) The sponsor, through the MR, may delegate duties associated with maintaining the qualification of the FSTD (*e.g.*, corrective and preventive maintenance, scheduling for and the conducting of tests and/or inspections, functional preflight checks) but retains the responsibility and authority for the day-to-day qualification of the FSTD. One person may serve in this capacity for more than one FSTD, but one FSTD would not have more than one person serving in this capacity.

(3) The QMS requirements should not be interpreted to preclude a given QMS program from being applicable to more than one certificate holder (*e.g.*, part 119 and part 142 or two part 119 certificate holders) and should not be interpreted to preclude an individual from being a Management Representative (MR) for more than one certificate holder (*e.g.*, part 119 and part 142 or two part 119 certificate holders) as long as the other QMS program requirements and the other MR requirements are respectively met for each such certificate holder.

(4) Standard Measurements for Flight Simulator Quality: A quality system tied to measurement of FSTD performance will improve and maintain training quality. One acceptable means of measuring FSTD performance is ARINC report 433 (as amended), entitled "Standard Measurements for Flight Simulator Quality. ARINC report 433 is a widely accepted industry standard.

(6) The NSPM will use the results of the assessment(s) of the voluntary portions of the QMS program (as described in Tables E4 and E5) to determine whether or not a sponsor or a FSTD may have the interval between NSPM-conducted evaluations extended and what the extension might be.

k. While the FAA does not mandate any specific QMS program format, the following subparagraphs outline those factors that would be typically found in an acceptable QMS program.

(1) Establishment of a Quality Policy. This is a formal written Quality Policy Statement that is a commitment by the sponsor outlining what the Quality System will achieve.

(2) The selected MR should be someone who has overall authority and responsibility for monitoring the on-going qualification of assigned FSTDs to ensure that all matters regarding FSTD qualification are being carried out as required by this part and ensuring that the QMS program is properly established, implemented, and maintained. The MR should regularly:

(i) Brief the sponsor's management regarding the status of on-going qualification processes; and

(ii) Serve as the primary contact point for all matters between the sponsor and the NSPM regarding the qualification of the assigned FSTDs.

(iii) Oversee the day-to-day quality control.

(3) The system and processes outlined in the QMS should enable the sponsor to monitor compliance with all applicable regulations and ensure correct maintenance and performance of the FSTD.

(4) A QMS program, together with a statement acknowledging completion of a periodic review by the MR, should include the following:

(i) A maintenance facility that provides suitable FSTD hardware and software tests and maintenance capability.

(ii) A recording system in the form of a technical log in which defects, deferred defects, and development projects are listed, assigned and reviewed within a specified time period.

(iii) Routine maintenance of the FSTD and performance of the QTG tests with adequate staffing to cover FSTD operating periods.

(iv) A planned internal assessment schedule and a periodic review should be used to verify that corrective action was complete and effective. The assessor should have adequate knowledge of FSTDs and should be acceptable to the NSPM.

(5) The MR should receive appropriate Quality System training and brief other personnel on the procedures.

TABLE E2.—INFORMATION SIMULATION QUALITY MANAGEMENT SYSTEM (SQMS) ASSESSMENT TOOL—INITIAL (DESK)

Element No.	Basic (Part 60 required) elements Does the sponsor have . . .	Rating see element assessment table			Comments
		N	P	Y	
E.2.1	A QMS program approved by the NSPM including a Quality Management System Manual that sets out the policies, processes, and/or procedures required by 14 CFR part 60 and part 60, appendix E.				
E.2.2	A policy, process, and/or procedure specifying how the sponsor will identify deficiencies in the QMS.				
E.2.3	A policy, process, and/or procedure specifying how the sponsor will document how the QMS program will be changed to address deficiencies when found.				
E.2.4	A policy, process, and/or procedure specifying how the sponsor will propose program changes to the NSPM and receive approval prior to their implementation.				
E.2.5	A policy, process, and/or procedure specifying how the sponsor will document that at least one FSTD is used within the sponsor's FAA-approved flight training program for the aircraft or set of aircraft at least once within the 12-month period following the initial/upgrade evaluation conducted by the NSP and at least once within each subsequent 12-month period thereafter.				
E.2.6	A policy, process, and/or procedure specifying how the sponsor will document that at least one FSTD is used within the sponsor's FAA-approved flight training program for the aircraft or set of aircraft at least once within the 12-month period following the first continuing qualification evaluation conducted by the NSP and at least once within each subsequent 12-month period thereafter.				

TABLE E2.—INFORMATION SIMULATION QUALITY MANAGEMENT SYSTEM (SQMS) ASSESSMENT TOOL—INITIAL (DESK)—Continued

Element No.	Basic (Part 60 required) elements Does the sponsor have . . .	Rating see element assessment table N	P	Y	Comments
E.2.7	A policy, process, and/or procedure specifying how the sponsor will obtain an annual written statement from a qualified pilot (after having flown the subject aircraft or set of aircraft during the preceding 12-month period) that the performance and handling qualities of the subject FSTD represents the subject aircraft or set of aircraft (within the normal operating envelope). Required only if the subject FSTD is not used in the sponsor's FAA-approved flight training program for the aircraft or set of aircraft at least once within the preceding 12-month period.				
E.2.8	A policy, process, and/or procedure specifying how independent feedback (from persons recently completing training, evaluation, or obtaining flight experience; instructors and check airmen using the FSTD for training, evaluation or flight experience sessions; and FSTD technicians and maintenance personnel) will be received and addressed by the sponsor regarding the FSTD and its operation.				
E.2.9	A policy, process, and/or procedure specifying how and where the FSTD Statement of Qualification will be posted, or accessed by an appropriate terminal or display, in or adjacent to the FSTD.				
E.2.10	A policy, process, and/or procedure specifying how the sponsor's management representative (MR) is selected and identified by name to the NSPM.				
E.2.11	A policy, process, and/or procedure specifying the MR's authority and responsibility for the following:				
E.2.11.a	Monitoring the on-going qualification of assigned FSTDs to ensure all matters regarding FSTD qualification are being carried out as provided for in 14 CFR part 60.				
E.2.11.b	Ensuring that the QMS is properly established, implemented, and maintained by overseeing the QMS policies, practices, and/or procedures and by and modifying when and where necessary.				
E.2.11.c	Regularly briefing sponsor's management on the status of the on-going FSTD qualification program and the effectiveness and efficiency of the QMS. (designate maximum interval).				
E.2.11.d	Serving as the primary contact point for all matters between the sponsor and the NSPM regarding the qualification of assigned FSTDs.				
E.2.11.e	Delegating the MR assigned duties to an individual at each of the sponsor's locations, when/if/where appropriate.				
E.2.12	A policy, process, and/or procedure specifying how the sponsor will:				
E.2.12.a	Ensure that the data made available to the NSPM (the validation data package) includes the aircraft manufacturer's flight test data (or other data approved by the NSPM) and all relevant data developed after the type certificate was issued (e.g., data developed in response to an airworthiness directive) if such data results from a change in performance, handling qualities, functions, or other characteristics of the aircraft that must be considered for flight crew member training, evaluation, or for meeting experience requirements of this chapter.				
E.2.12.b	Immediately notify the NSPM when an addition to or a revision of the flight related data or airplane systems related data is available if this data is used to program and/or operate a qualified FFS, including technical information about this data to the NSPM relative to the data's significance for training, evaluation, or flight experience activities in the FFS.				
E.2.12.c	Maintain a liaison with the manufacturer of the aircraft being simulated (or with the holder of the aircraft type certificate for the aircraft being simulated if the manufacturer is no longer in business), and/or, if appropriate, with the person having supplied the aircraft data package for the FFS for the purposes of receiving notification of data package changes..				
E.2.13.	A policy, process, and/or procedure specifying how the sponsor will make available all special equipment and qualified personnel needed to accomplish or assist in the accomplishment of tests during initial, continuing qualification, or special evaluations.				
E.2.14	A policy, process, and/or procedure specifying how the sponsor will submit to the NSPM a request to evaluate the FSTD for initial qualification at a specific level and simultaneously request the TPAA forward a concurring letter to the NSPM; including how the MR will use qualified personnel to confirm the following:				

TABLE E2.—INFORMATION SIMULATION QUALITY MANAGEMENT SYSTEM (SQMS) ASSESSMENT TOOL—INITIAL (DESK)—Continued

Element No.	Basic (Part 60 required) elements	Rating see element assessment table			Comments
	Does the sponsor have . . .	N	P	Y	
E.2.14.a	That the performance and handling qualities of the FSTD represents those of the aircraft or set of aircraft within the normal operating envelope.				
E.2.14.b	The FSTD systems and sub-systems (including the simulated aircraft systems) functionally represent those in the aircraft or set of aircraft.				
E.2.14.c	The cockpit represents the configuration of the specific type; or aircraft make, model, and series aircraft being simulated, as appropriate.				
E.2.15	A policy, process, and/or procedure specifying how, for an initial evaluation, all of the subjective tests and all of the objective tests are accomplished at the sponsor's training facility, except as provided for in the applicable QPS.				
E.2.16	A policy, process, and/or procedure specifying how, after the NSPM completes the evaluation for initial qualification, the sponsor will update the QTG with the results of the FAA-witnessed tests and demonstrations together with the results of all the objective tests and demonstrations described in the applicable QPS.				
E.2.17	A policy, process, and/or procedure specifying how the sponsor will make the MQTG available to the NSPM upon request.				
E.2.18	A policy, process, and/or procedure specifying how the sponsor will apply to the NSPM to add (an) additional qualification(s) to the Statement of Qualification.				
E.2.19	A policy, process, and/or procedure specifying how the sponsor accomplishes all applicable QPS Attachment 2 objective tests each year in a minimum of four evenly spaced inspections as specified in the applicable QPS.				
E.2.20	A policy, process, and/or procedure specifying how the sponsor completes a functional preflight check of the FSTD within the preceding 24 hours of FSTD use.				
E.2.21	A policy, process, and/or procedure specifying how the sponsor schedules with the NSPM continuing qualification evaluations not later than 60 days before the evaluation is due.				
E.2.22	A policy, process, and/or procedure specifying how the sponsor ensures that the FSTD has received a continuing qualification evaluation at the interval as described in the respective MQTG, allowing for the 1-month grace period before or after the calendar month required.				
E.2.23	A policy, process, and/or procedure describing that when a discrepancy is discovered the following is recorded in the FSTD discrepancy log:				
E.2.23.a	A description of each discrepancy is entered and remains in the log until the discrepancy is corrected.				
E.2.23.b	A description of the corrective action taken for each discrepancy, the identity of the individual taking the action, and the date that action is taken.				
E.2.24	A policy, process, and/or procedure specifying how the discrepancy log is kept in a form and manner acceptable to the Administrator and is kept in or adjacent to the FSTD. (An electronic log that may be accessed by an appropriate terminal or display in or adjacent to the FSTD is satisfactory.)				
E.2.25	A policy, process, and/or procedure that requires each instructor, check airman, or representative of the Administrator conducting training, evaluation, or flight experience for flight crew members, and each person conducting the preflight inspection, who discovers a discrepancy, including any missing, malfunctioning, or inoperative components in the FSTD, to write or cause to be written a description of that discrepancy into the discrepancy log at the end of the FSTD preflight or FSTD use session.				
E.2.26	A policy, process, and/or procedure specifying how the sponsor will (if operating an FSTD based on an interim qualification), within twelve months of the release of the final aircraft data package by the aircraft manufacturer (but no later than two years after the issuance of the interim qualification status the sponsor) apply for initial qualification based on the final aircraft data package approved by the aircraft manufacturer.				
E.2.27	A policy, process, and/or procedure specifying how the sponsor determines whether an FSTD change qualifies as a modification as described in 14 CFR part 60.				

TABLE E2.—INFORMATION SIMULATION QUALITY MANAGEMENT SYSTEM (SQMS) ASSESSMENT TOOL—INITIAL (DESK)—Continued

Element No.	Basic (Part 60 required) elements	Rating see element assessment table			Comments
	Does the sponsor have . . .	N	P	Y	
E.2.28	A policy, process, and/or procedure specifying how the sponsor will ensure the FSTD is modified in accordance with any FSTD Directive regardless of the original qualification basis.				
E.2.29	A policy, process, and/or procedure specifying how, if an FSTD change is determined to be a modification as defined in 14 CFR part 60, the sponsor will notify the NSPM and TPAA of their intent to use the modified FSTD and to ensure that the modified FSTD will not be used prior to:				
E.2.29.a	Twenty-one days since the sponsor notified the NSPM and the TPAA of the proposed modification and the sponsor has not received any response from either the NSPM or the TPAA.				
E.2.29.b	Twenty-one days since the sponsor notified the NSPM and the TPAA of the proposed modification and one has approved the proposed modification and the other has not responded.				
E.2.29.c	The FSTD successfully completing any evaluation the NSPM may require in accordance with the standards for an evaluation for initial qualification or any part thereof before the modified FSTD is placed in service.				
E.2.30	A policy, process, and/or procedure specifying how, after a FSTD modification is approved by the NSPM, the sponsor will:				
E.2.30.a	Post an addendum to the Statement of Qualification until such time as a permanent, updated statement is received from the NSPM and posted.				
E.2.30.b	Update the MQTG with current objective test results and appropriate objective data for each affected objective test or other MQTG section that is affected by the modification.				
E.2.30.c	File in the MQTG the direction to make the modification and the record of the modification completion.				
E.2.31	A policy, process, and/or procedure specifying how the sponsor will track the length of time a component has been missing, malfunctioning, or inoperative (MMI), including:				
E.2.31.a	How the sponsor will post a list of MMI components in or adjacent to the FSTD.				
E.2.31.b	How the sponsor will notify the NSPM if the MMI has not been repaired or replaced within 30 days; or if the sponsor has a discrepancy prioritization system, describe how discrepancies are prioritized and how the sponsor will notify the NSPM if the MMI has not been repaired or replaced within the specified timeframe.				
E.2.32	A policy, process, and/or procedure specifying how the sponsor will notify the NSPM and how the sponsor will seek re-qualification of the FSTD if the FSTD is moved and reinstalled in a different location.				
E.2.33	A policy, process, and/or procedure specifying how the sponsor will maintain control of the following documents: [The sponsor must specify how these records are maintained in plain language form or in coded form; but if the coded form is used, the sponsor must specify how the preservation and retrieval of information will be conducted.]				
E.2.33.a	The MQTG and each amendment thereto.				
E.2.33.b	A record of all FSTD modifications required by this part since the issuance of the original Statement of Qualification.				
E.2.33.c	Results of the qualification evaluations (initial and each upgrade) since the issuance of the original Statement of Qualification..				
E.2.33.d.	Results of the objective tests conducted in accordance with this part for a period of 2 years.				
E.2.33.e	Results of the previous three continuing qualification evaluations, or the continuing qualification evaluations from the previous 2 years, whichever covers a longer period.				
E.2.33.f	Comments obtained in accordance with this part for a period of at least 90 days.				
E.2.33.g	A record of all discrepancies entered in the discrepancy log over the previous 2 years, including the following:				
E.2.33.g.1	A list of the components or equipment that were or are missing, malfunctioning, or inoperative.				
E.2.33.g.2	The action taken to correct the discrepancy.				
E.2.33.g.3	The date the corrective action was taken.				
E.2.33.g.4	The identity of the person determining that the discrepancy has been corrected.				

TABLE E.3.—INFORMATION (SQMS) ASSESSMENT TOOL—ON-SITE

Element number	Basic (Part 60 Required) Elements	Rating See Element Assessment Table			Comments
		N	P	Y	
	There is evidence that the element is: (1) Being utilized/applied as is appropriate/necessary; (2) Being utilized/applied *as stated/specified/defined in the QMS;* (3) Achieving/producing effective results.				
E.3.1.	The Quality Management System Manual sets our current QMS policies, processes and/or procedures.				
E.3.2.	The policy, process, and/or procedure specifying how the sponsor will identify deficiencies in the QMS.				
E.3.3.	The policy, process, and/or procedure specifying how the sponsor will document how the QMS program will be changed to address deficiencies when found.				
E.3.4.	The policy, process, and/or procedure specifying how the sponsor will propose program changes to the NSPM and receive approval prior to their implementation.				
E.3.5.	The policy, process, and/or procedure specifying how the sponsor will document that at least one FSTD is used within the sponsor's FAA-approved flight training program for the aircraft or set of aircraft at least once within the 12-month period following the initial/upgrade evaluation conducted by the NSP and at least once within each subsequent 12-month period thereafter.				
E.3.6.	The policy, process, and/or procedure specifying how the sponsor will document that at least one FSTD is used within the sponsor's FAA-approved flight training program for the aircraft or set of aircraft at least once within the 12-month period following the first continuing qualification evaluation conducted by the NSP and at least once within each subsequent 12-month period thereafter.				
E.3.7.	The policy, process, and/or procedure specifying how the sponsor will obtain an annual written statement from a qualified pilot (after having flown the subject aircraft or set of aircraft during the preceding 12-month period) that the performance and handling qualities of the subject FSTD represents the subject aircraft or set of aircraft (within the normal operating envelope). Required only if the subject FSTD is not used in the sponsor's FAA-approved flight training program for the aircraft or set of aircraft at least once within the preceding 12-month period.				
E.3.8.	A policy, process, and/or procedure specifying how independent feedback (from persons recently completing training, evaluation, or obtaining flight experience; instructors and check airmen using the FSTD for training, evaluation or flight experience sessions; and FSTD technicians and maintenance personnel) will be received and addressed by the sponsor regarding the FSTD and its operation.				
E.3.9.	The policy, process, and/or procedure specifying how and where the FSTD Statement of Qualification will be posted, or accessed by an appropriate terminal or display, in or adjacent to the FSTD.				
E.3.10.	The policy, process, and/or procedure specifying how the sponsor's management representative (MR) is selected and identified by name to the NSPM.				
E.3.11.	The policy, process, and/or procedure specifying the MR's authority and responsibility for the following:				
E.3.11.a.	Monitoring the on-going qualification of assigned FSTDs to ensure all matters regarding FSTD qualification are being carried out as provided for in 14 CFR part 60.				
E.3.11.b.	Ensuring that the QMS is properly established, implemented, and maintained by overseeing the QMS policies, practices, and/or procedures and by and modifying when and where necessary.				
E.3.11.c.	Regularly briefing sponsor's management on the status of the on-going FSTD qualification program and the effectiveness and efficiency of the QMS. (designate maximum interval).				
E.3.11.d.	Serving as the primary contact point for all matters between the sponsor and the NSPM regarding the qualification of assigned FSTDs.				
E.3.11.e.	Delegating the MR assigned duties to an individual at each of the sponsor's locations, when/if/ where appropriate.				
E.3.12.	A policy, process, and/or procedure specifying how the sponsor will:				
E.3.12.a.	Ensure that the data made available to the NSPM (the validation data package) includes the aircraft manufacturer's flight test data (or other data approved by the NSPM) and all relevant data developed after the type certificate was issued (e.g., data developed in response to an airworthiness directive) if such data results from a change in performance, handling qualities, functions, or other characteristics of the aircraft that must be considered for flight crew member training, evaluation, or for meeting experience requirements of this chapter.				
E.3.12.b.	Immediately notify the NSPM when an addition to or a revision of the flight related data or airplane systems related data is available if this data is used to program and/or operate a qualified FFS, including technical information about this data to the NSPM relative to the data's significance for training, evaluation, or flight experience activities in the FFS.				
E.3.12.c.	Maintain a liaison with the manufacturer of the aircraft being simulated (or with the holder of the aircraft type certificate for the aircraft being simulated if the manufacturer is no longer in business), and/or, if appropriate, with the person having supplied the aircraft data package for the FFS for the purposes of receiving notification of data package changes.				
E.3.13.	A policy, process, and/or procedure specifying how the sponsor will make available all special equipment and qualified personnel needed to accomplish or assist in the accomplishment of tests during initial, continuing qualification, or special evaluations.				

TABLE E.3.—INFORMATION (SQMS) ASSESSMENT TOOL—ON-SITE—Continued

Element number	Basic (Part 60 Required) Elements	Rating See Element Assessment Table			Comments
		N	P	Y	
E.3.14.	A policy, process, and/or procedure specifying how the sponsor will submit to the NSPM a request to evaluate the FSTD for initial qualification at a specific level and simultaneously request the TPAA forward a concurring letter to the NSPM; including how the MR will use qualified personnel to confirm the following:				
E.3.14.a.	That the performance and handling qualities of the FSTD represent those of the aircraft or set of aircraft within the normal operating envelope.				
E.3.14.b.	The FSTD systems and sub-systems (including the simulated aircraft systems) functionally represent those in the aircraft or set of aircraft.				
E.3.14.c.	The cockpit represents the configuration of the specific type; or aircraft make, model, and series aircraft being simulated, as appropriate.				
E.3.15.	A policy, process, and/or procedure specifying how, for an initial evaluation, all of the subjective tests and all of the objective tests are accomplished at the sponsor's training facility, except as provided for in the applicable QPS.				
E.3.16.	A policy, process, and/or procedure specifying how, after the NSPM completes the evaluation for initial qualification, the sponsor will update the QTG with the results of the FAA-witnessed tests and demonstrations together with the results of all the objective tests and demonstrations described in the applicable QPS.				
E.3.17.	A policy, process, and/or procedure specifying how the sponsor will make the MQTG available to the NSPM upon request.				
E.3.18.	A policy, process, and/or procedure specifying how the sponsor will apply to the NSPM to add (an) additional qualification(s) to the Statement of Qualification.				
E.3.19.	A policy, process, and/or procedure specifying how the sponsor accomplishes all applicable QPS Attachment 2 objective tests each year in a minimum of four evenly spaced inspections as specified in the applicable QPS.				
E.3.20.	A policy, process, and/or procedure specifying how the sponsor completes a functional preflight check of the FSTD within the preceding 24 hours of FSTD use.				
E.3.21.	A policy, process, and/or procedure specifying how the sponsor schedules with the NSPM continuing qualification evaluations not later than 60 days before the evaluation is due.				
E.3.22.	A policy, process, and/or procedure specifying how the sponsor ensures that the FSTD has received a continuing qualification evaluation at the interval as described in the respective MQTG, allowing for the 1-month grace period before or after the calendar month required.				
E.3.23.	A policy, process, and/or procedure describing that when a discrepancy is discovered the following is recorded in the FSTD discrepancy log:				
E.3.23.a.	A description of each discrepancy is entered and remains in the log until the discrepancy is corrected.				
E.3.23.b.	A description of the corrective action taken for each discrepancy, the identity of the individual taking the action, and the date that action is taken.				
E.3.24	A policy, process, and/or procedure specifying how the discrepancy log is kept in a form and manner acceptable to the Administrator and is kept in or adjacent to the FSTD. (An electronic log that may be accessed by an appropriate terminal or display in or adjacent to the FSTD is satisfactory.).				
E.3.25.	A policy, process, and/or procedure that requires each instructor, check airman, or representative of the Administrator conducting training, evaluation, or flight experience for flight crew members, and each person conducting the preflight inspection, who discovers a discrepancy, including any missing, malfunctioning, or inoperative components in the FSTD, to write or cause to be written a description of that discrepancy into the discrepancy log at the end of the FSTD preflight or FSTD use session.				
E.3.26.	A policy, process, and/or procedure specifying how the sponsor will (if operating an FSTD based on an interim qualification), within twelve months of the release of the final aircraft data package by the aircraft manufacturer (but no later than two years after the issuance of the interim qualification status the sponsor) apply for initial qualification based on the final aircraft data package approved by the aircraft manufacturer.				
E.3.27.	A policy, process, and/or procedure specifying how the sponsor determines whether an FSTD change qualifies as a modification as described in 14 CFR part 60..				
E.3.28.	A policy, process, and/or procedure specifying how the sponsor will ensure the FSTD is modified in accordance with any FSTD Directive regardless of the original qualification basis.				
E.3.29.	A policy, process, and/or procedure specifying how, if an FSTD change is determined to be a modification as defined in 14 CFR part 60, the sponsor will notify the NSPM and TPAA of their intent to use the modified FSTD and to ensure that the modified FSTD will not be used prior to:				
E.3.29.a.	Twenty-one days since the sponsor notified the NSPM and the TPAA of the proposed modification and the sponsor has not received any response from either the NSPM or the TPAA.				
E.3.29.b.	Twenty-one days since the sponsor notified the NSPM and the TPAA of the proposed modification, and one has approved the proposed modification and the other has not responded.				
E.3.29.c.	The FSTD successfully completing any evaluation the NSPM may require in accordance with the standards for an evaluation for initial qualification or any part thereof before the modified FSTD is placed in service.				

TABLE E.3.—INFORMATION (SQMS) ASSESSMENT TOOL—ON-SITE—Continued

Element number	Basic (Part 60 Required) Elements	Rating See Element Assessment Table			Comments
		N	P	Y	
E.3.30.	A policy, process, and/or procedure specifying how, after a FSTD modification is approved by the NSPM, the sponsor will:				
E.3.30.a.	Post an addendum to the Statement of Qualification until such time as a permanent, updated statement is received from the NSPM and posted.				
E.3.30.b.	Update the MQTG with current objective test results and appropriate objective data for each affected objective test or other MQTG section that is affected by the modification.				
E.3.30.c.	File in the MQTG the direction to make the modification and the record of the modification completion.				
E.3.31.	A policy, process, and/or procedure specifying how the sponsor will track the length of time a component has been missing, malfunctioning, or inoperative (MMI), including:				
E.3.31.a.	How the sponsor will post a list of MMI components in or adjacent to the FSTD.				
E.3.31.b.	How the sponsor will notify the NSPM if the MMI has not been repaired or replaced within 30 days; or if the sponsor has a discrepancy prioritization system, describe how discrepancies are prioritized and how the sponsor will notify the NSPM if the MMI has not been repaired or replaced within the specified timeframe.				
E.3.32.	A policy, process, and/or procedure specifying how the sponsor will notify the NSPM and how the sponsor will seek re-qualification of the FSTD if the FSTD is moved and reinstalled in a different location.				
E.3.33.	A policy, process, and/or procedure specifying how the sponsor will maintain control of the following documents: The sponsor must specify how these records are maintained in plain language form or in coded form; but if the coded form is used, the sponsor must specify how the preservation and retrieval of information will be conducted.].				
E.3.33.a.	The MQTG and each amendment thereto.				
E.3.33.b.	A record of all FSTD modifications required by this part since the issuance of the original Statement of Qualification.				
E.3.33.c.	Results of the qualification evaluations (initial and each upgrade) since the issuance of the original Statement of Qualification.				
E.3.33.d.	Results of the objective tests conducted in accordance with this part for a period of 2 years.				
E.3.33.e.	Results of the previous three continuing qualification evaluations, or the continuing qualification evaluations from the previous 2 years, whichever covers a longer period.				
E.3.33.f.	Comments obtained in accordance with this part for a period of at least 90 days.				
E.3.33.g.	A record of all discrepancies entered in the discrepancy log over the previous 2 years, including the following:				
E.3.33.g.1.	A list of the components or equipment that were or are missing, malfunctioning, or inoperative.				
E.3.33.g.2.	The action taken to correct the discrepancy.				
E.3.33.g.3.	The date the corrective action was taken.				
E.3.33.g.4.	The identity of the person determining that the discrepancy has been corrected.				

TABLE E.4.—INFORMATION SQMS ASSESSMENT TOOL—INITIAL (DESK)

Element number	EXPANDED (voluntary) elements	Rating see element assessment table			Comments
	Does the sponsor have . . .	N	P	Y	
QUALITY MANAGEMENT SYSTEM MANUAL:					
V.4.1.	Quality Management System Manual documentation includes:				
V.4.1.a.	The scope of the SQMS, including:				
V.4.1.a.1.	Responsibilities Matrix, or the equivalent, designating responsibility, by position, name or title, for approval and control of SQMS functions/elements.				
V.4.1.a.2.	Documented SQMS policies, processes and procedures listed in V.4.10, or reference to them.				
V.4.1.a.3.	A description of the sequence and interaction of the documented SQMS processes.				
V.4.2.	Quality Management System Manual established as a controlled document that includes provision for identification of current revision status and the date of last revision imprinted on each page concerned.				
QUALITY POLICY AND QUALITY OBJECTIVES:					
V.4.3.	A quality policy that:				
V.4.3.a.	Is appropriate to the purpose of the organization.				
V.4.3.b.	Includes the concept of continual SQMS improvement.				
V.4.3.c.	Provides a framework for establishing and reviewing quality objectives.				
V.4.4.	Quality objectives that:				
V.4.4.a.	Have been established for relevant SQMS functions at relevant levels within the organization.				

TABLE E.4.—INFORMATION SQMS ASSESSMENT TOOL—INITIAL (DESK)—Continued

Element number	EXPANDED (voluntary) elements Does the sponsor have . . .	Rating see element assessment table N	P	Y	Comments
V.4.4.b. ..	Include the ultimate objective of providing the continuous presentation of a qualified FSTD, or FSTDs, for credible flight training, evaluation and/or meeting experience requirements.				
V.4.4.c. ..	Are measurable and consistent with the Quality Policy.				
MANAGEMENT COMMITMENT:					
V.4.5.	A policy, process, and/or procedure that specifies how management will:				
V.4.5.a. ..	Ensure that the quality policy is communicated and understood at appropriate levels of the organization.				
V.4.5.b. ..	Ensure that employees are aware of the relevance and importance of their activities and how they contribute to the achievement of the quality objectives.				
V.4.5.c. ..	Ensure that the resources (human and financial) necessary to achieve the quality objectives are identified, planned and available.				
V.4.5.d. ..	Document management resource planning output.				
V.4.5.e. ..	Conduct and record periodic management reviews (stated minimum interval required) to:				
	(1) Evaluate planned resource allocation and				
	(2) Take action to ensure continuing suitability and effectiveness of the:.				
V.4.5.e.1.	Quality policy.				
V.4.5.e.2.	Quality objectives.				
V.4.5.f. ...	Verify implementation of proper corrective action/managed change on assessment deficiencies.				
V.4.5.g. ..	Record the results of corrective action/managed change on assessment deficiencies and report the results to the NSPM.				
DOCUMENT/RECORD CONTROL					
V.4.6.	A Master List of internal and external documents that are *actively* utilized in the SQMS to ensure effective operation and control of the processes (identified, as applicable, by publisher/originator, title/description, volume no./form no., revision no./version, effective date)..				
	Note: By implementing a policy, process or procedure that categorizes inactive/unused documents as "archived," these documents: (1) May be left off of the Master List, (2) Must be controlled and (3) Must be added to the Master List if/when they are subsequently activated [re: V.4.7.h.]..				
V.4.7.	A policy, process, and/or procedure that specifies how the sponsor will provide for:				
V.4.7.a. ..	Approval of documents for adequacy prior to use.				
V.4.7.b. ..	Periodic review, updating, re-approval of documents (where necessary).				
V.4.7.c. ..	Identification of current document revision status including the date of last revision on each page concerned.				
V.4.7.d. ..	Ensuring that current relevant versions of applicable documents are available at point-of-use.				
V.4.7.e. ..	Suitable identification of obsolete documents if they are retained for any purpose.				
V.4.7.f. ...	Preventing the unintended use of obsolete documents.				
V.4.7.g. ..	Ensuring that external-origin documents are identified & their distribution/accessibility controlled.				
V.4.7.h. ..	Protection and storage/archiving of records/documents.				
V.4.8.	A policy, process, and/or procedure specifying how the sponsor will retain the following for a period of two years (The sponsor must specify whether these records are maintained in plain language form or in coded form. If the coded form is used, the sponsor must specify how the preservation retrieval of information will be conducted.):				
V.4.8.a. ..	A record of training time lost due to FSTD discrepancies.				
V.4.8.b. ..	A record of the two most recent NSPM assessments.				
V.4.8.c. ..	A record of the two most recent Sponsor assessments.				
V.4.8.d. ..	SQMS Corrective Action records and/or Managed Change documentation (Including change pertaining to assessment findings)				
ASSIGNMENT of PERSONNEL/TRAINING					
V.4.9.	A policy, process or procedure specifying how the sponsor will, for those performing inspection, testing, engineering and normal, preventative and corrective maintenance on FSTDs:				
V.4.9.a. ..	Identify the necessary skill requirements.				
V.4.9.b. ..	Assign personnel that satisfy the identified skill requirements based upon experience, skills, education or training				
V.4.9.c. ..	Maintain appropriate ongoing records of skill, experience, education and/or training qualifications for assigned personnel.				
V.4.9.d. ..	Evaluate the adequacy/appropriateness of the skill requirements and the effectiveness of sponsor-provided training, referencing, in part, the criteria for workmanship specified in V.4.11.d.				
POLICY, PROCESS and/or PROCEDURE CONTROL					
V.4.10. ...	Documented policies, processes and/or procedures for *essential QMS functions* that directly affect quality, including the relevant/essential sequence and interaction of these processes (Supported by diagrams/flow charts/maps at sponsor's discretion) to include:				

TABLE E.4.—INFORMATION SQMS ASSESSMENT TOOL—INITIAL (DESK)—Continued

Element number	EXPANDED (voluntary) elements Does the sponsor have . . .	Rating see element assessment table N	P	Y	Comments
V.4.10.a.	Scheduling and tracking inspection, testing, engineering and normal and preventative maintenance on FSTDs to verify that the specified qualification requirements for the FSTD are met.				
V.4.10.b.	A policy, process, and/or procedure specifying how the sponsor will determine FSTD training, evaluation, and/or flight experience restrictions, including: (1) Implementation, status notification and coordination with the sponsor's training organization, other users and TPAA and (2) Removal of the restrictions.				
V.4.11. ...	A policy, process, and/or procedure specifying how the sponsor will implement controlled conditions to provide:				
V.4.11.a.	A suitable work environment.				
V.4.11.b.	Approval of equipment.				
V.4.11.c.	Availability of suitable equipment and suitable equipment maintenance.				
V.4.11.d.	Compliance with documented procedures and/or reference standards/codes set out in the Quality Management System Manual.				
V.4.11.e.	Criteria for workmanship (e.g., written standards, representative samples or illustrations).				
V.4.12. ...	A policy, process, and/or procedure specifying how the sponsor will ensure use of current, valid measuring and monitoring devices, including:				
V.4.12.a.	Recording the basis for their periodic, or prior to use, calibration.				
V.4.12.b.	Protecting them from damage and safeguarding them from adjustments that would invalidate their calibration.				
V.4.13. ...	A policy, process, and/or procedure that specifies how the sponsor will record NSPM assessments.				
INTERNAL ASSESSMENT					
V.4.14. ...	A policy, process, and/or procedure that specifies how the sponsor will conduct internal assessments to determine that the SQMS: (1) Has been effectively implemented and maintained, (2) Conforms to regulatory standards and (3) Conforms to SQMS requirements in accordance with documented procedures, as follows:				
V.4.14.a.	Responsibilities and requirements for conducting assessments.]				
V.4.14.b.	Assessment frequency (at least annually).				
V.4.14.c.	Assessment scope.				
V.4.14.d.	How assessments are conducted and recorded.				
V.4.14.e.	Personnel other than those who control/perform the activity, process, procedure or practice being assessed conduct the assessment (Authorization to deviate from this standard may be approved by the NSPM for those sponsors that have limited personnel resources).				
V.4.14.f.	When, how and by whom the results of such assessments and the associated corrective action/managed change are reported to Responsible Management and the NSPM.				
CORRECTIVE ACTION/MANAGED CHANGE (For Other Than FSTD Operational Discrepancies)					
V.4.15. ...	A policy, process, and/or procedure that specifies how a perceived need for change will:				
V.4.15.a.	Be validated (determined), and if valid, be activated as a Change Initiative.				
	If processed as a **Corrective Action:**				
V.4.15.b.	Determine the cause.				
V.4.15.c.	Determine and implement corrective action.				
V.4.15.d.	Record the action taken.				
V.4.15.e.	Evaluate the effectiveness of the action taken.				
V.4.15.f.	Record the results of this evaluation.				
V.4.15.g.	Evaluate the need for further action to prevent recurrence.				
	If processed as a **Managed Change:**				
V.4.15.h.	Analyze and determine action on the Change Initiative.				
V.4.15.i.	Establish the Scope of Change.				
V.4.15.j.	Develop a Change Plan.				
V.4.15.k.	Review the Change Plan.				
V.4.15.l.	Implement the Approved Change Plan.				
V.4.15.m.	Evaluate the implemented change.				
V.4.15.n.	Review the evaluation.				

TABLE E.5.—INFORMATION—SQMS ASSESSMENT TOOL—ON-SITE

Element number	EXPANDED (Voluntary) Elements	Rating—See Element Assessment Table N	P	Y	Comments (Designate N/A Elements)
	There is evidence that the element is: (4) (1) Being utilized/applied as is appropriate/necessary;				

TABLE E.5.—INFORMATION—SQMS ASSESSMENT TOOL—ON-SITE—Continued

Element number	EXPANDED (Voluntary) Elements	Rating—See Element Assessment Table N	P	Y	Comments (Designate N/A Elements)
	(4) (2) Being utilized/applied *as stated/specified/defined in the QMS;* (4) (3) Achieving/producing effective results.				
QUALITY MANAGEMENT SYSTEM MANUAL:					
V.5.1.	Quality Management System Manual contains*current:*				
V.5.1.a.	Responsibilities Matrix, or the equivalent, designating responsibility by position, name or title for approval and/or control of essential QMS functions/ elements.				
V.5.1.b.	Documented SQMS processes and procedures listed in V.5.10, or reference to them.				
V.5.1.c.	Descriptions of the sequence and interaction of the documented SQMS processes.				
V.5.2.	The Quality Management System Manual is being properly controlled and includes identification of current revision status and the date of last revision imprinted on each page concerned.				
QUALITY POLICY AND QUALITY OBJECTIVES:					
V.5.3.	Currently stated quality policy:				
V.5.3.a.	Is appropriate for the organization.				
V.5.3.b.	Includes the concept of continual SQMS improvement.				
V.5.4.	Current written quality objectives:				
V.5.4.a.	Exist for relevant QMS functions at relevant levels within the organization.				
V.5.4.b.	Include the *''ultimate objective''* of providing continuous presentation of a qualified FSTD, or FSTDs, for credible flight training, evaluation and/or meeting experience requirements.				
V.5.4.c.	Are measurable and consistent with the Quality Policy.				
MANAGEMENT COMMITMENT:					
V.5.5.	Management is using their stated SQMS method(s) to:				
V.5.5.a.	Communicate and ensure that the quality policy is understood at appropriate levels of the organization.				
V.5.5.b.	Ensure that employees are aware of the relevance and importance of their activities and how they contribute to the achievement of the quality objectives.				
V.5.5.c.	Allocate resources (human and financial), using documented resource planning output, and implement action necessary to achieve planned operational results/quality objectives.				
V.5.5.d.	Document resource planning output.				
V.5.5.e.	Conduct periodic recorded management reviews (in compliance with stated minimum interval) to evaluate and take action (corrective action/managed change) to ensure continuing suitability and effectiveness of the:				
v.5.5.e.1.	Quality policy.				
v.5.5.e.2.	Quality objectives.				
V.5.5.f.	Verify implementation of proper corrective action/managed change on assessment deficiencies.				
V.5.5.g.	Record the results of corrective action/managed change on assessment deficiencies and report the results to the NSPM.				
DOCUMENT/RECORD CONTROL					
V.5.6.	Internal and external documents:				
V.5.6.a.	That are *actively* utilized in the SQMS to ensure effective operation and control of the processes are:				
v.5.6.a.1.	On the Master List of Documents, including documents originally categorized as ''archived'' that have been activated.				
V.5.6.a.2.	Adequately identified by publisher/originator, title/description, volume no./ form no., revision no./version, or effective date..				
V.5.6.b.	That are *inactive/unused* are being controlled according to the approved ''archiving'' policy [re: V.5.7.h.].				
V.5.7.	Stated SQMS method(s) for:				
V.5.7.a.	Approval of documents for adequacy prior to issue.				
V.5.7.b.	Periodically (where necessary) reviewing documents and records and updating/re-approving them.				
V.5.7.c.	Maintaining current revision(s) and entering revision status and the date of last revision on each page concerned.				
V.5.7.d.	Maintaining current relevant versions of applicable documents at point-of-use.				

TABLE E.5.—INFORMATION—SQMS ASSESSMENT TOOL—ON-SITE—Continued

Element number	EXPANDED (Voluntary) Elements	Rating—See Element Assessment Table			Comments (Designate N/A Elements)
		N	P	Y	
V.5.7.e.	Suitably identifying and designating obsolete documents if they are retained for any purpose.				
V.5.7.f.	Preventing unintended use of obsolete documents.				
V.5.7.g.	Identifying and controlling distribution/accessibility of documents of external origin.				
V.5.7.h.	Adequately protecting and storing/archiving records/documents.				
V.5.8.	Documents/records have been retained for *two years*, in plain language form or in coded form, as follows:				
V.5.8.a.	Training time lost due to FSTD discrepancies.				
V.5.8.b.	Two most recent NSPM assessments.				
V.5.8.c.	Two most recent Sponsor assessments.				
V.5.8.d.	SQMS Corrective Action records and/or Managed Change documentation (Including change pertaining to assessment findings).				
V.5.8.e.	Documented Management Resource Planning output and review.				
ASSIGNMENT of PERSONNEL/TRAINING					
V.5.9.	Stated SQMS method(s) for:				
V.5.9.a.	Assignment of personnel to perform inspection, testing, engineering and normal, preventative and corrective maintenance on FSTDs based upon experience, skills, education or training that satisfies the identified skill requirements.				
V.5.9.b.	Maintaining appropriate records of experience, skills, education or training to indicate that the qualifications of the assigned personnel satisfy the stated skill requirements.				
V.5.9.c.	Evaluating the: (1) Adequacy/appropriateness of the identified skill requirements and (2) Effectiveness of sponsor-provided training, utilizing, in part, the criteria for workmanship specified in V.5.11.d.				
POLICY, PROCESS and/or PROCEDURE CONTROL					
V.5.10.	Documented policies, processes and/or procedures for essential SQMS functions, including the relevant/essential sequence and interaction of these processes (Supported by diagrams/flow charts/maps at sponsor's discretion) to include:				
V.5.10.a.	Scheduling and tracking inspection, testing, engineering and normal and preventative maintenance on FSTDs to verify that the specified qualification requirements for the FSTD are met.				
V.5.10.b.	Determination of *FSTD training, evaluation, and/or flight experience restrictions,* including their implementation, status notification and coordination with the sponsor's training organization, other users and TPAA and removal of the restrictions.				
V.5.11.	Implementation of controlled conditions that provide:				
V.5.11.a.	A suitable work environment.				
V.5.11.b.	Approval of equipment.				
V.5.11.c.	Availability of suitable equipment and suitable equipment maintenance.				
V.5.11.d.	Compliance with documented procedures and/or reference standards/codes as set out in the Quality Management System Manual.				
V.5.11.e.	Utilization of criteria for workmanship (*e.g.*, written standards, representative samples/illustrations).				
V.5.12.	Implementation of controlled conditions that provide availability of current, valid measuring/monitoring devices that are consistent with measurement requirements, including:				
V.5.12.a.	Recording the basis for the periodic, or prior to use, calibration of measurement devices.				
V.5.12.b.	Protection of measurement devices from damage and safeguarding them from adjustments that would invalidate their calibration.				
V.5.13.	The method used to record NSPM assessments, including all recommendations and corrective action/managed change taken.				
INTERNAL ASSESSMENT					
V.5.14.	Internal assessments have been conducted to determine that: (1) The SQMS has been effectively implemented and maintained, (2) Conforms to regulatory standards and (3) Conforms to SQMS requirements in accordance with documented procedures, including:.				
V.5.14.a.	Assignment of responsibilities and requirements for conducting assessments.				
V.514.b.	Assessment frequency.				

TABLE E.5.—INFORMATION—SQMS ASSESSMENT TOOL—ON-SITE—Continued

Element number	EXPANDED (Voluntary) Elements	Rating—See Element Assessment Table			Comments (Designate N/A Elements)
		N	P	Y	
V.5.14.c.	Adequate assessment scope.				
V.5.14.d.	Assessment methodology and recording.				
V.5.14.e.	Personnel, other than those who control/perform the activity, process, procedure or practice being assessed, conducted the assessment (Note any NSPM approved authorization to deviate from this requirement for sponsors that have limited personnel resources).				
V.5.14.f.	Reporting assessment results to Responsible Management and the NSPM.				
CORRECTIVE ACTION/MANAGED CHANGE (For Other Than FSTD Operational Discrepancies)					
V.5.15.	The policy, process, and/or procedure that specifies how a perceived need for change will:				
V.5.15.a.	Be validated (determined), and if valid, be activated as a Change Initiative.				
	If processed as a Corrective Action:				
V.5.15.b.	Determine the cause.				
V.5.15.c.	Determine and implement corrective action.				
V.5.15.d.	Record the action taken.				
V.5.15.e.	Evaluate the effectiveness of the action taken.				
V.5.15.f.	Record the results of this evaluation.				
V.5.15.g.	Evaluate the need for further action to prevent recurrence.				
—.					
	If processed as a Managed Change:.				
V.5.15.h.	Analyze and determine action on the Change Initiative.				
V.5.15.i.	Establish the Scope of Change.				
V.5.15.j.	Develop a Change Plan.				
V.5.15.k.	Review the Change Plan.				
V.5.15.l.	Implement the Approved Change Plan.				
V.5.15.m.	Evaluate the implemented change.				
V.5.15.n.	Review the evaluation.				

Continuation Sheet

Sponsor ______________________ Program ________________ Date ____________ Page No. _____ I or O ______

FAA Element Number	Sponsor Item Number	Action*		Comments	Resolved#	
		Status/Category	Date		Status/Category	Date

(Continue as Necessary)

***ACTION**
Rating / Status Codes:
Rating = Yes (Y); Partial (P); None (N)
Status = Advisory (A); Question (Q); Request (R); Observation (O)

#RESOLVED
Rating / Status Codes:
Rating = Yes (Y)
Status = Corrected or Acceptable (OK)

ELEMENT ASSESSMENT TABLE

Rating/Measurement Standard

Criteria: Complete, adequate, appropriate, accurate, clearly defined – flow chart, diagram, description

NONCOMPLIANCE/NONCONFORMITY (N)	PARTIAL COMPLIANCE/CONFORMITY (P)	ACCEBTABLE COMPLIANCE/CONFORMITY (Y)
Corrective Action Required	Corrective Action Required	No Corrective Action Required
There is no evidence of:	There is evidence of:	There is evidence of:
A. Compliance/Conformity. B. A written description.	A. A partial compliance/conformity. B. An incomplete written description.	A. Adequate compliance/conformity. B. An adequate written description
C. Identification, definition, documentation (flow chart, diagram, description)	*C. The process or procedure is:* *(a) Identified/defined inadequately,* *or* *(b) Documented inadequately.*	*C. The process or procedure is:* *(a) Identified/defined adequately,* *or* *(b) Documented adequately*
D. Implementation of a process or procedure.	*D. The process or procedure is:* *(a) Implemented inadequately/inappropriately,* *or* *(b) Not current as defined/documented.*	*D. The process or procedure is:* *(a) Implemented adequately/appropriately,* *or* *(b) Current as defined/documented.*
E. Effectiveness of a process or procedure.	*E. Of inadequate or partial effectiveness of a process or procedure.*	*E. Of adequate effectiveness of a process or procedure.*

End Information

BILLING CODE 4910–73–C

Appendix F to Part 60—Definitions and Abbreviations for Flight Simulation Training Devices

Begin Information

1. The definitions presented below in *Italic type face* are repeated from the regulatory definitions found in part 1 or part 60, as indicated. In the event that a discrepancy exists between a definition found here, and one found in part 1 or part 60, the part 1 or part 60 definition prevails.

End Information

Begin QPS Requirements

2. Definitions.

1st Segment—is that portion of the takeoff profile from liftoff to gear retraction.

2nd Segment—is that portion of the takeoff profile from after gear retraction to initial flap/slat retraction.

3rd Segment—is that portion of the takeoff profile after flap/slat retraction is complete.

Aircraft data package—is a combination of the various types of data used to design, program, manufacture, modify, and test the FSTD.

Airspeed—is calibrated airspeed unless otherwise specified and is expressed in terms of nautical miles per hour (knots).

Altitude—is pressure altitude (meters or feet) unless specified otherwise.

Angle of attack—is the angle between the airplane longitudinal axis and the relative wind vector projected onto the airplane plane of symmetry.

Automatic Testing—is FSTD testing wherein all stimuli are under computer control.

Bank—is the airplane attitude with respect to or around the longitudinal axis, or roll angle (degrees).

Breakout—is the force required at the pilot's primary controls to achieve initial movement of the control position.

Certificate holder—A person issued a certificate under parts 119, 141, or 142 of this chapter or a person holding an approved course of training for flight engineers in accordance with part 63 of this chapter. (Part 60)

Closed Loop Testing—is a test method for which the input stimuli are generated by controllers, which drive the FSTD to follow a pre-defined target response.

Computer Controlled Airplane—is an airplane where all pilot inputs to the control surfaces are transferred and augmented by computers.

Control Sweep—is movement of the appropriate pilot controller from neutral to an extreme limit in one direction (Forward, Aft, Right, or Left), a continuous movement back through neutral to the opposite extreme position, and then a return to the neutral position.

Convertible FSTD—is an FSTD in which hardware and software can be changed so that the FSTD becomes a replica of a different model, usually of the same type aircraft. The same FSTD platform, cockpit shell, motion system, visual system, computers, and necessary peripheral equipment can thus be used in more than one simulation.

Critical Engine Parameter—is the parameter, which is the most accurate measure of propulsive force.

Deadband—is the amount of movement of the input for a system for which there is no reaction in the output or state of the system observed.

Distance—is the length of space between two points and is expressed in terms of nautical miles unless specified otherwise.

Discrepancy—as used in this part, means an aspect of the FSTD that is not correct with respect to the aircraft being simulated. This includes missing, malfunctioning, and/or inoperative components that are required to be present and operate correctly for training, evaluation, and experience functions to be creditable. It also includes errors in the documentation used to support the FSTD (*e.g.,* errors in, or information missing from, the MQTG, required statements from appropriately qualified personnel).

Downgrade—is a permanent change in the qualification level of an FSTD to a lower level.

Driven—is a test method where the input stimulus or variable is positioned by automatic means, generally a computer input.

Electronic Copy of the MQTG—an electronic copy of the MQTG provided by an electronic scan presented in a Portable Document File (PDF), or similar format, acceptable to the NSPM.

Electronic Master Qualification Test Guide—is an electronic version of the MQTG (eMQTG), where all objective data obtained from airplane testing, or another approved source, together with correlating objective test results obtained from the performance of the FSTD and a description of the equipment necessary to perform the evaluation for the initial and the continuing qualification evaluations is stored, archived, or presented in either reformatted or digitized electronic format.

Engine—as used in this part, means the appliance or structure that supplies propulsive force for movement of the aircraft: *i.e.,* the turbine engine for turbine powered aircraft; the turbine engine and propeller assembly for turbo-propeller powered aircraft; and the reciprocating engine and propeller assembly for reciprocating engine powered aircraft. For purposes of this part, engine failure is the failure of either the engine, or propeller assembly, to provide thrust higher than idle power thrust due to a failure of either the engine or the propeller assembly.

Evaluation—With respect to an individual, the checking, testing, or review associated with flight crewmember qualification, training, and certification under parts 61, 63, 121, or 135 of this chapter. With respect to an FSTD, the qualification activities (*e.g.,* the objective and subjective tests, the inspections, or the continuing qualification evaluations) associated with the requirements of this part. (Part 60)

Fictional Airport—is a visual model of an airport that is a collection of non-''real world'' terrain, instrument approach procedures, navigation aids, maps, and visual modeling detail sufficient to enable completion of an Airline Transport Pilot Certificate or Type Rating.

Flight experience—Flight experience means recency of flight experience for landing credit purposes. (Part 60)

Flight simulation training device (FSTD) means a full flight simulator (FFS) or a flight training device (FTD). (Part 1)

Flight test data—(a subset of Objective data) Aircraft data collected by the aircraft manufacturer (or other supplier of data that are acceptable to the NSPM) during an aircraft flight test program. (Part 60)

Flight training device (FTD) means a replica of aircraft instruments, equipment, panels, and controls in an open flight deck area or an enclosed aircraft cockpit replica. It includes the equipment and computer programs necessary to represent aircraft (or set of aircraft) operations in ground and flight conditions having the full range of capabilities of the systems installed in the device as described in part 60 of this chapter and the qualification performance standard (QPS) for a specific FTD qualification level. (Part 1)

Free Response—is the response of the FSTD after completion of a control input or disturbance.

Frozen—is a test condition where one or more variables are held constant with time.

FSTD Approval—is the extent to which an FSTD may be used by a certificate holder as authorized by the FAA. It takes into account aircraft to FSTD differences and the training ability of the organization.

FSTD Directive—A document issued by the FAA to an FSTD sponsor, requiring a modification to the FSTD due to a recognized safety-of-flight issue and amending the qualification basis for the FSTD. (Part 60)

FSTD Latency—is the additional time beyond that of the response time of the aircraft due to the response of the FSTD.

FSTD Performance—The overall performance of the FSTD includes aircraft performance (*e.g.,* thrust/drag relationships, climb, range) as well as flight and ground handling. (Part 60)

Full flight simulator (FFS) means a replica of a specific type; or make, model, and series aircraft cockpit. It includes the assemblage of equipment and computer programs necessary to represent aircraft operations in ground and flight conditions, a visual system providing an out-of-the-cockpit view, a system that provides cues at least equivalent to those of a three-degree-of-freedom motion system, and has the full range of capabilities of the systems installed in the device as described in part 60 of this chapter and the qualification performance standards (QPS) for a specific FFS qualification level. (Part 1)

Generic Airport—is a Class III visual model that combines correct navigation aids for a real world airport with a visual model which does not correctly depict that same airport.

Grandfathering—as used in this part, means the practice of assigning a qualification basis for an FSTD, based on the period of time during which a published set of standards governed the requirements for the initial and continuing qualification of

FSTDs. Each FSTD manufactured during this specified period of time is ''grandfathered,'' or is ''held to the standards'' that are, or were, in effect during that time period. The grandfathered standards remain applicable to each FSTD manufactured during the stated time period, regardless of any subsequent modification to those standards and regardless of the sponsor, as long as the FSTD remains continuously qualified or is maintained in a non-qualified status in accordance with the specific requirements and time periods set out in this part. Each FSTD manufactured prior to the beginning date (or manufactured after the ending date) of a designated grandfather time period would have as its qualification basis, the standards in effect during the time period prior to, or subsequent to, the designated period.

Gross Weight—For objective test purposes:

Basic Operating Weight—(BOW) is the empty weight of the aircraft plus the weight of the following: normal oil quantity; lavatory servicing fluid; potable water; required crewmembers and their baggage; and emergency equipment.

Near Maximum Gross Weight—is a weight chosen by the sponsor or data provider that is not less than the basic operating weight (BOW) of the airplane being simulated plus 80% of the difference between the maximum certificated gross weight (either takeoff weight or landing weight, as appropriate for the test) and the BOW.

Light Gross Weight—is a weight chosen by the sponsor or data provider that is not more than 120% of the BOW of the airplane being simulated or as limited by the minimum practical operating weight of the test airplane.

Medium Gross Weight—is a weight chosen by the sponsor or data provider that is approximately ±10% of the average of the numerical values of the BOW and the maximum certificated gross weight.

Ground Effect—is the change in aerodynamic characteristics due to modification of the airflow past the aircraft caused by the proximity of the Earth's surface to the airplane.

Hands Off—is a test maneuver conducted without pilot control inputs.

Hands On—is a test maneuver conducted with pilot control inputs as required.

Heave—is FSTD movement with respect to or along the vertical axis.

Height—is the height above ground level (or AGL) expressed in meters or feet.

''*In Use'' Runway*—as used in this part, means the runway that is ''active,'' (is currently ''selected'' and able to be used for takeoffs and landings) and has the surface lighting and markings required by this part.

Integrated Testing—is testing of the FSTD such that all aircraft system models are active and contribute appropriately to the results where none of the models used are substituted with models or other algorithms intended for testing only.

Irreversible Control System—is a control system in which movement of the control surface will not backdrive the pilot's control in the cockpit.

Locked—is a test condition where one or more variables are held constant with time.

Manual Testing—is FSTD testing conducted without computer inputs except for initial setup and all modules of the simulation are active.

Master Qualification Test Guide (MQTG)—The FAA-approved Qualification Test Guide with the addition of the FAA-witnessed test results, applicable to each individual FSTD. (Part 60)

Medium—is the normal operational weight for a given flight segment.

National Simulator Program Manager (NSPM)—The FAA manager responsible for the overall administration and direction of the National Simulator Program (NSP), or a person approved by that FAA manager. (Part 60)

Nominal—is the normal operating configuration, atmospheric conditions, and flight parameters for the flight segment specified.

Non-Normal Control—is a term used in reference to Computer Controlled Airplanes and is the state where one or more of the intended control, augmentation, or protection functions are not fully working. NOTE: Specific terms such as ALTERNATE, DIRECT, SECONDARY, or BACKUP may be used to define an actual level of degradation.

Normal Control—is a term used in reference to Computer Controlled Airplanes and is the state where the intended control, augmentation, and protection functions are fully working.

Objective data—Quantitative data, acceptable to the NSPM, used to evaluate the FSTD.

Objective test—A quantitative measurement and evaluation of FSTD performance. (Part 60)

Pitch—is the airplane attitude with respect to, or around, the lateral axis expressed in degrees.

Power Lever Angle (PLA)—is the angle of the pilot's primary engine control lever(s) in the cockpit. This may also be referred to as THROTTLE or POWER LEVER.

Predicted data—Estimations or extrapolations of either existing flight test data or data from other simulation models using engineering analyses, engineering simulations, design data, and/or wind tunnel data. (Part 60)

Protection Functions—are systems functions designed to protect an airplane from exceeding its flight maneuver limitations.

Pulse Input—is a step input to a control followed by an immediate return to the initial position.

Qualification level—The categorization of an FSTD established by the NSPM, based on the FSTDs demonstrated technical and operational capabilities as set out in this part. (Part 60)

Qualification Performance Standard (QPS)—The collection of procedures and criteria published by the FAA to be used when conducting objective tests and subjective tests, including general FSTD requirements, for establishing FSTD qualification levels. The QPS are published in the appendices to this part, as follows: Appendix A, for Airplane Simulators; Appendix B, for Airplane Flight Training Devices; Appendix C, for Helicopter Simulators; Appendix D, for Helicopter Flight Training Devices; Appendix E, for Quality Management Systems for Flight Simulation Training Devices; and Appendix F, for Definitions and Abbreviations for Flight Simulation Training Devices. (Part 60)

Qualification Test Guide (QTG)—The primary reference document used for evaluating an aircraft FSTD. It contains test results, statements of compliance and capability, the configuration of the aircraft simulated, and other information for the evaluator to assess the FSTD against the applicable regulatory criteria. (Part 60)

Quality Management System (QMS)—the aviation standard for flight simulation quality-systems that can be used for external quality-assurance purposes. It is a collection of generic and independent requirements unrelated to any specific industry or economic sector. It is not designed to enforce uniformity of quality systems, but to identify the processes needed, determine the sequence and interaction of these processes, determine criteria and methods required to ensure the effective operation and control of these processes, ensure the availability of information necessary to support the operation and monitoring of these processes, measure, monitor and analyze these processes, and implement the actions necessary to achieve planned results. The design and implementation of a specific quality management system is influenced by the varying needs of the individual sponsor, their particular objectives, the flight simulation products and services supplied, and the processes and specific practices employed.

Real-World Airport—as used in this part in reference to airport visual models, means a computer generated visual depiction of an airport that exists in reality.

Representative—When used as an adjective in this part, means typical, demonstrative, or characteristic of, or with respect to, the feature being described. For example:

1. ''Representative sampling of tests'' means a sub-set of the complete set of all tests such that the sample includes one or more of the tests in each of the major categories, the results of which would provide the evaluator a typical, or overall, understanding of the performance and/or handling characteristics of the FSTD.

2. ''Representative airport model'' (or ''ground/airborne traffic,'' ''lights,'' ''runway/taxiway markings,'' ''terrain,'' ''weather phenomena'') means a computer generated visual depiction of a real-world or fictional airport (or traffic, lights, markings, terrain, weather phenomena.) that is typical or characteristic of an airport (or traffic, lights, markings, terrain, weather phenomena) regularly used or seen by the sponsor, or the sponsor's client using the FSTD, in normal operations.

Reversible Control System—is a control system in which movement of the control surface will backdrive the pilot's control in the cockpit.

Roll—is the airplane attitude with respect to, or around, the longitudinal axis expressed in degrees.

Set of aircraft—Aircraft that share similar handling and operating characteristics and similar operating envelopes and have the same number and type of engines or power plants. (Part 60)

Sideslip Angle—is the angle between the relative wind vector and the airplane plane of symmetry. (note: this definition replaces the current definition of ''sideslip.'')

Simulation Quality Management System (SQMS)—consists of the required and voluntary elements of a quality management system for FSTD continuing qualification.

Snapshot—is a presentation of one or more variables at a given instant of time.

Special Evaluation—is an evaluation of the FSTD for purposes other than initial, upgrade, or continuing qualification. Circumstances that might indicate the need for a special evaluation would include, but not necessarily be limited to, the following: after the FSTD is moved and reinstalled at another location; after an update to FSTD software or hardware that might affect performance or flying qualities; after a substantial update to FSTD avionics packages (e.g., autopilot, flight management systems); after substantial modifications to FSTD configuration; after a complaint is received from a credible source indicating that the FSTD does not perform or handle like the aircraft it simulates.

Sponsor—A certificate holder who seeks or maintains FSTD qualification and is responsible for the prescribed actions as set out in this part and the QPS for the appropriate FSTD and qualification level. (Part 60)

Statement of Compliance and Capability (SOC)—is a declaration that specific requirements have been met. It must declare that compliance with the requirement is achieved and explain how the requirement is met (e.g., gear modeling approach, coefficient of friction sources). It must also describe the capability of the FSTD to meet the requirement (e.g., computer speed, visual system refresh rate). In doing this, the statement must provide references to needed sources of information for showing compliance, rationale to explain how the referenced material is used, mathematical equations and parameter values used, and conclusions reached.

Step Input—is an abrupt control input held at a constant value.

Subjective test—A qualitative assessment of the performance and operation of the FSTD. (Part 60)

Surge—is FSTD movement with respect to or along the longitudinal axis.

Sway—is FSTD movement with respect to or along the lateral axis.

Time History—is a presentation of the change of a variable with respect to time.

Training Program Approval Authority (TPAA)—A person authorized by the Administrator to approve the aircraft flight training program in which the FSTD will be used. (Part 60)

Training Restriction—is a temporary condition where, due to a Missing, Malfunctioning, or Inoperative (MMI) Component condition, the FSTD may continue to be used at the qualification level indicated on its SOQ but restricted from accomplishing the task for which the correct function of the MMI component is required.

Transport Delay or ''Throughput''—is the total FSTD system processing time required for an input signal from a pilot primary flight control until motion system, visual system, or instrument response. It is the overall time delay incurred from signal input until output response. It does not include the characteristic delay of the airplane simulated.

Upgrade—The improvement or enhancement of an FSTD for the purpose of achieving a higher qualification level. (Part 60)

Validation Data—Objective data used to determine if the FSTD performance is within the tolerances prescribed in the QPS.

Validation Test—An objective test whereby FSTD parameters are compared to the relevant validation data to ensure that the FSTD performance is within the tolerances prescribed in the QPS.

Visual Data Base—is a display that may include one or more visual models.

Visual Model—is a collection of one or more visual scenes of an airport or portion(s) of an airport.

Visual System Response Time—is the interval from a control input to the completion of the visual display scan of the first video field containing the resulting different information.

Yaw—is airplane attitude with respect to, or around, the vertical axis expressed in degrees.

3. Abbreviations.

AFM Approved Flight Manual.
AlL Above Ground Level (meters or feet).
AOA Angle of Attack (degrees).
APD Aircrew Program Designee.
CCA Computer Controlled Airplane.
cd/m^2 candela/$meter^2$, 3.4263 candela/m^2 = 1 ft-Lambert.
CFR Code of Federal Regulations.
cm(s) centimeter, centimeters.
daN decaNewtons, one (1) decaNewton = 2.27 pounds.
deg(s) degree, degrees.
DOF Degrees-of-freedom.
eMQTG Electronic Master Qualification Test Guide.
EPR Engine Pressure Ratio.
FAA Federal Aviation Administration (U.S.).
fpm feet per minute.
ft foot/feet, 1 foot = 0.304801 meters.
ft-Lambert foot-Lambert, 1 ft-Lambert = 3.4263 candela/m^2.
g Acceleration due to Gravity (meters or feet/sec^2); 1 g = 9.81 m/sec^2 or 32.2 feet/sec^2.
G/S Glideslope.
IATA International Airline Transport Association.
ICAO International Civil Aviation Organization.
IGE In ground effect.
ILS Instrument Landing System.
IQTG International Qualification Test Guide.
km Kilometers 1 km = 0.62137 Statute Miles.
kPa KiloPascal (Kilo Newton/Meters2). 1 psi = 6.89476 kPa.
kts Knots calibrated airspeed unless otherwise specified, 1 knot = 0.5148 m/sec or 1.689 ft/sec.
lb(s) pound(s), one (1) pound = 0.44 decaNewton.
LDP Landing decision point.
M,m Meters, 1 Meter = 3.28083 feet.
Min(s) Minute, minutes.
MLG Main Landing Gear.
Mpa MegaPascals (1 psi = 6894.76 pascals).
ms millisecond(s).
N NORMAL CONTROL Used in reference to Computer Controlled Airplanes.
nm Nautical Mile(s) 1 Nautical Mile = 6,080 feet.
NN NON-NORMAL CONTROL Used in reference to Computer Controlled Airplanes.
N1 Low Pressure Rotor revolutions per minute, expressed in percent of maximum.
N2 High Pressure Rotor revolutions per minute, expressed in percent of maximum.
N3 High Pressure Rotor revolutions per minute, expressed in percent of maximum.
NWA Nosewheel Angle (degrees).
OGE Out of ground effect.
PAPI Precision Approach Path Indicator System.
Pf Impact or Feel Pressure, often expressed as ''q.''
PLA Power Lever Angle.
PLF Power for Level Flight.
psi pounds per square inch.
QPS Qualification Performance Standard.
RAE Royal Aerospace Establishment.
R/C Rate of Climb (meters/sec or feet/min).
R/D Rate of Descent (meters/sec or feet/min).
REIL Runway End Identifier Lights.
RVR Runway Visual Range (meters or feet).
s second(s).
sec(s) second, seconds.
sm Statute Mile(s) 1 Statute Mile = 5,280 feet.
SOC Statement of Compliance and Capability.
Tf Total time of the flare maneuver duration.
Ti Total time from initial throttle movement until a 10% response of a critical engine parameter.
TIR Type Inspection Report.
T/O Takeoff.
Tt Total time from Ti to a 90% increase or decrease in the power level specified.
VASI Visual Approach Slope Indicator System.
VGS Visual Ground Segment.
V_1 Decision speed.
V_2 Takeoff safety speed.
Vmc Minimum Control Speed.
Vmca Minimum Control Speed in the air.
Vmcg Minimum Control Speed on the ground.
Vmcl Minimum Control Speed—Landing.
Vmu The speed at which the last main landing gear leaves the ground.
V_R Rotate Speed.
V_s Stall Speed or minimum speed in the stall.
WAT Weight, Altitude, Temperature.

End QPS Requirements

PART 121—OPERATING REQUIREMENTS: DOMESTIC, FLAG, AND SUPPLEMENTAL OPERATIONS

■ 7. The authority citation for part 121 continues to read as follows:

Authority: 49 U.S.C. 106(g), 1153, 40101, 40102, 40103, 40113, 41721, 44105, 44106, 44111, 44701–44717, 44722, 44901, 44903, 44904, 44906, 44912, 44914, 44936, 44938, 46103, 46105.

■ 8. Revise Appendix H to part 121 to read as follows:

Appendix H to Part 121—Advanced Simulation

This appendix provides guidelines and a means for achieving flightcrew training in advanced airplane simulators. The requirements in this appendix are in addition to the simulator approval requirements in § 121.407. Each simulator used under this appendix must be approved as a Level B, C, or D simulator, as appropriate.

Advanced Simulation Training Program

For an operator to conduct Level C or D training under this appendix all required simulator instruction and checks must be conducted under an advanced simulation training program approved by the Administrator for the operator. This program must also ensure that all instructors and check airmen used in appendix H training and checking are highly qualified to provide the training required in the training program. The advanced simulation training program must include the following:

1. The operator's initial, transition, upgrade, and recurrent simulator training programs and its procedures for re-establishing recency of experience in the simulator.

2. How the training program will integrate Level B, C, and D simulators with other simulators and training devices to maximize the total training, checking, and certification functions.

3. Documentation that each instructor and check airman has served for at least 1 year in that capacity in a certificate holder's approved program or has served for at least 1 year as a pilot in command or second in command in an airplane of the group in which that pilot is instructing or checking.

4. A procedure to ensure that each instructor and check airman actively participates in either an approved regularly scheduled line flying program as a flight crewmember or an approved line observation program in the same airplane type for which that person is instructing or checking.

5. A procedure to ensure that each instructor and check airman is given a minimum of 4 hours of training each year to become familiar with the operator's advanced simulation training program, or changes to it, and to emphasize their respective roles in the program. Training for simulator instructors and check airmen must include training policies and procedures, instruction methods and techniques, operation of simulator controls (including environmental and trouble panels), limitations of the simulator, and minimum equipment required for each course of training.

6. A special Line Oriented Flight Training (LOFT) program to facilitate the transition from the simulator to line flying. This LOFT program must consist of at least a 4-hour course of training for each flightcrew. It also must contain at least two representative flight segments of the operator's route. One of the flight segments must contain strictly normal operating procedures from push back at one airport to arrival at another. Another flight segment must contain training in appropriate abnormal and emergency flight operations.

Level B

Training and Checking Permitted

1. Recency of experience (§ 121.439).

2. Night takeoffs and landings (Part 121, Appendix E).

3. Landings in a proficiency check without the landing on the line requirements (§ 121.441).

Level C

Training and Checking Permitted

1. For all pilots, transition training between airplanes in the same group, and for a pilot in command the certification check required by § 61.153 of this chapter.

2. Upgrade to pilot-in-command training and the certification check when the pilot—

a. Has previously qualified as second in command in the equipment to which the pilot is upgrading;

b. Has at least 500 hours of actual flight time while serving as second in command in an airplane of the same group; and

c. Is currently serving as second in command in an airplane in this same group.

3. Initial pilot-in-command training and the certification check when the pilot—

a. Is currently serving as second in command in an airplane of the same group;

b. Has a minimum of 2,500 flight hours as second in command in an airplane of the same group; and

c. Has served as second in command on at least two airplanes of the same group.

4. For all second-in-command pilot applicants who meet the aeronautical experience requirements of § 61.159 of this chapter in the airplane, the initial and upgrade training and checking required by this part, and the certification check requirements of § 61.153 of this chapter.

Level D

Training and Checking Permitted

Except for the requirements listed in the next sentence, all pilot flight training and checking required by this part and the certification check requirements of § 61.153(g) of this chapter. The line check required by § 121.440, the static airplane requirements of appendix E of this part, and the operating experience requirements of § 121.434 must still be performed in the airplane.

Issued in Washington, DC, on August 28, 2006.

Marion C. Blakey,

Administrator.

[FR Doc. 06–8677 Filed 10–27–06; 8:45 am]

BILLING CODE 4910–13–P