Federal Aviation Administration
Aviation Rulemaking Advisory Committee

General Aviation Certification and Operations Issue Area
JAR/FAR 23 Harmonization Working Group

Task 4 – Flight test

Task Assignment

Federal Aviation Administration

Aviation Rulemaking Advisory Committee; General Aviation and Business Airplane Subcommittee: JAR/FAR 23 Harmonization Working Group

AGENCY: Federal Aviation Administration (FAA), DOT.

ACTION: Notice of establishment of JAR/FAR 23 Harmonization Working Group.

SUMMARY: Notice is given of the establishment of the JAR/FAR 23 Harmonization Working Group by the General Aviation and Business Airplane Subcommittee. This notice informs the public of the activities of the General Aviation and Business Airplane Subcommittee of the Aviation Rulemaking Advisory Committee.

FOR FURTHER INFORMATION CONTACT: Mr. William J. (Joe) Sullivan, Executive Director, General Aviation and Business Airplane Subcommittee, Aircraft Certification Service (AIR-3), 800 Independence Avenue, SW., Washington, DC 20591, telephone: (202) 267-9554; FAX: (202) 267-9562.

SUPPLEMENTARY INFORMATION: The Federal Aviation Administration (FAA) established an Aviation Rulemaking Advisory Committee (56 FR 2190, January 22, 1991) which held its first meeting on May 23, 1991 (56 FR 20492, May 3, 1991). The General Aviation and Business Airplane Subcommittee was established at that meeting to provide advice and recommendations to the Director, Aircraft Certification Service, FAA, regarding the airworthiness standards for standard and commuter category airplanes and engines in part 23 of the Federal Aviation Regulations, and parallel provisions of parts 91 and 135 of the Federal Aviation Regulations.

The FAA announced at the Joint Aviation Authorities (JAA)-Federal Aviation Administration (FAA) Harmonization Conference in Toronto, Ontario, Canada, (June 2-5, 1992) that it would consolidate within the Aviation Rulemaking Advisory Committee structure an ongoing objective to "harmonize" the Joint Aviation Requirements (JAR) and the Federal Aviation Regulations (FAR). Coincident with that announcement, the FAA assigned to the General Aviation and Business Airplane Subcommittee those rulemaking projects related to JAR/FAR 23 Harmonization which were then in the process of being coordinated between the JAA and the FAA. The Harmonization process included the intention to present the results of JAA/FAA coordination to the public in the form of a Notice of Proposed Rulemaking—an objective comparable to and compatible with that assigned to the Aviation Rulemaking Advisory Committee. The General Aviation and Business Airplane Subcommittee, consequently, established the JAR/FAR 23 Harmonization Working Group.

Specifically, the Working Group's tasks are the following: The JAR/FAR 23 Harmonization Working Group is charged with making recommendations to the General Aviation and Business Airplane Subcommittee concerning the FAA disposition of the following rulemaking subjects recently coordinated between the JAA and the FAA:

Task 1-Review JAR Issues: Review JAR 23 Issue No. 4 (which excludes commuter category airplanes) and No. 5 (which includes commuter category airplanes), and compare them with Amendment 23-42 to FAR 23, and the proposals in Notices 3 and 4 from the Part 23 Airworthiness Review. Identify technical differences between JAR 23 and FAR 23 which can be harmonized.

Task 2-Systems and Equipment: Based on the results of the Task 1 review, identify the changes to Subparts D and F of FAR 23 that are appropriate for harmonization, and those provisions that should not be harmonized, if any.

Task 3-Powerplant: Based on the results of the Task 1 review, identify the changes to Subpart E of FAR 23 that are appropriate for harmonization, and those provisions that should not be harmonized, if any.

Task 4-Flight Test: Based on the results of the Task 1 review, identify the changes to Subparts A, B and G of FAR 23 that are appropriate for harmonization, and those provisions that should not be harmonized, if any.

Task 5-Airframe: Based on the results of the Task 1 review, identify the changes to Subparts C and D of FAR 23 that are appropriate for harmonization, and those provisions that should not be harmonized, if any.

Reports

A. Recommend time line(s) for completion of each task, including rationale, for Subcommittee consideration at the meeting of the subcommittee held following publication of this notice.

B. Give a detailed presentation to the subcommittee of the results of Task 1 before proceeding with Tasks 2-5.

C. Give a detailed conceptual presentation on Tasks 2-5 to the Subcommittee before proceeding with the work stated under item D, below. Each presentation should identify what proposed amendments will be included in each notice, and whether any additional notices will be need to be drafted in addition to the four identified in item D, below. These reports may be combined or presented separately at the discretion of the working group chair.

D. Draft a separate Notice of Proposed Rulemaking for Tasks 2-5 proposing new or revised requirements, a supporting economic analysis, and other required analysis, with any other collateral documents (such as Advisory Circulars) the Working Group determines to be needed.

E. Give a status report on each task at each meeting of the Subcommittee.

The JAR/FAR 23 Harmonization Working Group will be comprised of experts from those organizations having an interest in the task assigned to it. A working group member need not necessarily be a representative of one of the organizations of the parent General Aviation and Business Airplane Subcommittee or of the full Aviation Rulemaking Advisory Committee. An individual who has expertise in the subject matter and wishes to become a member of the working group should *write* the person listed under the caption "FOR FURTHER INFORMATION CONTACT" expressing that desire, describing his or her interest in the task, and the expertise he or she would bring to the working group. The request will be reviewed with the subcommittee chair and working group leader, and the individual advised whether or not the request can be accommodated.

The Secretary of Transportation has determined that the information and use of the Aviation Rulemaking Advisory Committee and its subcommittees are necessary in the public interest in connection with the performance of duties imposed on the FAA by law. Meetings of the full committee and any subcommittees will be open to the public except as authorized by section 10(d) of the Federal Advisory Committee Act. Meetings of the JAR/FAR 23 Harmonization Working Group will not be open to the public, except to the extent that individuals with an interest and expertise are selected to participate. No public announcement of working group meetings will be made.

Issued in Washington, DC, on November 19, 1992.

William J. Sullivan,

Executive Director, General Aviation and Business Airplane Subcommittee, Aviation Rulemaking Advisory Committee.

[FR Doc. 92-28931 Filed 11-27-92; 8:45 am]

BILLING CODE 4910-13-M

Recommendation Letter

Mr. Anthony Broderick
Associate Administration for Regulation
and Certification-AVR-1
Federal Aviation Administration
800 Independence Ave.
Washington DC, 20591

208 Patterson St.
Falls Church, VA 22046

March 1, 1994

Dear Mr. Broderick:

The ARAC, General Aviation and Business Aircraft Issues Group met on February 8, 1994. It was the group recommendation that the enclosed Airframe, Flight, Powerplant and Systems JAR/FAR 23 Harmonization Draft Notices should be forwarded to FAA Washington for publication. Each notice has been reviewed and endorsed by FAA Kansas City and Washington Legal and is accompanied by an executive summary and economic analysis prepared by FAA.

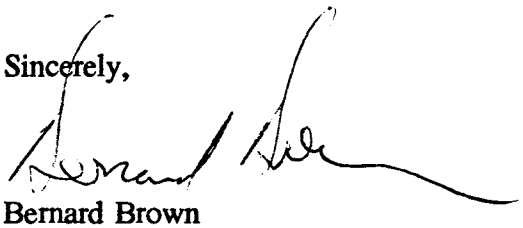
Also enclosed is a JAA letter to FAA dated January 20, 1994 to which is attached a table indicating the European study group disposition concerning text differences between JAR and FAR 23 following their review of notices 3 and 4 and the associated four draft harmonization notices. The FAA responses to the items listed which were endorsed by the issues group are also enclosed.

As you can see the JAR/FAR 23 and ARAC Working Groups with the support of the Kansas City Technical staff and the relevant FAA Staff in Washington have carried out an extremely thorough review over a considerable period of time. As you are undoubtedly aware prior to the formation of the four ARAC Working Groups, GAMA, AECMA, JAA, and the FAA had been working The JAR/FAR 23 Harmonization Program for approximately 2 years.

I believe all the people involved should be highly commended for a difficult and painstaking job very well done.

In view of the importance of the overall harmonization program every effort should be made to publish the NPRMS prior to the Annual JAA/FAA meeting in June.

Sincerely,



Bernard Brown
Asst. Chair, GABA Issues Group

cc John Colomy - FAA, Kansas City
Jim Dougherty - GAMA
Claude Schmitt - AECMA
Alain Leroy - JAA

Recommendation

[4910-13]

DEPARTMENT OF TRANSPORTATION

Federal Aviation Administration

14 CFR Part 23

[Docket No. ; Notice No.]

RIN: 2120-

Airworthiness Standards; Flight Proposals Based on European Joint Aviation Requirements Proposals

AGENCY: Federal Aviation Administration, DOT.

ACTION: Notice of proposed rulemaking.

SUMMARY: This notice proposes changes to the flight airworthiness standards for normal, utility, acrobatic, and commuter category airplanes. These proposals arise from the joint effort of the Federal Aviation Administration (FAA) and the European Joint Aviation Authorities (JAA) to harmonize the Federal Aviation Regulations (FAR) and the Joint Aviation Requirements (JAR) for airplanes that will be certificated in these categories. The proposed changes would provide nearly uniform flight airworthiness standards for airplanes certificated in the United States under 14 CFR part 23 (part 23) and in the JAA countries under Joint Aviation Requirements 23 (JAR 23) simplifying airworthiness approvals for import and export purposes.

DATES: Comments must be submitted on or before [Insert date 120 days after date of publication in the Federal Register].

ADDRESSES: Comments on this notice should be mailed in triplicate to: Federal Aviation Administration, Office of the

Chief Counsel, Attention: Rules Docket (AGC-200), Docket No. , 800 Independence Avenue, SW., Washington, DC 20591. Comments delivered must be marked Docket No. . Comments may be inspected in Room 915G weekdays between 8:30 a.m. and 5:00 p.m., except on Federal holidays.

In addition, the FAA is maintaining a duplicate information docket of comments in the Office of the Assistant Chief Counsel, ACE-7, Federal Aviation Administration, Central Region, 601 East 12th Street, Kansas City, Missouri 64106. Comments in the duplicate information docket may be inspected in the Office of the Assistant Chief Counsel weekdays, except Federal holidays, between the hours of 7:30 a.m. and 4:00 p.m.

FOR FURTHER INFORMATION CONTACT: Frank Stogsdill, ACE-111, Small Airplane Directorate, Aircraft Certification Service, Federal Aviation Administration, 601 East 12th Street, Kansas City, Missouri 64106; telephone (816) 426-5688.

SUPPLEMENTARY INFORMATION:

Comments Invited

Interested persons are invited to participate in the making of the proposed rule by submitting such written data, views, or arguments as they may desire. Comments relating to the environmental, energy, or economic impact that might result from adopting the proposals in this notice are also invited. Substantive comments should be accompanied by cost estimates. Comments should identify the regulatory docket or notice number

and should be submitted in triplicate to the Rules Docket address specified above. All comments received on or before the specified closing date for comments will be considered by the Administrator before taking action on this proposed rulemaking. The proposals contained in this notice may be changed in light of comments received. All comments received will be available, both before and after the closing date for comments, in the Rules Docket for examination by interested persons. A report summarizing each FAA public contact concerned with the substance of this proposal will be filed in the docket. Commenters wishing the FAA to acknowledge receipt of their comments submitted in response to this notice must include a preaddressed, stamped postcard on which the following statement is made: "Comments to Docket No. ." The postcard will be date stamped and returned to the commenter.

Availability of NPRM

Any person may obtain a copy of this Notice of Proposed Rulemaking (NPRM) by submitting a request to the Federal Aviation Administration, Office of Public Affairs, Attention: Public Inquiry Center, APA-200, 800 Independence Avenue, SW., Washington, DC 20591, or by calling (202) 267-3484. Communications must identify the notice number of this NPRM.

Persons interested in being placed on the mailing list for future NPRM's should request, from the above office, a copy of

Advisory Circular No. 11-2A, Notice of Proposed Rulemaking Distribution System, which describes the application procedure.

Background

At the June 1990 meeting of the JAA Council (consisting of JAA members from European countries) and the FAA, the FAA Administrator committed the FAA to support the harmonization of the FAR with the JAR being developed for use by the European authorities who are members of the JAA. In response to this commitment, the FAA Small Airplane Directorate established an FAA Harmonization Task Force to work with the JAR 23 Study Group to harmonize part 23 and the proposed JAR 23. The General Aviation Manufacturers Association (GAMA) also established a JAR 23/part 23 Committee to provide technical assistance in this effort.

Following a review of the first draft of proposed JAR 23, members of the FAA Harmonization Task Force and the GAMA Committee met in Brussels, Belgium for the October 1990 meeting of the JAR 23 Study Group. Representatives from the Association Europeenne des Constructeures de Material Aerospatial (AECMA), an organization of European airframe manufacturers, also attended. The main agenda item for this meeting was the establishment of procedures to accomplish harmonization of the airworthiness standards for normal, utility, and acrobatic category airplanes. The JAA had decided that its initial rulemaking effort should be limited to these three categories and that commuter category airworthiness standards should be addressed separately.

After that meeting, technical representatives from each of the four organizations (GAMA, AECMA, FAA and JAA) met to resolve differences between the proposed JAR and part 23. This portion of the harmonization effort involved a number of separate meetings of specialists in the flight, airframe, powerplant, and systems disciplines. These meetings showed that harmonization would require revisions to both part 23 and the proposed JAR 23.

Near the end of the effort to harmonize the normal, utility, and acrobatic category airplane airworthiness standards, the JAA requested and received recommendations from its member countries on proposed airworthiness standards for commuter category airplanes. The JAA and the FAA held specialist and study group meetings to discuss these recommendations, which resulted in proposals to revise portions of the part 23 commuter category airworthiness standards.

Unlike European rulemaking, where commuter category airworthiness standards are separate, for U.S. rulemaking, it is advantageous to adopt normal, utility, acrobatic, and commuter category airworthiness standards simultaneously, since commuter category airworthiness standards are already contained in part 23. Accordingly, this NPRM proposes to revise the flight airworthiness standards for all part 23 airplanes.

During the part 23 harmonization effort, the FAA established an Aviation Rulemaking Advisory Committee (ARAC) (56 FR 2190, January 22, 1991), which held its first meeting on May 23, 1991 (56 FR 20492, May 3, 1991). The General Aviation and Business Airplane (GABA) Subcommittee was established at that meeting to

provide advice and recommendations to the Director, Aircraft Certification Service, FAA, regarding the airworthiness standards in part 23 as well as related provisions of parts 91 and 135 of the regulations.

The FAA announced, on June 2-5, 1992, at the JAA/FAA Harmonization Conference in Toronto, Ontario, Canada, that it would consolidate within the ARAC structure an ongoing objective to "harmonize" the JAR and the FAR. Coinciding with that announcement, the FAA assigned the GABA Subcommittee those rulemaking projects related to JAR 23/part 23 harmonization that were in final coordination between the JAA and the FAA. The harmonization process included the intention to present the results of JAA/FAA coordination to the public as NPRM's. Subsequently, the GABA Subcommittee established the JAR 23 Study Group.

The JAR 23 Study Group made recommendations to the GABA Subcommittee concerning the FAA's disposition of the rulemaking issues coordinated between the JAA and the FAA. The draft NPRM's previously prepared by the FAA harmonization team were made available to the harmonization working group to assist them in their effort.

The FAA received unsolicited comments from the JAA dated January 20, 1994, concerning issues that were left unresolved with the JAR 23 Study Group. The JAR/FAR 23 Harmonization Working Group did not address some of the unresolved issues because the JAA had not yet reached positions on those issues. Unresolved issues will be dealt with at future FAR/JAR

proposed in this document relate directly to final rule changes which were an outgrowth of the 1983 review. Amendment 23-43 (58 FR 18958, April 9, 1993) and Amendment 23-45 (58 FR 42136, August 6, 1993) are referenced in this document where relevant to the changes being proposed.

Discussion of Proposals

Section 1.1 General definitions.

This proposal would amend § 1.1 to add a definition of "maximum speed for stability characteristics, V_{FC}/M_{FC}." This proposed change would harmonize part 1 and JAR 1. The definition is currently contained in § 23.175(b)(2) and also in § 25.253(b). Moving the definition to part 1 would simplify the text of part 23 and ease the referencing of the term V_{FC}/M_{FC}. The definition would be deleted from § 23.175(b)(2).

Section 23.3 Airplane categories.

This proposal would make a clarifying change to utility category maneuvers, change commuter category maneuvers and prohibit dual type certification of commuter category airplanes.

The limitation for utility category airplanes in § 23.3(b)(2) would be revised to add an outside limit of 90 degrees in angle of bank for lazy eights, chandelles, and steep turns.

Section 23.3(d) would be revised to delete chandelles and lazy eights as approved operations in commuter category airplanes because the FAA does not anticipate any operational need for such maneuvers.

category zero fuel weight requirement in § 23.25(a) to § 23.343. The FAA proposes removing the reference to both standby power rocket engines and to appendix E in § 23.25(a)(1)(iii) because this is a rare and obsolete design feature. If standby power rocket engines were proposed as a design feature, the FAA would issue special conditions to ensure adequate airworthiness.

Section 23.33 Propeller speed and pitch limits.

Proposed revisions to § 23.33(b)(1) would delete the reference to V_Y and replace it with "the all engine(s) operating climb speed specified in § 23.65." This would be done for consistency with other changes in performance requirements. Section 23.33(b)(2) would be revised to use "V_{NE}" in place of "never exceed speed," since V_{NE} is defined in part 1, and to delete the word "placarded" which is unnecessary.

Section 23.45 General.

In Notice of Proposed Rulemaking, Small Airplane Airworthiness Review Program Notice No. 4, Notice No. 90-18 (55 FR 26534, June 28, 1990), the FAA requested comments on the need for weight, altitude, and temperature (WAT) criteria, as information or as a limitation on piston-powered, twin-engine part 23 airplanes. It also requested comments about WAT criteria on turbine-powered twin-engine part 23 airplanes, specifically during takeoff and landing.

WAT criteria is used to determine the maximum weight an airplane can have in relation to altitude and temperature for safe takeoff. This criteria provides a pilot with the information needed to determine if a takeoff and climb can be

successfully completed, including for multiengine airplanes, if one engine becomes inoperative. WAT criteria has been required under part 23 for commuter category airplanes, at all approved altitudes. A limited WAT criteria has been required for turbine engine powered airplanes at 5,000 feet and at standard temperature plus 40°F, but not for higher altitudes or temperatures. For some multiengine powered airplanes WAT data has been provided as information to pilots but is not required to be followed.

The FAA received three comments on mandating WAT criteria in part 23. One commenter (GAMA) "believes that WAT information is useful but certainly not the only way to present operating data for any airplane" and that making WAT criteria an airplane or operating limitation for part 23 airplanes is "an unnecessary and unjustified expansion or redirection of operating criteria."

Another commenter (ALPA) wants WAT information furnished during the certification process. The commenter cites the variety of operational uses of these airplanes including in scheduled air carrier and regional airline service. The commenter also cites the need for "one level" of safety as justification for expanding the WAT requirements.

The other commenter (JAA) also supports WAT criteria. This commenter believes that the chance of a single-engine failure on any airplane is high. Also, this commenter warns that safety considerations include airplane occupants and personnel on the ground. According to the commenter, transport category airplanes follow WAT criteria by limiting the operation of the airplane.

Beyond the point where takeoff can be rejected, one-engine-inoperative climbs must guarantee obstacle clearance. The commenter recognizes a need for generally similar requirements for commuter category airplanes.

The JAA believes that requiring a continued flight capability would preclude the operation of single-engine airplanes. Also, the commenter believes that airplane size and stall speed provide characteristics that permit safe landings in the event of an inoperative engine for single-engine airplanes and smaller multiengine airplanes.

The commenter points out that between the two extremes of the transport category airplane and the single-engine airplane lie the light twin-engine reciprocating airplanes and turbine engine airplanes, ranging from four seats to nine and from 4,000 to 12,500 pounds. The commenter notes that, for these types of airplanes, it would be burdensome to require compliance with full net flight path obstacle clearance. In the commenter's opinion, a safe forced landing becomes less satisfactory with increased takeoff weight, involving longer stopping distances even for the same landing speed. The commenter notes that the twin-engine airplanes have other significant adverse characteristics compared to single-engine airplanes. First, an engine failure is twice as probable; second, asymmetric power demands immediate pilot action.

The commenter also points out that the inability to continue flight with one engine inoperative creates the following situation: the chance of a second engine failure is increased; a

suitable site for an emergency landing is reduced; and the pilot resists the inevitable forced landing and tries to maintain flight. Training under more favorable conditions may have taught the pilot to expect success in those situations. In unfavorable conditions, attempts to maintain flight lead to loss of airspeed at high asymmetric power and, commonly, loss of directional control that results in a stall/spin accident.

The commenter advocates certification and operating criteria for multiengine airplanes that blend the performance requirements for a single-engine airplane and a transport category airplane. The commenter believes that the existing requirements accept a limited period of risk just before and just after liftoff, where engine failure may not be fully accounted for. The commenter believes that the application of WAT limits clearly accounts for actual conditions, although the climb gradient requirements are lower than the requirements of part 25/JAR 25.

The commenter proposes no distinction between reciprocating and turbine engines. In the commenter's opinion, the WAT criteria should be imposed, where applicable, as limitations through the Airplane Flight Manual (AFM).

The commenter does not believe that such proposals would involve costs disproportionate to the benefits. The commenter suggests that the comment from the Small Airplane Airworthiness Review Conference, held October 22-26, 1984, that such criteria would "eliminate the certification of an entire class of airplanes," is an exaggeration. The proposals are achievable, in the commenter's view, by typical modern light twin-engine

airplanes with realistic payloads, particularly the more significant executive/air taxi airplanes. The adoption of this concept, in the commenter's opinion, would instill a greater awareness of performance consideration in pilots from an early stage of their training.

The commenter also believes that the requirements on climb and handling qualities of the present §§ 23.65 and 23.67 are illogical and unreasonable. The commenter recommends using WAT criteria so that it applies equally to all airplane operations because it offers improved airplane capability.

The commenter points out that manufacturers of "WAT type" airplanes routinely determine performance under a wide range of conditions. The commenter also notes that flight manuals produced to the widely accepted General Aviation Manufacturers Association (GAMA) specification already contain performance data beyond the minimum requirements of part 23. In the commenter's opinion, additional testing or data scheduling create no additional costs.

To determine the necessity of applying WAT criteria to other than transport and commuter airplanes, the commenter notes that present draft JAR 23 applies WAT limits only to piston-engine airplanes above 6,000 pounds and turbine-engine airplanes. The JAR Operations Group proposes applying WAT limits to all JAR 23 airplanes in commercial operations.

In 1991, the FAA studied the accident record of reciprocating engine-powered, multiengine part 23 airplanes of over 6,000 pounds maximum takeoff weight with a substantial fleet

size. The FAA completed the study using the National Transportation Safety Board (NTSB) accident briefs and evaluating those statistics over the life of the individual airplanes. The statistics show the following:

(a) Over 100 accidents and 200 fatalities occurred due to engine failure during the study period.

(b) Forty-seven of the engine failure accidents occurred because the pilot failed to maintain flying speed and/or directional control.

(c) Engine reliability is a significant factor in the accident study. (For example, airplanes of similar or the same aerodynamic configuration, but with different engines, have significantly different accident records.)

After reviewing the accident statistics, and recognizing the performance capabilities of the accident airplanes, the FAA concludes the following:

(a) Engine reliability would not be of major concern if the airplane had adequate performance on the remaining operative engine.

(b) The loss of flying speed and subsequent loss of airplane control would not be a significant problem if the airplane exhibited adequate climb performance capabilities to fly out of an engine loss situation at low speeds.

Based on these statistics and conclusions from the FAA 1991 study and on comments, the FAA has determined that WAT limits are necessary for safe operation of multiengine airplanes of the type that will be involved in transporting passengers for hire.

Operating rules (part 135) are already in place that specify some performance limitations. The cutoff weight for reciprocating engine-powered airplanes of 6,000 pounds would encompass most airplanes of concern. All turbine engine-powered airplanes are included because of the adverse effect of increasing temperatures on turbine engine performance.

This proposal would change § 23.45 to require weight, altitude, and temperature (WAT) performance accountability for normal, utility, and acrobatic airplanes with a maximum takeoff weight over 6,000 pounds and all turbine-powered airplanes. Including WAT accountability necessitates reorganization and revisions to all paragraphs of this section. The inclusion of WAT accountability in part 23 also requires changes to several other sections in part 23.

Paragraph (a)(1) would be revised to require that performance requirements be met for still air and "standard atmosphere." Current (a)(1) uses the term "standard atmospheric conditions."

The applicability of paragraph (a)(1) and (2) would be revised to require that all airplanes meet the performance requirements for still air and standard atmosphere, and that ambient atmospheric conditions, which currently must be met by commuter category airplanes, would have to be met by (1) commuter category airplanes, (2) reciprocating engine-powered airplanes of more than 6,000 pounds maximum weight, and (3) turbine engine-powered airplanes.

Proposed paragraph (b) would replace current requirements of paragraph (b) pertaining to power or thrust available with the altitude and temperature requirements for performance data.

Proposed § 23.45(c) is moved and modified from § 23.51. It would require that performance data be determined with the cowl flaps in the position used in cooling tests required by § 23.1041 to § 23.1047 and permits the cowl flap position to be addressed only once instead of at each individual performance paragraph.

Proposed paragraph (d) is the same as current paragraph (c) pertaining to the determination of available propulsion thrust. Proposed changes to § 23.45(b), (c), (d), and (e) would delete references to "thrust" and retain just "power," for standardization with the JAR. This is considered appropriate since power covers engine output, despite how the absorbed power is transmitted to the atmosphere. The FAA proposes this change in subsequent sections where the term "power or thrust" is used.

Proposed paragraph (e) is the same as requirements of current paragraph (d) with a minor editorial revision.

Proposed new paragraph (f) is based on current paragraphs (e)(3) and (e)(5)(i), which apply only to commuter category airplanes. Proposed changes to § 23.45(f) would extend to all airplane categories the requirement for all takeoff and landing procedures to be consistently executable by pilots of average skill. This is considered appropriate since takeoffs and landings must be made routinely by operational pilots. It is also appropriate that takeoff and landing performance published

in the Airplane Flight Manual (AFM) can be consistently achieved by operational pilots.

Proposed new paragraph (g) would require determining takeoff distance, accelerate-stop distance, takeoff distance and takeoff run, and landing distance on a smooth, dry, hard-surfaced runway. The FAA considers these limitations necessary for WAT limited airplanes since the WAT takeoff performance is only valid on a particular defined surface. The FAA does not consider the testing necessary to extend the same limitations to non-WAT airplanes burdensome to applicants since that information is already available in GAMA Spec. No. 1 AFMs. Additionally, the proposal allows for the derivation of landing and takeoff data on non-hard surfaces, such as grass and gravel and, thus, will not require additional flight testing.

Proposed new paragraph (h) is the same as current paragraph (e), which covers additional performance requirements for commuter category airplanes, except for some minor revisions. In the list of items to be determined in paragraph (h)(3), "landing distance" would not be included since it would already be covered in proposed § 23.45(g). A reference to § 23.67 in paragraph (h)(4) would be updated to be consistent with proposed revisions to that section in this notice; and the phrase "missed approaches" would be changed to "discontinued approaches" to be consistent with the proposed change to § 23.143. Proposed paragraph (h)(5)(i) requiring that the procedures must be able to be consistently executed by a crew of average skill would have added to it "in atmospheric conditions reasonably expected to be

encountered in service." These clarifying words would also appear in paragraph (h).

Section 23.49 Stalling speed.

Section 23.49 would be reorganized and edited for clarification. Currently the requirements for V_{so} and V_{s1} are separated. In the proposed section the requirements are merged except for the requirements now in current paragraph (b), which would be redesignated as paragraph (c) in the reorganization. The existing § 23.49(d) would be moved to § 23.49(b) and revised to clarify that the stall speed is to be determined under the same conditions at which the stall characteristics are determined.

Proposed changes to paragraph (a) are as follows:

(1) Proposed paragraph (a)(4) would be a requirement that the airplane be in the condition existing in the test, in which V_{so} and V_{s1} are being used.

(2) Proposed paragraph (a)(5) would be a revised version of current paragraph (a)(6). The current requirement states that the center of gravity must be in the most unfavorable position within the allowable landing range. The proposed requirement would state that the center of gravity must be in the position that results in the highest value of V_{so} and V_{s1}.

(3) As mentioned under § 23.45, the current paragraph (a)(5) is moved to § 23.45(c).

All of the changes are clarifying and not an increase in requirements.

Section 23.51 Takeoff speeds.

This proposal would revise the paragraph heading from "Takeoff" to "Takeoff speeds" and incorporate the takeoff speed requirements currently contained in § 23.53. This revision to the heading and reorganization of takeoff requirements is proposed for harmony with JAR 23.

Current § 23.51(a) would be moved. Current paragraph (a) requires that the distance required to take off and climb over a 50-foot obstacle must be determined with the engines operating within approved operating limitations and with cowl flaps in the normal takeoff position. These requirements as modified would be covered under proposed §§ 23.45(c) and (d) and 23.1587.

Current § 23.51(b) in measuring seaplane and amphibian takeoff distances would be deleted because it is a statement of an acceptable method of compliance. Also, there is not a need for addressing a separate seaplane starting point.

Current § 23.51(c) concerning pilot skills and conditions would be deleted since it would be covered under the general requirements in proposed § 23.45(f).

Current § 23.51(d) would be deleted because the requirements are partly covered under § 23.45 in commuter category performance and other performance requirements. In addition, the information requirements would be covered under § 23.1587. Subpart G, under which § 23.1587 appears, is generally used to specify what information must be in the AFM.

For multiengine normal, utility, and acrobatic category airplanes, the determination of V_R is transferred from § 23.53(a)

to proposed § 23.51(a) with minor changes in the specified rotation speed. For multiengine airplanes, in proposed paragraph (a)(1) the margin between rotation speed and V_{MC} increases to 1.05 V_{MC}, and a margin of 1.10 V_{S1} is established between V_R and stall.

Proposed paragraph (a) would define V_R as the speed at which the pilot makes a control input, with the intention of lifting the airplane out of contact with the runway or water surface. This definition would apply to tail wheel and tricycle gear airplanes, seaplanes, and single-engine airplanes.

In addition to the multiengine rotation speed discussed above, proposed paragraph (a) would include rotation speeds for single-engine airplanes and seaplanes and amphibians. This proposed rule would extend V_R applicability to all part 23 airplanes to establish a safe and standardized procedure that can be used by operational pilots to achieve AFM takeoff performance. This proposed use of rotation speed is consistent with part 25.

In proposed paragraph (b) the speed at 50 feet is based on current § 23.53(b) with no change in requirements.

For commuter category airplanes, the takeoff speed requirements move from § 23.53(c) to proposed § 23.51(c) with editorial changes. The option in proposed (c)(1)(i) for an applicant to determine a V_{MCG} and establish a V_1 based on V_{MCG} rather than a margin above V_{MCA} is added.

Section 23.53 Takeoff performance.

The heading of § 23.53 and the content would be new. This section would now provide general takeoff performance requirements.

The proposal would move the takeoff speed requirements of the current § 23.53 to § 23.51. (See proposal for § 23.51.) Proposed § 23.53 provides general takeoff performance requirements for normal, utility, acrobatic, and commuter category airplanes. Proposed paragraph (a) is based on current § 23.51(a). Proposed paragraph (b) is a modification of current § 23.1587(a)(5). Proposed paragraph (c) is based on § 23.51(d).

Section 23.55 Accelerate-stop distance.

This proposal would revise § 23.55 to clarify the accelerate-stop segments and to make editorial changes.

This proposal would divide the accelerate-stop maneuver into three segments, rest to V_{EF} (proposed (a)(1)), V_{EF} to V_1 (proposed (a)(2)), and V_1 to rest (proposed (a)(3)). This is not a new requirement, but it divides the total distance into three segments to be considered. The phrase, "in the case of engine failure," in current § 23.55(a)(2) would be deleted because it would be included in proposed (a)(2). Also, the phrase, "assuming that . . . the pilot has decided to stop as indicated by application of the first retarding means at the speed V_1," is deleted because it is stated in proposed § 23.51(c)(1)(ii). The "exceptional skill" phrase of § 23.55(b)(3) would be deleted because it will remain in proposed § 23.45(h)(5)(i). The

§ 23.55(b) phrase "if that means is available with the critical engine inoperative" would be deleted because it is covered by the safe and reliable requirements.

Section 23.57 Takeoff path.

Section 23.57 would be revised to clarify and specify which takeoff path segments must be determined in flight. Proposed paragraph (a) would clarify that the transition to the enroute configuration should be completed on or before reaching 1500 feet above the takeoff surface. In current § 23.57(c)(1), the slope of the airborne part of the takeoff path must be "positive at each point"; this is changed in proposed (c)(1) to "not negative at any point," to allow acceleration in level flight, which is implied by current § 23.61(c). A proposed editorial change to § 23.57(c)(3) would specify that the climb gradient "must not be less than . . .," as opposed to "may not be less than. . . ." The option in current § 23.57(d) of determining the takeoff path, either by continuous demonstration or by synthesis from segments, no longer reflects current practice, nor is it entirely desirable. The only viable option in determining the takeoff path from rest to 35 feet above the takeoff surface is by a continuous demonstration. The most practical method of determining the takeoff path from 35 feet to 1500 feet above the takeoff surface is by synthesis from segments. Accordingly, proposed § 23.57(d) and (e) would incorporate these changes.

Section 23.59 Takeoff distance and takeoff run.

This proposal would clarify § 23.59 with no substantial change in requirements. The proposal would change the opening

text to clarify that the determination of takeoff run is the applicant's option since the applicant may choose not to present clearway data. The reference in current § 23.59(a)(2) and (b)(2) to "along the takeoff path," in a takeoff with all engines operating, would be deleted since takeoff path is a one-engine-inoperative condition. Additionally, V_{LOF} is changed to liftoff point to clarify that the requirements specify a point and related distance, not a speed.

Section 23.63 Climbs: general.

Proposed new § 23.63 would assemble general climb requirements from §§ 23.65 and 23.67 into a single section and differentiate between WAT limited airplanes (reciprocating engine powered airplanes of above 6,000 pounds maximum takeoff weight and all turbine engine powered airplanes) and those airplanes that are not WAT limited (reciprocating engine powered airplanes of 6,000 pounds or less). (See the proposed change to § 23.45 for discussion of WAT limits.) Proposed new § 23.63(a)(1) would require that compliance be shown out of ground effect. This requirement is in current § 23.67(e), which applies to commuter category airplanes. For many years FAA policy has been that the only acceptable method of compliance has been to determine climb performance out of ground effect. Proposed new § 23.63(a)(3) requires that compliance must be shown, unless otherwise specified, with one engine inoperative, at a bank angle not exceeding 5 degrees. This requirement is in current § 23.149 and has been applied generally for part 23 airplanes except commuter category airplanes in certain circumstances.

Section 23.65 Climb: All engines operating.

This proposal would clarify § 23.65 and would change minimum climb speeds for multiengine airplanes.

Proposed revisions to § 23.65(a) would change the applicability from "each airplane" as adopted in Amendment 23-45, (58 FR 42136, August 6, 1993) to "each normal, utility, and acrobatic category reciprocating engine-powered airplane of 6,000 pounds or less maximum weight." It would change the phrase "angle of climb" to "climb gradient" and establish the climb gradient at 8.3 percent for landplanes and 6.7 percent for seaplanes and amphibians with certain specified performance conditions.

Proposed (a)(4) would establish a minimum climb speed for multiengine airplanes of not less than the greater of 1.1 V_{MC} and 1.2 V_{S1}, which would provide a margin above V_{MC}.

The cowl flap requirements currently in paragraph (a)(5) would be moved to § 23.45(c).

Current § 23.65(b) would be deleted. These requirements should have been deleted in Amendment 23-45 (58 FR 42136, August 6, 1993), but they were overlooked. Since the adoption of Amendment 23-45 there is no longer a rate of climb requirement in § 23.65(a). The alternative means of compliance allowed by paragraph (b), therefore, is obsolete and not consistent with the more stringent performance requirements proposed by this NPRM. Also, the alternative means of compliance in paragraph (b) was rarely used by applicants.

The proposed § 23.65(b) would add WAT limits for reciprocating engine-powered airplanes of more than 6,000 pounds maximum weight and turbine engine-powered airplanes. (See proposal for § 23.45 for discussion of WAT limits.)

Current § 23.65(c) would be moved to § 23.65(b) and the temperature and altitude would be deleted since WAT limits are proposed for turbine engine-powered airplanes and the four percent gradient would apply at any approved takeoff ambient condition. Proposed § 23.65(b)(2) provides for landing gear down unless the gear can be retracted in not more than seven seconds. This is more stringent than the present requirement, but the same as the proposed one-engine-inoperative takeoff climb requirements, and is considered appropriate to this weight and class of airplane with WAT limits.

Current § 23.65(d) would be deleted since the requirements are already covered in the proposed § 23.45(h)(2) and current § 23.21.

Section 23.66 Takeoff climb; one-engine inoperative.

Proposed new § 23.66 would require the determination of the one-engine-inoperative climb capability of all WAT limited reciprocating engine-powered and turbine engine-powered airplanes immediately after takeoff. Since most reciprocating engine-powered airplanes do not have autofeather, the condition immediately after takeoff can be critical. There is not a minimum climb requirement in this configuration, only the determination of the climb or descent gradient. This information does not become a limitation; it is provided to the pilot in the

AFM (see § 23.1587) to allow the pilot to make informed judgments before takeoff.

Section 23.67 Climb: one engine inoperative.

This proposal would reorganize § 23.67 for harmonization with the JAR; and would require WAT limits for some airplanes; require wings level climb up to 400 feet for commuter category airplanes, and make minor changes in airplane configuration requirements.

Revised § 23.67(a) would specify the climb requirements for non-WAT airplanes with no change in requirements for those airplanes.

Proposed § 23.67(b) would specify climb requirements for WAT airplanes. WAT criteria would be applied for both reciprocating engine-powered airplanes of more than 6,000 pounds maximum weight and turbine engine-powered airplanes. (See the discussion of WAT limits in the proposed change to § 23.45.) Turbine engine-powered airplanes are currently subject to limited WAT limitations under § 23.67(c), which would be incorporated into proposed § 23.67(b).

The takeoff flap position for normal, utility, and acrobatic category reciprocating engine-powered airplanes of 6,000 pounds or less is changed to "wing flaps retracted" from "most favorable position" (current § 23.67(4)). Wing flaps retracted is the position most used in certification and in service for this size of airplane. The proposed change is contained in § 23.67(a)(1)(iv), (a)(2)(iv), and (b)(2)(iv).

Current § 23.67(d) is deleted since all climb speeds (both all-engine and one engine inoperative) are scheduled and the determination of V_Y is no longer required. V_Y is also proposed to be deleted in all other sections of part 23 for the same reason.

Current § 23.67(e) for commuter category airplanes would be redesignated as § 23.67(c) with no change in requirements except that the takeoff climb with landing gear extended must be conducted with the landing gear doors open. This is a conservative approach offered by the JAA to specify a definite gear door configuration and to delete the requirement to determine performance during the transient condition of gear doors opening and closing. Proposed § 23.67(c)(1) specifies that the first segment climb must be conducted with the wings level and further specifies that the climb speed for the segment must be V_2 instead of the current requirement for a range of speeds from V_{LOF} and whatever the applicant selects at gear retraction. Proposed § 23.67(c)(2) requires conducting the second segment climb with wings level, which would be appropriate for operational scenarios.

The current § 23.67(e)(1) requirements are partially moved to § 23.67(c) and the remainder are contained in § 23.63(a)(1) and (d).

Proposed § 23.67(c)(3), enroute climb, adds a minimum climb speed to ensure an adequate margin above stall speed.

The proposed § 23.67(c)(4) makes no substantive changes in the current requirements of § 23.67(e)(3) but does change the

paragraph heading from "Approach" to "Discontinued approach." In addition, proposed § 23.67(c)(4) clarifies that the climb gradients must be met at an altitude of 400 feet above the landing surface.

Section 23.69 Enroute climb/descent.

Proposed new § 23.69 would require the determination of all engine and one-engine-inoperative climb/descent rates and gradients in the enroute configuration under all operational WAT conditions. This information is necessary for enroute flight planning and dispatch. Climb speeds are specified to provide a margin above V_{S1}.

Section 23.71 Glide: Single-engine airplanes.

Proposed new § 23.71 would require the determination of glide distance and speed for single-engine airplanes. The information is necessary for flight planning and for providing the pilot with information from which to make informed decisions.

Section 23.73 Reference landing approach speed.

Proposed new § 23.73 would define the reference landing approach speeds, V_{REF}. Establishing a definition for these speeds simplifies the use of V_{REF} in other portions of the rule. The V_{REF} speeds for the various category airplanes are established as not less than 1.3 V_{SO}. Also, the established speeds consider the appropriate relationship to V_{MC} determined under § 23.149.

Section 23.75 Landing distance.

This proposal would reorganize § 23.75 for harmonization with the JAR, add the landing reference speed, V_{REF}, and delete the portion on brake pressures.

The introductory paragraph of this section would be revised to delete the reference to the AFM because part 23, subpart B, is generally used to specify what must be determined during flight test and part 23, subpart G, is generally used to specify what must be placed in the AFM. The introductory paragraph would also be revised to require landing distances to be determined at standard temperature for each weight and altitude. Service experience has shown that landing distances are not sensitive to temperatures. The use of standard temperature is consistent with WAT requirements and the increased level of safety introduced in this NPRM. The revised introductory paragraph deletes the reference to "approximately 3 knots" for seaplanes and amphibians because this information will be moved to advisory material on acceptable methods of compliance.

Revised § 23.75(a) adds V_{REF} and requires its use. (See proposal for § 23.73.)

The text of the current § 23.75(b) is deleted because proposed § 23.45 would specify these general requirements. Proposed new § 23.75(b) clarifies that a constant configuration must be maintained throughout the maneuver.

Revised § 23.75(d) would continue the current requirement for showing that a safe transition to the balked landing conditions can be made and specify the weight that must be considered for the transition to the balked landing conditions. This proposed new requirement reflects current industry practice.

Current § 23.75(e), concerning pressure limits on wheel brakes, is moved to proposed § 23.735, Brakes. (See the Systems

FAR/JAR Harmonization NPRM.) The brake pressure requirement is more appropriately a systems requirement and the test pilot lacks a practical way to determine compliance. Proposed new § 23.75(e) is a general requirement to ensure the reliability of the brakes and tires.

Proposed § 23.75(f) is revised by changing the first use of the word "means" to "retardation means," and by deleting paragraph (f)(3). Paragraph (f)(3) requires that no more than average skill shall be required to control the airplane. This topic is covered in proposed § 23.45(f).

Section 23.75(h) is deleted because the introductory paragraph of proposed § 23.75 would contain commuter category requirements and proposed § 23.1587 would require landing distance correction factors.

Section 23.77 Balked landing.

This section would be revised to include additional WAT requirements and to make editorial changes.

Proposed revisions to § 23.77(a) and (b) would differentiate between WAT and non-WAT; and, in paragraph (b), would include the more stringent WAT limited airplane requirements. (See proposal for § 23.45.) Section 23.77(a)(4) adds a new climb speed requirement to ensure that acceleration is not required during the transition from landing to balked landing. The climb gradient of § 23.77(b) was selected to be slightly less than the non-WAT airplane sea level requirement as a tradeoff for a balked landing climb capability at all altitudes and temperatures.

The commuter category climb gradient of 3.3 percent specified in § 23.77(c) changes to 3.2 percent for consistency with part 25. Additional editorial changes and deletions are proposed for § 23.77(c) because the general requirements would be covered in the proposed § 23.45.

Section 23.143 General.

Proposed § 23.143(a) would be revised to add the phrase "during all flight phases" to the lead-in of the paragraph. "Go-around" would be added to the list of flight phases.

The JAA/FAA decided, during FAR/JAR Harmonization meetings, that the term "go-around" included the all engine balked landings of § 23.77, various all engine and one-engine-inoperative aborted landings specified in the AFM, and the commuter category discontinued approach of § 23.67(c)(4). In this NPRM, balked landing refers only to the all engine balked landing of § 23.77.

The table in paragraph (c) would be changed to show a change in two-hand roll force from 60 to 50 pounds, which is consistent with JAR 25. The table also would be changed to show a one-hand on the rim roll force of 25 pounds. This is a JAA/FAA harmonized value.

Section 23.145 Longitudinal Control.

Proposed § 23.145 would be revised by changing the speed ranges applicable to the takeoff, enroute, and landing configurations. In proposed paragraph (b)(2) the requirement for "altering and maintaining, as a minimum, the speed used to show compliance with § 23.77" would be changed to "to allow the airspeed to transition from 1.3 V_{so} to 1.3 V_{s1}." In proposed

paragraph (b)(5) for landing configuration, the speed reference would be changed from 1.4 V_{SO} to V_{REF}.

Editorial changes are also proposed for the lead-in to paragraph (b) with no substantive change.

Current paragraphs (b)(2)(i) and (ii) would be redesignated as (b)(2) and (b)(3), respectively.

Proposed paragraph (b)(3) would add more specific requirements if gated flap positions are used.

Proposed paragraph (b)(4) is the same as current paragraph (b)(4). Proposed paragraph (b)(5) is the same as current paragraph (b)(5) except for changes in trim speed to V_{REF} and the allowance of a two-handed control. Use of two hands is considered appropriate because the pilot does not need to change power settings.

Proposed paragraph (b)(6) is current paragraph (b)(3).

Proposed paragraph (c) would change the speed range for maneuvering capability from "above V_{MO}/M_{MO} and up to V_D/M_D" to "above V_{MO}/M_{MO} and up to the maximum speed shown under § 23.251." This change is considered necessary because a range of speeds can be chosen as V_D/M_D. Reference to § 23.251 would ensure a flight demonstrated speed instead of a design speed.

Proposed paragraph (d) would change the speed that must be maintained for power-off glide from 1.3 V_{SO} to V_{REF}.

Section 23.147 Directional and lateral control.

This proposal would make minor revisions to § 23.147(a) and add two new requirements in proposed paragraphs (b) and (c). The flaps retracted configuration for § 23.127(a)(4) would be consistent with the proposed § 23.67.

Proposed § 23.147(b) would add a test for the condition when, during enroute climb, an engine fails and a time delay of two seconds occurs before the pilot takes corrective action. The intent of this proposed change is to test for a likely operational scenario and to ensure a satisfactory result.

Proposed § 23.147(c) would test for the failure or disconnection of the primary lateral control. This paragraph requires that the airplane exhibit adequate dihedral effect throughout the airplane's operational envelope to ensure continued safe flight and landings if a lateral control disconnects. In addition, this requirement provides compatibility with the relaxed requirements of proposed § 23.177(b) (see proposal for § 23.177).

Section 23.149 Minimum control speed.

This proposal would clarify § 23.149, add a V_{MC} in the landing configuration, and provide the procedure for determining a ground V_{MC}.

Current § 23.149(a) would be revised in the proposal by making clarifying and editorial changes with no change in requirements. Section 23.149(b) would be revised by making

clarifying changes and deleting the reference to lesser weights in paragraph (b)(4) because the range of weights is covered in § 23.21.

Proposed § 23.149(c) specifies the requirements for a V_{MC} in the landing configuration for WAT and commuter airplanes. This proposed new requirement is necessary for airplanes in this category to provide a V_{REF} margin above the V_{MC} determined in the landing configuration. (See proposal for § 23.73.)

The new § 23.149(f) proposes the requirements for determining a V_{MCG} for commuter category airplanes, at the option of the applicant, to comply with § 23.51. (See proposal for § 23.51.)

Section 23.153 Control during landings.

This proposal would revise § 23.153 to reference landing speeds to V_{REF} and to reorganize the section.

Section 23.155 Elevator control forces in maneuvers.

Proposed § 23.155 would make changes to the power and gradient of the stick force curve.

Proposed § 23.155(b) specifies the maximum continuous power for the test instead of allowing a power selected by the applicant as an operating limitation. This revision would eliminate a power specification that is unnecessary and would simplify normal operations for the pilot.

Proposed § 23.155(c) addresses stick force gradient to ensure that stick force lightening is not excessive. The FAA will issue advisory material on acceptable methods of compliance.

Section 23.157 Rate of roll.

This proposal would revise § 23.157(d) power and trim requirements and would clarify the flap position. Proposed § 23.157(d)(1) would clarify that the flaps should be in the landing position. Proposed § 23.157(d)(3) would make the power consistent with the approach configuration, which is the configuration being tested. Proposed § 23.157(d)(4) would relate the trim speed to the proposed V_{REF}. (See proposal for § 23.73.)

Section 23.161 Trim.

This proposal would revise § 23.161 power, configurations, and speeds.

Proposed § 23.161(a) would state the safety principles underlying the trim requirements and would provide a regulatory requirement for considering conditions that might be encountered outside the requirements addressed in paragraphs (b) through (d).

Proposed § 23.161(b)(1) would add a requirement to trim at M_{MO} in addition to V_{MO}. This proposed change only clarifies that the airplane must trim in the Mach limited speed range.

Proposed § 23.161(b)(2) would require lateral and directional trim over a range of 1.4 V_{S1} to V_H or V_{MO}/M_{MO} for commuter category airplanes instead of only the high speed requirement in the present rules. It is appropriate for commuter category airplanes to trim in the proposed range. It would not be burdensome because all present commuter category airplanes were designed to the proposed standard.

The proposed introductory paragraph of § 23.161(c) would delete the reference to V_{MO}/M_{MO}, since it is addressed in other

appropriate places. Proposed § 23.161(c)(1) would require trim at takeoff power, as this is a likely operational scenario for most airplanes and the condition should be tested. In addition, the proposed change would relate the maximum continuous power climb speeds and configuration to § 23.69, the enroute climb requirement. Current § 23.161(c)(2) moves to § 23.161(c)(4), changes the reference V_{REF} for a landing speed, and adds a requirement for the airplane to trim at the steepest landing approach gradient the applicant chooses under § 23.75. It is appropriate for the airplane to trim at all landing conditions. Current § 23.161(c)(3) moves to § 23.161(c)(2) with editorial changes. Current § 23.161(c)(4) moves to § 23.161(c)(3) with an increase in the trim speed from 0.9 V_{NO} or V_{MO} to V_{NO} or V_{NO}/M_{NO}. The increase in trim speed is appropriate because descent is permitted and is common at V_{NO}.

Proposed § 23.161(d) would make editorial changes in the introductory paragraph. It would reference the appropriate § 23.67 requirements and delete commuter category speed ranges, which are moved to the new § 23.161(e). Section 23.161(d)(4) is revised to specify flaps retracted instead of referencing the § 23.67 configurations. Flaps retracted is the likely sustained configuration where a pilot would need to trim. Also, the flaps retracted configuration for § 23.161(d)(4) would be consistent with the proposed § 23.67.

Proposed new § 23.161(e) would ensure that excessive forces are not encountered in commuter category airplanes during extended climbs at V_2 in the takeoff configuration, when climb above 400 feet is required.

Section 23.175 Demonstration of static longitudinal stability.

This proposal would make changes to § 23.175 power, configurations, and speeds.

Proposed § 23.175(a)(1) would change the flap position from the climb position to the flaps retracted position. This is a clarifying change since virtually all part 23 airplanes use flaps retracted for climb. Also, this proposed change would align the part 23 and part 25 climb static longitudinal stability requirements.

Proposed § 23.175(a)(3) would delete the option for the applicant to select some power other than maximum continuous power as an operating limitation. As noted in the proposed change to § 23.155, this would eliminate a power specification that is unnecessary and simplify normal operations for the pilot. Proposed § 23.175(a)(4) would make the trim speed consistent with the enroute all-engine climb speed.

The proposed change to § 23.175(b) would rearrange the section with no change in requirements. The definition of V_{FC}/M_{MC} contained in § 23.175(b)(2) is proposed to be moved to part 1, to harmonize with JAR 1. (See the proposed change to § 1.1.)

Current § 23.175(c), which requires the test for gear down cruise static longitudinal stability, would be deleted. This test is considered superfluous to the landing configuration

static longitudinal stability test and does not represent a likely operating scenario.

Proposed § 23.175(c) would be current § 23.175(d) with only a change to use V_{REF} as the trim speed.

Section 23.177 Static directional and lateral stability.

Proposed revisions to § 23.177 would delete the requirements for two-control airplanes, make minor clarifying changes, and specify an exclusion for acrobatic category airplanes.

Proposed § 23.177 would delete the introductory phrase concerning three-control airplanes, which is consistent with the deletion of the requirements for two-control airplanes in current paragraph (b). The two-control airplane regulations were introduced in 1945 but no two-control airplanes have been certificated for several decades and no need is foreseen for these regulations. If an applicant proposes a two-control airplane, the FAA would issue special conditions. After deleting the introductory portion of § 23.177(a), paragraph (a)(1) would be redesignated as (a). In the first sentence, the proposed change replaces "skid" with "wings level sideslip" to clarify the intended maneuver. Also, the proposed change increases the power requirement for demonstration of directional stability in the landing configuration. The current requirement specifies power necessary to maintain a three degree angle of descent. Maximum continuous power is considered appropriate since directional stability should be maintained during a balked landing, particularly since directional instability is an undesirable

characteristic at any point in the flight envelope. Also, V_A is replaced by V_O to be consistent with § 23.1507.

Proposed § 23.177(b), currently (a)(2), replaces "any" with "all" in the first sentence to clarify that all landing gear and flap positions must be addressed. Also, the proposed paragraph would specify a minimum speed at which static lateral stability may not be negative, as 1.3 V_S, for all configurations except takeoff. This is consistent with the other speeds specified in § 23.177(b) and relieves the requirement for other than takeoff speeds.

Proposed new § 23.177(c) would provide an exclusion for the dihedral effect for acrobatic category airplanes approved for inverted flight. The proposed change recognizes that, in fully acrobatic airplanes, the dihedral effect is not a desired characteristic.

The addition of proposed § 23.147(c), which ensures lateral control capability without the use of the primary lateral control system, compensates for the relieving nature of proposed § 23.177(b) and the exception from the requirements of § 23.177(b) for acrobatic category airplanes.

Present § 23.177(a)(3) is redesignated as § 23.177(d). The proposed § 23.177(d) deletes the next to the last sentence, concerning bank angle and heading, because the current requirement is not a necessary test condition and a constant heading during the sideslip may be impossible in some airplanes.

Present § 23.177(b) is deleted, as previously discussed, because it applies to two-control airplanes.

Section 23.201 Wings level stall.

This proposal would delete both two-control airplanes and altitude loss requirements and would make clarifying changes in § 23.201.

The proposed change to § 23.201(a) deletes the applicability reference for an airplane with independently controlled roll and directional controls. The last word, "pitches" is replaced by "stalls" since stalls may be defined by other than nose-down pitching.

Present § 23.201(b) is deleted since it applies to two-control airplanes. (See proposed change for § 23.177 for discussion of two-control airplane requirements.)

Current § 23.201(c) is divided into proposed § 23.201(b) and (c). Proposed § 23.201(b) covers stall recognition and proposed § 23.201(c) addresses stall recovery. Proposed § 23.201(b) clarifies that the test should start from a speed at least 10 knots above the stall speed. Proposed § 23.201(b) has no change in requirements. Section 23.201(c) is changed to specify how long the control must be held against the stop. This change would ensure that the procedure for determining stall speed is the same procedure used to test stall characteristics. The last sentence of current paragraph (c) on the increase of power is deleted because it would only apply to altitude loss.

Present § 23.201(d) would be deleted, as suggested by the JAA, since the determination of altitude loss, and its subsequent

furnishing in the AFM, is not considered information useful to the pilot for safe operation of the airplane.

Proposed § 23.201(d) would be based on present § 23.201(e) and would be revised to clarify that the roll and yaw limits apply during both entry and recovery.

Proposed § 23.201(e) is present paragraph (f) with some revisions. During FAR/JAR harmonization meetings, the JAA pointed out to the FAA that in high power-to-weight ratio airplanes, extreme nose-up attitudes were the principal criteria for use of reduced power, not the presence of undesirable stall characteristics. The FAA concurs and proposes to delete the phrase concerning stall characteristics.

Section 23.203 Turning flight and accelerated turning stalls.

Proposed § 23.203 would be revised by adding the word "turning" before "stalls" and after "accelerated" in the heading, the introductory text, and in proposed paragraphs (a)(2) and (b)(5). This proposed change clarifies that accelerated stalls are performed in turning flight. Also, it clarifies the definition to show that accelerated stalls are not intended to be performed in straight flight. This clarification reflects current certification practice.

Proposed § 23.203(a) and (b) would reference the stall definition in § 23.201(b), which is more specific than the present general words "when the stall has fully developed or the elevator has reached its stop."

For clarification, current paragraph (b)(4) would be separated into proposed paragraphs (b)(4) and (b)(5) without

substantive change, and current paragraph (b)(5) would be redesignated as paragraph (b)(6).

Proposed § 23.203(c)(1) would clarify the wing flap positions by changing "each intermediate position" to "each intermediate normal operating position."

The proposed change to § 23.203(c)(4) would clarify the use of reduced power. (See the proposed change to § 23.201(f).)

Proposed new paragraph (c)(6) has been added to be consistent with new § 23.207(c)(6) configurations (Amendment 23-45).

Section 23.205 Critical engine-inoperative stalls.

This proposal would delete § 23.205. The present requirement to demonstrate stalls with the critical engine inoperative is restricted to the enroute configuration and to a level of power asymmetry with which the airplane is controllable with wings level at the stalling speed. As a result, the power on the operating engines at the stall is normally fairly low, and neither the configuration nor the power setting represent the conditions most likely to accompany an inadvertent stall in service. Reduction of power of the operating engine(s) during the recovery is permitted, and it is questionable whether such action would be taken promptly in an inadvertent stall in service. Experience shows that stalls with significant power asymmetry can result in a spin, even on airplanes that are certificated to the present requirement. Apparently the requirement for demonstrating one-engine-inoperative stalls is not effective in ensuring that inadvertent stalls in service with

one engine inoperative will have satisfactory characteristics and be recoverable. Sufficient protection against the hazard of stalling with one engine inoperative is provided by the one-engine-inoperative performance requirements and operating speed margins, coupled with the requirements for determination of V_{MC}, the addition of a directional and lateral control test under § 23.147(b), and demonstration of stalling characteristics with symmetric power.

Section 23.207 Stall warning.

This proposal would delete the upper limit on stall speed margin and provide for mutable stall warning on acrobatic category airplanes in § 23.207.

Proposed § 23.207(c) would reference the stall tests required by § 23.201(b) and § 23.203(a)(1) and specify that during such tests for one knot per second deceleration stalls, both wings level and turning, the stall warning must begin at a speed exceeding the stalling speed by a margin of not less than 5 knots. The quantified upper limit in the current rule of 10 knots or 15 percent of the stalling speed would be deleted. The upper limit has created problems for manufacturers because of the complex design features required to show compliance. The upper limit requirement was in effect replaced by the nuisance stall warning requirement in § 23.207(d).

Present § 23.207(d) would be divided and moved to proposed § 23.207(d) and (e). Proposed § 23.207(d) on nuisance stall warnings would have no change in requirements. Proposed § 23.207(e) would delete the bottom limit of five knots for

decelerations greater than one knot per second. Also, it would specify that the stall warning must begin sufficiently before the stall so that the pilot can take corrective action. This is considered appropriate because, at the higher deceleration rates of three to five knots per second, a specified five knots may not be enough stall warning.

Proposed new § 23.207(f) allows for a mutable stall warning system for acrobatic category airplanes, with automatic arming for takeoff and rearming for landing. This feature is useful for acrobatic pilots and provides safeguards for takeoff and landing.

Section 23.221 Spinning.

This proposal would revise the point to start the one-turn-spin recovery count, delete the "characteristically incapable of spinning" option, and make minor changes in acrobatic category spins in § 23.221.

Proposed § 23.221(a) would replace the exception for airplanes characteristically incapable of spinning with an exception for airplanes that demonstrate compliance with the optional spin resistent requirements of paragraph (a)(2) of this section. Criteria for an airplane incapable of spinning are unnecessary since criteria for spin resistant airplanes are provided. Proposed § 23.221(a) would change the point at which the count for the one-turn-spin recovery begins. The change would specify a more specific point to begin the count by replacing the current phrase "after the controls have been applied" with "after initiation of the first control action for recovery." Under the present rules, if an applicant proposes a

multiple step recovery procedure that starts with the rudder, then the airplane may be effectively recovered before the start of the recovery count.

Proposed § 23.221(a)(1)(ii) would specify that no control force or characteristic can adversely affect prompt recovery. This would be an improvement over the present prohibition of excessive back pressure in current § 23.221(a)(1)(ii).

Present § 23.221(a)(1) is proposed to be recodified into § 23.221(a)(1)(i) through (a)(1)(iv) with no changes in the requirements. Present § 23.221(a)(2) on spin resistent airplanes would be restated with minor editorial changes but with no change in requirements.

Proposed § 23.221(b) would specify the emergency egress requirements of § 23.807(b)(5) for those utility category airplanes approved for spinning. This is considered an appropriate way to cross-reference the requirements of § 23.807 to the flight requirements.

The proposed § 23.221(c) introductory paragraph would require acrobatic category airplanes to meet the one-turn-spin requirements of § 23.221(a). This change is proposed because acrobatic category airplanes should have sufficient controllability to recover from the developing one-turn-spin under the same conditions as normal category airplanes. The proposed introductory paragraph would also cross-reference § 23.807 for emergency egress requirements.

Proposed § 23.221(c) pertaining to acrobatic category airplanes would add a requirement in proposed paragraph (c)(1)

for spin recovery after six turns or any greater number of turns for which certification is requested. The proposed rule would require recovery within 1.5 turns after initiation of the first control action for recovery. This proposed requirement would ensure recovery within 1.5 turns if the spin mode changes beyond six turns. As an alternative, the applicant may stop at six turns and provide a limitation of six turns.

Proposed § 23.221(c)(2) would delete the option to retract flaps during recovery and would provide the applicant with a choice of flaps up or flaps deployed for spin approval. The paragraph would continue to prohibit exceeding applicable airspeed limits and limit maneuvering load factors.

A new § 23.221(c)(4) is proposed to ensure that the acrobatic spins do not cause pilot incapacitation.

The present § 23.221(d) is proposed to be deleted. The recognition of airplanes that are "characteristically incapable of spinning" has been in the regulation since at least 1937. In 1942, the present weight, center of gravity, and control mis-rig criteria were introduced into Civil Air Regulation (CAR) 03. Since then, the National Aeronautics and Space Administration (NASA) spin resistant requirements, which are based on research, have been developed and incorporated in the regulations by amendment 23-42 (56 FR 344, January 3, 1991). If an applicant proposes a non-spinable airplane, it would be appropriate to apply the more technologically advanced requirements of proposed § 23.221(a)(2); therefore, § 23.221(d) would be deleted.

Section 23.233 Directional stability and control.

This proposal would make minor word changes to § 23.233(a) to harmonize this section with the corresponding JAR section.

Section 23.235 Operation on unpaved surfaces.

This proposal would revise the heading of § 23.235 and delete water operating requirements, which are moved to proposed new § 23.237.

Section 23.237 Operation on water.

Proposed new § 23.237, for operation on water, is essentially the same as the current § 23.235(b).

Section 23.253 High speed characteristics.

This proposal would delete the current paragraph (b)(1), since the requirement for piloting strength and skill is covered in § 23.141.

Section 23.562 Emergency landing dynamic conditions.

This proposal would change the one engine inoperative climb reference in § 23.562(d) to § 23.67(a)(1).

Section 23.1323 Airspeed indicating system.

This proposal would delete the AFM requirements from § 23.1323, which are in current paragraph (d)(1) and are proposed to be redesignated in the systems NPRM as paragraph (f).

Removing § 23.1323(f) would delete from this section the requirement to show airspeed system calibration information since this requirement would be covered in proposed § 23.1587 in this NPRM.

Section 23.1325 Static pressure system.

This proposal would revise § 23.1325(e) to clarify that the calibration must be conducted in flight, which is standard certification practice. Section 23.1325(f) would be deleted because the results of the calibration would be required in the proposed § 23.1587.

Section 23.1511 Flap extended speed.

This proposal would delete from § 23.1511(a) references to § 23.457 because § 23.457 is proposed to be deleted from the FAR in a related NPRM on airframes.

Section 23.1521 Powerplant limitations.

This proposal would require, under § 23.1521, maximum temperature to be established for takeoff operation and would require an ambient temperature limit for reciprocating engines in airplanes of more than 6,000 pounds.

Proposed § 23.1521(b)(5) would require the establishment of maximum cylinder head, liquid coolant, and oil temperature limits for takeoff operation without regard to the allowable time. Presently, temperature limits are required only if the takeoff power operation is permitted for more than two minutes. It is appropriate to require operating temperature limitations because most takeoff operations will exceed two minutes.

Proposed § 23.1521(e) would require an ambient temperature limit for turbine engine-powered airplanes and reciprocating engine-powered airplanes over 6,000 pounds. This change is

proposed because these airplanes are subject to WAT limits and it will ensure that airplane engines will cool at the ambient temperature limit.

Section 23.1543 Instrument markings: General.

Proposed new § 23.1543(c) would require that all related instruments be calibrated in compatible units. This is considered essential for safe operation.

Section 23.1545 Airspeed indicator.

Proposed revisions to § 23.1545 would differentiate between WAT limited and non-WAT limited airplanes in § 23.1545.

Proposed § 23.1545(b)(5) would delete any one-engine-inoperative best rate of climb speed marking requirements for WAT limited airplanes. These airplanes would already have scheduled speeds in case of an engine failure. Proposed paragraph (b)(5) would apply only to non-WAT airplanes for which the one-engine-inoperative best rate of climb speed marking has been simplified to sea level at maximum weight. Since the blue arc rule was promulgated in amendment 23-23 (43 FR 50593, October 30, 1978), certification experience has shown that the marking of an arc is unnecessarily complicated. For many airplanes, the arc was so narrow that the arc was a line. Therefore, proposed paragraph (b)(5) would require a blue radial line instead of an arc.

Proposed § 23.1545(b)(6) would retain the same V_{MC} requirement for non-WAT airplanes and delete any V_{MC} markings for WAT airplanes since WAT airplanes already have scheduled speeds in case of engine failure.

Section 23.1553 Fuel quantity indicator.

This proposal would delete, from § 23.1553, the use of an arc to show a quantity of unusable fuel. The proposed rule references the unusable fuel determination and requires only a red radial line, which would provide a clearer indication of fuel quantity for pilots.

Section 23.1555 Control markings.

This proposal would add to § 23.1555(e)(2) the requirement that no other control be red. This would help prevent use of a wrong control in an emergency.

Section 23.1559 Operating limitations placard.

This proposal would simplify the present § 23.1559 and delete duplicate material.

Proposed § 23.1559(a), (b), and a new paragraph (c), would provide essentially the same information as the current rule. All airplanes currently operate with an AFM and the new rule places emphasis on using the AFM to define required operating limitations.

Section 23.1563 Airspeed placards.

This proposal would add a new paragraph (c) to § 23.1563. The new paragraph would be applicable to WAT limited airplanes and would require providing the maximum V_{MC} in the takeoff configuration determined under § 23.149(b). This is desirable since the V_{MC} is not marked on the airspeed indicator for these airplanes.

Section 23.1567 Flight maneuver placard.

Proposed new § 23.1567(d), which would be applicable to acrobatic and utility airplanes approved for intentional spinning, would require a placard listing control actions for recovery. Also, it would require a statement on the placard that the airplane be recovered when spiral characteristics occur, or after six turns, or at any greater number of turns for which certification tests have been conducted. This paragraph would replace the similar placard requirement in current § 23.1583(e)(3) for acrobatic category airplanes, and the placard requirement would be deleted from § 23.1583(e).

Section 23.1581 General.

This proposal would make editorial changes in § 23.1581 and would recognize WAT limited and non-WAT limited airplanes.

Proposed new § 23.1581(a)(3) would require information necessary to comply with relevant operating rules. This is a FAR/JAR harmonization item and is considered necessary because some operational rules, such as § 135.391, require flight planning with one-engine-inoperative cruise speed and/or driftdown data. For United States part 135 airplanes, it represents no change in requirements.

Proposed § 23.1581(b)(2) would require that only WAT limited airplane AFM's provide data necessary for determining WAT limits.

Proposed new § 23.1581(c) would require the AFM units to be the same as on the instruments. This requirement would enhance operational safety.

Proposed § 23.1581(d) would delete the current requirement for a table of contents. This is considered to be a format requirement and not appropriate for this section, which specifies AFM content. Current § 23.1581(d) is being replaced by a requirement to present all operational airspeeds as indicated airspeeds. Although not currently required, this is current certification practice.

Section 23.1583 Operating limitations.

Proposed revisions to § 23.1583 would make minor changes in the operating limitations information furnished in the AFM. These proposed changes include revising airspeed limitations for commuter category airplanes, requiring AFM limitations for WAT limited airplanes, furnishing ambient temperature limitations, furnishing smoking restriction information, and furnishing information specifying types of runway surfaces.

Proposed § 23.1583(a)(3) would make the V_{MO}/M_{MO} airspeed operating limitations applicable only to turbine powered commuter category airplanes. This is consistent with current practice since no reciprocating engine-powered commuter category airplanes have been proposed.

Proposed § 23.1583(c)(3) would add takeoff and landing weight limitations for WAT limited airplanes. (See the § 23.45 proposal for discussion of WAT limited airplanes.)

Proposed § 23.1583(c)(4) and (5) renumber the present § 23.1583(c)(3) and (4). These proposed paragraphs are revised editorially and cross-references are updated. Proposed paragraph (c)(4)(ii) would impose a new requirement that the AFM include

the maximum takeoff weight for each airport altitude and ambient temperature within the range selected by the applicant at which the accelerate-stop distance determined under § 23.55 is equal to the available runway length plus the length of any stopway, if available. This is currently required for transport category airplanes and is necessary for harmonization with the JAR.

Proposed new § 23.1583(c)(6) would establish the zero wing fuel weight of § 23.343 as a limitation. This would provide the pilot with information necessary to prevent exceeding airplane structural limits.

Proposed § 23.1583(d) has editorial changes only.

Proposed § 23.1583(e)(1) and (2) would delete references to "characteristically incapable of spinning." As discussed under § 23.221, requirements for "characteristically incapable of spinning" would be deleted.

Proposed § 23.1583(e)(3) and (4) would replace present paragraph (e)(3). Proposed § 23.1583(e)(4) would add the requirement for specifying limitations associated with spirals, six turn spins, or more than six turn spins. The requirement for a placard has been deleted since the requirement would be covered in § 23.1567.

Proposed § 23.1583(e)(5) would be based on current paragraph (e)(4) for commuter category airplanes. It would be revised to define the maneuvers as those proposed for commuter category airplanes in § 23.3.

Proposed § 23.1583(f) would revise the heading of the paragraph and add the limit negative load factor for acrobatic

category airplanes. The limit negative load factor is essential for safe operational use.

Proposed § 23.1583(g) would make editorial changes with no change in requirements. The paragraph would reference the requirements of flight crews in § 23.1523.

Proposed § 23.1583(i), (j) and (k) are the current § 23.1583(k), (l) and (m), as redesignated.

Proposed new § 23.1583(l) would require furnishing baggage and cargo loading limits.

Proposed new § 23.1583(m) would require furnishing any special limitations on systems and equipment. This would provide the pilot with information necessary for safe operation of the airplane systems and equipment.

Proposed new § 23.1583(n) would require a statement on ambient temperature limitations. Maximum cooling temperature limits have been required for turbine powered airplanes by § 23.1521(e); however, the requirement for the limitation has never been specified in § 23.1583. Proposed § 23.1583(n) would require furnishing both maximum and minimum temperature limits if appropriate. A minimum temperature limit would provide the pilot with information necessary to avoid airplane damage during low temperature operations.

Proposed new § 23.1583(o) would require furnishing any occupant smoking limitations on the airplane. This would enhance safe operation of the airplane.

Proposed new § 23.1583(p) would require the applicant to state what runway surfaces have been approved. This provides the

pilot with a positive indication of which runway types may be used.

Section 23.1585 Operating procedures.

This proposal would rearrange the current material in § 23.1585 and add additional requirements as discussed below.

Proposed § 23.1585(a) would contain the requirements applicable to all airplanes. The requirements would be arranged in a different order from the current requirements in paragraph (a). The requirements for information that must be included cover -- unusual flight or ground handling characteristics; maximum demonstrated values of crosswinds; recommended speed for flight in rough air; restarting an engine in flight; and making a normal approach and landing in accordance with § 23.73 and § 23.75. All of these requirements are in current § 23.1585(a) except for restarting a turbine engine in flight, which is in current paragraph (c)(5) pertaining only to multiengine airplanes. The FAA decided that a restart capability is not required for single reciprocating engine airplanes for the reasons given in the preamble discussion of proposal 3 in amendment 23-43 (58 FR 18958, April 9, 1993). The requirement for providing restart information should apply to single turbine engines, since turbine engine designs incorporate a restart capability and inadvertent shutdowns may occur. Normal approach and landing information in accordance with the landing requirement in proposed § 23.73 and § 23.75 is new. This is

necessary to enable pilots to achieve the published landing distances and, if necessary, to safely transition to a balked landing.

Proposed § 23.1585(b) would be a revision of § 23.1585(b) on gliding after an engine failure for single-engine airplanes. The proposed version would reference requirements in proposed § 23.71.

Proposed § 23.1585(c) for multiengine airplanes would require compliance with (a) plus the following information requirements from current paragraph (c): approach and landing with an engine inoperative; balked landing with an engine inoperative; and V_{ssr} as determined in § 23.149. Current paragraph (c) requirements for information on procedures for continuing a takeoff following an engine failure and continuing a climb following an engine failure would be moved to proposed (e) for normal, utility, and acrobatic multiengines.

Proposed § 23.1585(d) would apply to normal, utility and acrobatic airplanes. These airplanes would have to comply with paragraph (a) and either (b) or (c). These airplanes would also have to comply with the normal takeoff, climb, and the abandoning a takeoff procedures, which are currently contained in paragraph (a).

As discussed above, § 23.1585(c), for normal, utility and acrobatic multiengine airplanes, would require compliance with proposed (a), (c), and (d) plus requirements for continuing a takeoff or climb with one engine inoperative, which are now in current paragraph (c)(1) and (2).

Proposed § 23.1585(f) would require commuter category airplanes to comply with paragraphs (a) and (c) plus the normal takeoff requirements from current paragraph (a)(2) revised; accelerate-stop requirements, which are new, and continuing takeoff after engine failure, which are in current paragraph (c)(1).

Proposed § 23.1585(g) would be the same as current paragraph (d) on identifying operating conditions, which necessitate fuel system independence.

Proposed § 23.1585(h) would be the same as current paragraph (e) for disconnecting the battery from its charging source.

Proposed § 23.1585(i) is based on current paragraph (g) on the total quantity of usable fuel and adds information on the effect of pump failure on unusable fuel.

Proposed new § 23.1585(j) would require procedures for safe operation of the airplanes' systems and equipment. Although not currently required, this is current industry practice.

Present § 23.1585(h), commuter category airplane procedures for restarting turbine engines in flight, would no longer be necessary because the requirement would be covered under paragraph (a)(4).

Section 23.1587 Performance information.

Proposed § 23.1587 would rearrange existing material, delete ski plane performance exceptions, delete the option of calculating approximate performance, delete stall altitude loss data, and require overweight landing performance in § 23.1587.

Stalling speed requirements of current paragraph (c)(2) and (3) would be combined and moved to paragraph (a)(1) and would reference the stalling speed requirement of § 23.49. Information on the steady rate and gradient of climb with all engines operating would be required by proposed paragraph (a)(2). This is revised from current paragraph (a)(2). The reference would be changed to proposed § 23.69(a).

Proposed (a)(3) would require, as is now required, that landing distance be determined under § 23.75, and would add that this must be provided for each airport altitude, standard temperature, and type of surface for which it is valid. Proposed paragraph (a)(4) would require information on the effect on landing distance when landing on other than hard surface, as determined under § 23.45(g). Proposed paragraph (a)(5) would cover information on the effects on landing distance of runway slope and wind. This would provide the pilot with data with which to account for these factors in his or her takeoff calculations.

Current requirements in § 23.1587(b) on ski planes would be deleted. Proposed paragraph (b) would add a steady angle of climb/descent requirement as determined under § 23.77(a). This requirement would apply to all non-WAT airplanes.

Proposed paragraph (c) would apply to normal, utility, and acrobatic category airplanes, rather than all airplanes as in current paragraph (c). The proposed (c) would delete stall altitude loss requirements that are in current paragraph (c)(1). As mentioned, current stalling speed requirements would be moved

to proposed paragraph (a)(1). Current paragraph (c)(4) on cooling climb speed data would also be deleted since all airplanes would cool at scheduled speeds.

Proposed paragraph (c)(1) would pertain to the takeoff distance determined under § 23.53 and the type of surface. Proposed paragraphs (c)(2) and (c)(3) pertain to the effect on takeoff distance of the runway surface, slope, and headwind and tailwind component.

Proposed paragraph (c)(4) would impose a new requirement pertaining to the one-engine inoperative takeoff climb/descent performance for WAT-limited airplanes. This pertains only to reciprocating engine-powered airplanes. It would provide the pilot with the information determined under proposed § 23.66.

Proposed paragraph (c)(5) pertains to enroute rate and gradient of climb/descent determined under § 23.69(b), for multiengine airplanes.

Proposed § 23.1587(d) for commuter category airplanes would incorporate the present data plus the addition of accelerate-stop data, overweight landing performance, and the effect of operation on other than smooth hard surfaces.

Section 23.1589 Loading information.

Proposed § 23.1589(b) would make editorial changes to simplify the text, with no change in requirements.

Appendix E.

Appendix E would be deleted for the reasons given in the proposed change to § 23.25.

Preliminary Regulatory Evaluation, Initial Regulatory Flexibility Determination, and Trade Impact Assessment

Proposed changes to Federal regulations must undergo several economic analyses. First, Executive Order 12866 directs that each Federal agency shall propose or adopt a regulation only upon a reasoned determination that the benefits of the intended regulation justify its costs. Second, the Regulatory Flexibility Act of 1980 requires agencies to analyze the economic impact of regulatory changes on small entities. Third, the Office of Management and Budget directs agencies to assess the effects of regulatory changes on international trade. In conducting these analyses, the FAA has determined that this rule: (1) would generate benefits that justify its costs and is not a "significant regulatory action" as defined in the Executive Order; (2) is not significant as defined as DOT's Policies and Procedures; (3) would not have a significant impact on a substantial number of small entities; and (4) would not constitute a barrier to international trade. These analyses, available in the docket, are summarized below.

Regulatory Evaluation Summary

Of the 57 sections that would be amended or added in this proposed rule, the FAA has identified 15 that could result in additional compliance costs to one or more airplane categories. Amendments to five sections could result in cost savings. The greatest costs would be incurred by manufacturers of WAT limited airplanes (e.g., multiengine airplanes with maximum weights of

more than 6,000 pounds). When amortized over a production run, the quantified incremental costs would be relatively modest--less than $100 per airplane. The FAA solicits comments concerning the incremental certification/development costs attributable to the proposed rule.

The primary benefit of the proposed rule would be the cost efficiencies of harmonization with the JAR for those manufacturers that choose to market airplanes in JAA countries as well as to manufacturers in JAA countries that choose to market airplanes in the U.S. Other benefits of the proposed rule would be decreased reliance on special conditions, simplification of the certification process through clarification of existing requirements, and increased flexibility through optional designs.

Regulatory Flexibility Determination

The Regulatory Flexibility Act of 1980 (RFA) was enacted by Congress to ensure that small entities are not unnecessarily and disproportionately burdened by Federal regulations. The RFA requires a Regulatory Flexibility Analysis if a proposed rule would have a significant economic impact, either detrimental or beneficial, on a substantial number of small entities. Based on FAA Order 2100.14A, Regulatory Flexibility Criteria and Guidance, the FAA has determined that the proposed amendments would not have a significant economic impact on a substantial number of small entities.

International Trade Impact Assessment

The proposed rule would not constitute a barrier to international trade, including the export of American airplanes to foreign countries and the import of foreign airplanes into the United States. Instead, the proposed flight certification procedures have been harmonized with those of the JAA and would lessen restraints on trade.

Federalism Implications

The regulations proposed herein would not have substantial direct effects 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, in accordance with Executive Order 12612, it is determined that this proposal would not have sufficient federalism implications to warrant the preparation of a Federalism Assessment.

Conclusion

The FAA proposes to revise the flight airworthiness standards for normal, utility, acrobatic, and commuter category airplanes with the same standards that will be proposed for the same category airplanes by the Joint Airworthiness Authority in Europe. If adopted, the proposed revision would reduce the regulatory burden on the United States and European airplane manufacturers by relieving them of the need to show compliance

with different standards each time they seek certification approval of an airplane in a different country.

For the reasons discussed in the preamble, and based on the findings in the Regulatory Evaluation, the FAA has determined that this proposed regulation is not a significant regulatory action. In addition, the FAA certifies that this proposal, if adopted, will not have a significant economic impact on a substantial number of small entities under the criteria of the Regulatory Flexibility Act. This proposal is not considered significant under DOT Regulatory Policies and Procedures (44 FR 11034, February 26, 1979). An initial regulatory evaluation of the proposal has been placed in the docket. A copy may be obtained by contacting the person identified under "FOR FURTHER INFORMATION CONTACT."

List of Subjects in 14 CFR Part 1

Air transportation.

List of Subjects in 14 CFR Part 23

Aircraft, Aviation safety, Signs and symbols.

The Proposed Amendment

In consideration of the foregoing, the Federal Aviation Administration proposes to amend parts 1 and 23 of the Federal Aviation Regulations (14 CFR parts 1 and 23) as follows:

PART 1--DEFINITIONS AND ABBREVIATIONS

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

Authority: 49 U.S.C. app. 1347, 1348, 1354(a), 1357(d)(2), 1372, 1421 through 1430, 1432, 1442, 1443, 1472, 1510, 1522, 1652(e), 1655(c), 1657(f); 49 U.S.C. 106(g).

2. A new definition is added to § 1.1 to read as follows:

§ 1.1 General definitions.

* * * * *

Maximum speed for stability characteristics, V_{FC}/M_{FC} means a speed that may not be less than a speed midway between maximum operating limit speed (V_{MO}/M_{MO}) and demonstrated flight diving speed (V_{DF}/M_{DF}), except that, for altitudes where the Mach number is the limiting factor, M_{FC} need not exceed the Mach number at which effective speed warning occurs.

* * * * *

PART 23--AIRWORTHINESS STANDARDS: NORMAL, UTILITY, ACROBATIC, AND COMMUTER CATEGORY AIRPLANES

3. The authority citation for part 23 continues to read as follows:

Authority: 49 U.S.C. app. 1344, 1354(a), 1355, 1421, 1423, 1425, 1428, 1429, 1430, 49 U.S.C. 106(g).

4. Section 23.3 is amended by revising paragraphs (b)(2, (d), and (e) to read as follows:

§ 23.3 Airplane categories.

* * * * *

(b) * * *

(1) * * *

(2) Lazy eights, chandelles, and steep turns, or similar maneuvers, in which the angle of bank is more than 60 degrees but not more than 90 degrees.

(3) * * *

* * * * *

(d) The commuter category is limited to propeller-driven, multiengine airplanes that have a seating configuration, excluding pilot seats, or 19 or less, and a maximum certificated takeoff weight of 19,000 pounds or less. The commuter category operation is limited to any maneuver incident to normal flying, stalls (except whip stalls) and steep turns, in which the angle of bank is not more than 60 degrees.

(e) Except for commuter category, airplanes may be type certificated in more than one category if the requirements of each requested category are met.

5. Section 23.25 is amended by revising paragraphs (a)(1)(i) and (a)(1)(iii) to read as follows:

§ 23.25 Weight limits.

(a) Maximum weight. The maximum weight is the highest weight at which compliance with each applicable requirement of this part (other than those complied with at the design landing weight) is shown. The maximum weight must be established so that it is--

(1) Not more than the least of--

(i) The highest weight selected by the applicant; or

(ii) * * *

(iii) The highest weight at which compliance with each applicable flight requirement is shown, and

* * * * *

6. Section 23.33 is amended by revising paragraphs (b)(1) and (2) to read as follows:

§ 23.33 Propeller speed and pitch limits.

(b) * * *

(1) During takeoff and initial climb at the all engine(s) operating climb speed specified in § 23.65, the propeller must limit the engine r.p.m., at full throttle or at maximum allowable

takeoff manifold pressure, to a speed not greater than the maximum allowable takeoff r.p.m.; and

(2) During a closed throttle glide, at V_{NE}, the propeller may not cause an engine speed above 110 percent of maximum continuous speed.

* * * * *

7. Section 23.45 is revised to read as follows:

§ 23.45 General.

(a) Unless otherwise prescribed, the performance requirements of this part must be met for--

(1) Still air and standard atmosphere; and

(2) Ambient atmospheric conditions, for commuter category airplanes, for reciprocating engine-powered airplanes of more than 6,000 pounds maximum weight, and for turbine engine-powered airplanes.

(b) Performance data must be determined over not less than the following ranges of conditions--

(1) Airport altitudes from sea level to 10,000 feet; and

(2) For reciprocating engine-powered airplanes of 6,000 pounds, or less, maximum weight, temperature from standard to 30°C above standard; or

(3) For reciprocating engine-powered airplanes of more than 6,000 pounds maximum weight and turbine engine-powered airplanes, temperature from standard to 30°C above standard, or the maximum ambient atmospheric temperature at which compliance with the cooling provisions of § 23.1041 to § 23.1047 is shown, if lower.

(c) Performance data must be determined with the cowl flaps or other means for controlling the engine cooling air supply in the position used in the cooling tests required by § 23.1041 to § 23.1047.

(d) The available propulsive thrust must correspond to engine power, not exceeding the approved power, less--

(1) Installation losses; and

(2) The power absorbed by the accessories and services appropriate to the particular ambient atmospheric conditions and the particular flight condition.

(e) The performance, as affected by engine power, must be based on a relative humidity of--

(1) 80 percent, at and below standard temperature; and

(2) 34 percent, at and above standard temperature plus 50°F.

Between the two temperatures, the relative humidity must vary linearly.

(f) Unless otherwise prescribed in determining the takeoff and landing distances, changes in the airplane's configuration, speed, and power must be made in accordance with procedures established by the applicant for operation in service. These procedures must be able to be executed consistently by pilots of average skill in atmospheric conditions reasonably expected to be encountered in service.

(g) The following, as applicable, must be determined on a smooth, dry, hard-surfaced runway--

(1) Takeoff distance of § 23.53(b);

(2) Accelerate-stop distance of § 23.55;

(3) Takeoff distance and takeoff run of § 23.59; and

(4) Landing distance of § 23.75.

The effect on these distances of operation on other types of surfaces (for example, grass, gravel) when dry, may be determined or derived and these surfaces listed in the Airplane Flight Manual in accordance with § 23.1583(p).

(h) For commuter category airplanes, the following also apply:

(1) Unless otherwise prescribed, the applicant must select the takeoff, enroute, approach, and landing configurations for the airplane.

(2) The airplane configuration may vary with weight, altitude, and temperature, to the extent that they are compatible with the operating procedures required by paragraph (h)(3) of this section.

(3) Unless otherwise prescribed, in determining the critical-engine-inoperative takeoff performance, takeoff flight path, and accelerate-stop distance, changes in the airplane's configuration, speed, and power must be made in accordance with procedures established by the applicant for operation in service.

(4) Procedures for the execution of discontinued approaches and balked landings associated with the conditions prescribed in § 23.67(c)(4) and § 23.77(c) must be established.

(5) The procedures established under paragraphs (h)(3) and (h)(4) of this section must--

(i) Be able to be consistently executed by a crew of average skill in atmospheric conditions reasonably expected to be encountered in service;

(ii) Use methods or devices that are safe and reliable; and

(iii) Include allowances for any reasonably expected time delays in the execution of the procedures.

8. Section 23.49 is revised to read as follows:

§ 23.49 Stalling speed.

(a) V_{so} and V_{s1} are the stalling speeds or the minimum steady flight speeds, in knots (CAS), at which the airplane is controllable with--

(1) For reciprocating engine-powered airplanes, the engine(s) idling, the throttle(s) closed or at not more than the power necessary for zero thrust at a speed not more than 110 percent of the stalling speed;

(2) For turbine engine-powered airplanes, the propulsive thrust not greater than zero at the stalling speed, or, if the resultant thrust has no appreciable effect on the stalling speed, with engine(s) idling and throttle(s) closed;

(3) The propeller(s) in the takeoff position;

(4) The airplane in the condition existing in the test, in which V_{so} and V_{s1} are being used;

(5) The center of gravity in the position that results in the highest value of V_{so} and V_{s1}; and

(6) The weight used when V_{so} or V_{s1} are being used as a factor to determine compliance with a required performance standard.

(b) V_{so} and V_{s1} must be determined by flight tests, using the procedure and meeting the flight characteristics specified in § 23.201.

(c) Except as provided in paragraph (d) of this section, V_{so} at maximum weight must not exceed 61 knots for--

(1) Single-engine airplanes; and

(2) Multiengine airplanes of 6,000 pounds or less maximum weight that cannot meet the minimum rate of climb specified in § 23.67(a)(1) with the critical engine inoperative.

(d) All single-engine airplanes, and those multiengine airplanes of 6,000 pounds or less maximum weight with a V_{so} of more than 61 knots that do not meet the requirements of § 23.67(a)(1), must comply with § 23.562(d).

9. Section 23.51 is revised to read as follows:

§ 23.51 Takeoff speeds.

(a) For normal, utility, and acrobatic category airplanes, rotation speed, V_R, is the speed at which the pilot makes a control input, with the intention of lifting the airplane out of contact with the runway or water surface.

(1) For multiengine landplanes, V_R must not be less than the greater of 1.05 V_{MC} or 1.10 V_{s1};

(2) For single-engine landplanes, V_R, must not be less than V_{SI}; and

(3) For seaplanes and amphibians taking off from water, V_R, may be any speed that is shown to be safe under all reasonably expected conditions, including turbulence and complete failure of the critical engine.

(b) For normal, utility, and acrobatic category airplanes, the speed at 50 feet above the takeoff surface level must not be less than:

(1) For multiengine airplanes, the highest of--

(i) A speed that is shown to be safe for continued flight (or emergency landing, if applicable) under all reasonably expected conditions, including turbulence and complete failure of the critical engine;

(ii) 1.10 V_{MC}; or

(iii) 1.20 V_{S1}.

(2) For single-engine airplanes, the higher of--

(i) A speed that is shown to be safe under all reasonably expected conditions, including turbulence and complete engine failure; or

(ii) 1.20 V_{S1}.

(c) For commuter category airplanes, the following apply:

(1) V_1 must be established in relation to V_{EF} as follows:

(i) V_{EF} is the calibrated airspeed at which the critical engine is assumed to fail. V_{EF} must be selected by the applicant but must not be less than 1.05 V_{MC} determined under § 23.149(b) or, at the option of the applicant, not less than V_{MCG} determined under § 23.149(f).

(ii) The takeoff decision speed, V_1, is the calibrated airspeed on the ground at which, as a result of engine failure or other reasons, the pilot is assumed to have made a decision to continue or discontinue the takeoff. The takeoff decision speed, V_1, must be selected by the applicant but must not be less than V_{EF} plus the speed gained with the critical engine inoperative during the time interval between the instant at which the critical engine is failed and the instant at which the pilot recognizes and reacts to the engine failure, as indicated by the pilot's application of the first retarding means during the accelerate-stop determination of § 23.55.

(2) The rotation speed, V_R, in terms of calibrated airspeed, must be selected by the applicant and must not be less than the greatest of the following:

(i) V_1;

(ii) 1.05 V_{MC} determined under § 23.149(b);

(iii) 1.10 V_{S1}; or

(iv) The speed that allows attaining the initial climb-out speed, V_2, before reaching a height of 35 feet above the takeoff surface in accordance with § 23.57(c)(2).

(3) For any given set of conditions, such as weight, altitude, temperature, and configuration, a single value of V_R must be used to show compliance with both the one-engine-inoperative takeoff and all-engines-operating takeoff requirements.

(4) The takeoff safety speed, V_2, in terms of calibrated airspeed, must be selected by the applicant so as to allow the

gradient of climb required in § 23.67(c)(1) and (c)(2) but must not be less than 1.10 V_{MC} or less than 1.20 V_{S1}.

(5) The one-engine-inoperative takeoff distance, using a normal rotation rate at a speed 5 knots less than V_R, established in accordance with paragraph (c)(2) of this section, must be shown not to exceed the corresponding one-engine-inoperative takeoff distance, determined in accordance with § 23.57 and § 23.59(a)(1), using the established V_R. The takeoff, otherwise performed in accordance with § 23.57, must be continued safely from the point at which the airplane is 35 feet above the takeoff surface and at a speed not less than the established V_2 minus 5 knots.

(6) The applicant must show, with all engines operating, that marked increases in the scheduled takeoff distances, determined in accordance with § 23.59(a)(2), do not result from over-rotation of the airplane or out-of-trim conditions.

10. Section 23.53 is revised to read as follows:

§ 23.53 Takeoff performance.

(a) For normal, utility, and acrobatic category airplanes, the takeoff distance must be determined in accordance with paragraph (b), using speeds determined in accordance with § 23.51(a) and (b).

(b) For normal, utility, and acrobatic category airplanes, the distance required to takeoff and climb to a height of 50 feet above the takeoff surface must be determined for each weight,

altitude, and temperature within the operational limits established for takeoff with--

(1) Takeoff power on each engine;

(2) Wing flaps in the takeoff position(s); and

(3) Landing gear extended.

(c) For commuter category airplanes, takeoff performance, as required by §§ 23.55 through 23.59, must be determined with the operating engine(s) within approved operating limitations.

11. Section 23.55 is amended by revising paragraph (a) and the introductory text of paragraph (b) to read as follows:

§ 23.55 Accelerate-stop distance.

* * * * *

(a) The accelerate-stop distance is the sum of the distances necessary to--

(1) Accelerate the airplane from a standing start to V_{EF} with all engines operating;

(2) Accelerate the airplane from V_{EF} to V_1, assuming the critical engine fails at V_{EF}; and

(3) Come to a full stop from the point at which V_1 is reached.

(b) Means other than wheel brakes may be used to determine the accelerate-stop distances if that means--

(1) * * *

(2) * * *

12. Section 23.57 is amended by revising the introductory text of paragraph (a), paragraph (b), paragraph (c)(1), the introductory text of paragraph (c)(3), paragraph (c)(4), and paragraph (d); and by adding a new paragraph (e) to read as follows:

§ 23.57 Takeoff path.

* * * * *

(a) The takeoff path extends from a standing start to a point in the takeoff at which the airplane is 1500 feet above the takeoff surface at or below which height the transition from the takeoff to the enroute configuration must be completed; and

* * * * *

(b) During the acceleration to speed V_2, the nose gear may be raised off the ground at a speed not less than V_R. However, landing gear retraction must not be initiated until the airplane is airborne.

(c) * * *

(1) The slope of the airborne part of the takeoff path must not be negative at any point;

* * * * *

(3) At each point along the takeoff path, starting at the point at which the airplane reaches 400 feet above the takeoff surface, the available gradient of climb must not be less than--

* * * * *

(4) Except for gear retraction and automatic propeller feathering, the airplane configuration must not be changed, and

no change in power that requires action by the pilot may be made, until the airplane is 400 feet above the takeoff surface.

(d) The takeoff path to 35 feet above the takeoff surface must be determined by a continuous demonstrated takeoff.

(e) The takeoff flight path from 35 feet above the takeoff surface must be determined by synthesis from segments; and

(1) The segments must be clearly defined and must be related to distinct changes in configuration, power, and speed;

(2) The weight of the airplane, the configuration, and the power must be assumed constant throughout each segment and must correspond to the most critical condition prevailing in the segment; and

(3) The takeoff flight path must be based on the airplane's performance without ground effect.

13. Section 23.59 is amended by revising the introductory paragraph, paragraph (a)(2), and paragraph (b) to read as follows:

§ 23.59 Takeoff distance and takeoff run.

For each commuter category airplane, the takeoff distance and, at the option of the applicant, the takeoff run, must be determined.

(a) * * *

(2) With all engines operating, 115 percent of the horizontal distance from the start of the takeoff to the point at which the airplane is 35 feet above the takeoff surface, determined by a procedure consistent with § 23.57.

(b) If the takeoff distance includes a clearway, the takeoff run is the greater of--

(1) The horizontal distance along the takeoff path from the start of the takeoff to a point equidistant between the liftoff point and the point at which the airplane is 35 feet above the takeoff surface as determined under § 23.57; or

(2) With all engines operating, 115 percent of the horizontal distance from the start of the takeoff to a point equidistant between the liftoff point and the point at which the airplane is 35 feet above the takeoff surface, determined by a procedure consistent with § 23.57.

14. A new § 23.63 is added to read as follows:

§ 23.63 Climb: general.

(a) Compliance with the requirements of §§ 23.65, 23.66, 23.67, 23.69, and 23.77 must be shown--

(1) Out of ground effect; and

(2) At speeds that are not less than those at which compliance with the powerplant cooling requirements of §§ 23.1041 to 23.1047 has been demonstrated; and

(3) Unless otherwise specified, with one engine inoperative, at a bank angle not exceeding 5 degrees.

(b) For normal, utility, and acrobatic category reciprocating engine-powered airplanes of 6,000 pounds or less maximum weight, compliance must be shown with § 23.65(a), § 23.67(a), where appropriate, and § 23.77(a) at maximum takeoff or landing weight, as appropriate, in a standard atmosphere.

(c) For normal, utility, and acrobatic category reciprocating engine-powered airplanes of more than 6,000 pounds maximum weight, and turbine engine-powered airplanes in the normal, utility, and acrobatic category, compliance must be shown at weights as a function of airport altitude and ambient temperature, within the operational limits established for takeoff and landing, respectively, with--

(1) Sections 23.65(b) and 23.67(b)(1) and (2), where appropriate, for takeoff, and

(2) Section 23.67(b)(2), where appropriate, and § 23.77(b), for landing.

(d) For commuter category airplanes, compliance must be shown at weights as a function of airport altitude and ambient temperature within the operational limits established for takeoff and landing, respectively, with--

(1) Sections 23.67(c)(1), 23.67(c)(2), and 23.67(c)(3) for takeoff; and

(2) Sections 23.67(c)(3), 23.67(c)(4), and 23.77(c) for landing.

15. Section 23.65 is revised to read as follows:

§ 23.65 Climb: all engines operating.

(a) Each normal, utility, and acrobatic category reciprocating engine-powered airplane of 6,000 pounds or less maximum weight must have a steady climb gradient at sea level of at least 8.3 percent for landplanes or 6.7 percent for seaplanes and amphibians with--

(1) Not more than maximum continuous power on each engine;

(2) The landing gear retracted;

(3) The wing flaps in the takeoff position(s); and

(4) A climb speed not less than the greater of 1.1 V_{MC} and 1.2 V_{S1} for multiengine airplanes and not less than 1.2 V_{S1} for single-engine airplanes.

(b) Each normal, utility, and acrobatic category reciprocating engine-powered airplane of more than 6,000 pounds maximum weight and turbine engine-powered airplanes in the normal, utility, and acrobatic category must have a steady gradient of climb after takeoff of at least 4 percent with--

(1) Takeoff power on each engine;

(2) The landing gear extended, except that if the landing gear can be retracted in not more than seven seconds, the test may be conducted with the gear retracted;

(3) The wing flaps in the takeoff position(s); and

(4) A climb speed as specified in § 23.65(a)(4).

16. A new § 23.66 is added to read as follows:

§ 23.66 Takeoff climb: one-engine inoperative.

For normal, utility, and acrobatic category reciprocating engine-powered airplanes of more than 6,000 pounds maximum weight, and turbine engine-powered airplanes in the normal, utility, and acrobatic category, the steady gradient of climb or descent must be determined at each weight, altitude, and ambient temperature within the operational limits established by the applicant with--

(a) The critical engine inoperative and its propeller in the position it rapidly and automatically assumes;

(b) The remaining engine(s) at takeoff power;

(c) The landing gear extended, except that if the landing gear can be retracted in not more than seven seconds, the test may be conducted with the gear retracted;

(d) The wing flaps in the takeoff position(s);

(e) The wings level; and

(f) A climb speed equal to that achieved at 50 feet in the demonstration of § 23.53.

17. Section 23.67 is revised to read as follows:

§ 23.67 Climb: one engine inoperative.

(a) For normal, utility, and acrobatic category reciprocating engine-powered airplanes of 6,000 pounds or less maximum weight, the following apply:

(1) Except for those airplanes that meet the requirements prescribed in § 23.562(d), each airplane with a V_{so} of more than 61 knots must be able to maintain a steady climb gradient of at least 1.5 percent at a pressure altitude of 5,000 feet with the--

(i) Critical engine inoperative and its propeller in the minimum drag position;

(ii) Remaining engine(s) at not more than maximum continuous power;

(iii) Landing gear retracted;

(iv) Wing flaps retracted; and

(v) Climb speed not less than 1.2 V_{s1}.

(2) For each airplane that meets the requirements prescribed in § 23.562(d), or that has a V_{so} of 61 knots or less, the steady gradient of climb or descent at a pressure altitude of 5,000 feet must be determined with the--

(i) Critical engine inoperative and its propeller in the minimum drag position;

(ii) Remaining engine(s) at not more than maximum continuous power;

(iii) Landing gear retracted;

(iv) Wing flaps retracted; and

(v) Climb speed not less than 1.2 V_{s1}.

(b) For normal, utility, and acrobatic category reciprocating engine-powered airplanes of more than 6,000 pounds maximum weight, and turbine engine-powered airplanes in the normal, utility, and acrobatic category--

(1) The steady gradient of climb at an altitude of 400 feet above the takeoff surface must be measurably positive with the--

(i) Critical engine inoperative and its propeller in the minimum drag position;

(ii) Remaining engine(s) at takeoff power;

(iii) Landing gear retracted;

(iv) Wing flaps in the takeoff position(s); and

(v) Climb speed equal to that achieved at 50 feet in the demonstration of § 23.53.

(2) The steady gradient of climb must not be less than 0.75 percent at an altitude of 1,500 feet above the takeoff surface, or landing surface, as appropriate, with the--

(i) Critical engine inoperative and its propeller in the minimum drag position;

(ii) Remaining engine(s) at not more than maximum continuous power;

(iii) Landing gear retracted;

(iv) Wing flaps retracted; and

(v) Climb speed not less than 1.2 V_{s1}.

(c) For commuter category airplanes, the following apply:

(1) Takeoff; landing gear extended. The steady gradient of climb at the altitude of the takeoff surface must be measurably positive for two-engine airplanes, not less than 0.3 percent for three-engine airplanes, or 0.5 percent for four-engine airplanes with--

(i) The critical engine inoperative and its propeller in the position it rapidly and automatically assumes;

(ii) The remaining engine(s) at takeoff power;

(iii) The landing gear extended, and all landing gear doors open;

(iv) The wing flaps in the takeoff position(s);

(v) The wings level; and

(vi) A climb speed equal to V_2.

(2) Takeoff; landing gear retracted. The steady gradient of climb at an altitude of 400 feet above the takeoff surface must be not less than 2.0 percent for two-engine airplanes, 2.3

percent for three-engine airplanes, and 2.6 percent for four-engine airplanes with--

(i) The critical engine inoperative and its propeller in the position it rapidly and automatically assumes;

(ii) The remaining engine(s) at takeoff power;

(iii) The landing gear retracted;

(iv) The wing flaps in the takeoff position(s);

(v) A climb speed equal to V_2.

(3) Enroute. The steady gradient of climb at an altitude of 1,500 feet above the takeoff or landing surface, as appropriate, must be not less than 1.2 percent for two-engine airplanes, 1.5 percent for three-engine airplanes, and 1.7 percent for four-engine airplanes with--

(i) The critical engine inoperative and its propeller in the minimum drag position;

(ii) The remaining engine(s) at not more than maximum continuous power;

(iii) The landing gear retracted;

(iv) The wing flaps retracted; and

(v) A climb speed not less than 1.2 V_{s1}.

(4) Discontinued approach. The steady gradient of climb at an altitude of 400 feet above the landing surface must be not less than 2.1 percent for two-engine airplanes, 2.4 percent for three-engine airplanes, and 2.7 percent for four-engine airplanes, with--

(i) The critical engine inoperative and its propeller in the minimum drag position;

(ii) The remaining engine(s) at takeoff power;

(iii) Landing gear retracted;

(iv) Wing flaps in the approach position(s) in which V_{s1} for these position(s) does not exceed 110 percent of the V_{s1} for the related all-engines-operating landing position(s); and

(v) A climb speed established in connection with normal landing procedures but not exceeding 1.5 V_{s1}.

18. A new § 23.69 is added to read as follows:

§ 23.69 Enroute climb/descent.

(a) All engines operating. The steady gradient and rate of climb must be determined at each weight, altitude, and ambient temperature within the operational limits established by the applicant with--

(1) Not more than maximum continuous power on each engine;

(2) The landing gear retracted;

(3) The wing flaps retracted; and

(4) A climb speed not less than 1.3 V_{s1}.

(b) One engine inoperative. The steady gradient and rate of climb/descent must be determined at each weight, altitude, and ambient temperature within the operational limits established by the applicant with--

(1) The critical engine inoperative and its propeller in the minimum drag position;

(2) The remaining engine(s) at not more than maximum continuous power;

(3) The landing gear retracted;

(4) The wing flaps retracted; and

(5) A climb speed not less than 1.2 V_{S1}.

19. A new § 23.71 is added to read as follows:

§ 23.71 Glide: Single-engine airplanes.

The maximum horizontal distance traveled in still air, in nautical miles, per 1,000 feet of altitude lost in a glide, and the speed necessary to achieve this must be determined with the engine inoperative, its propeller in the minimum drag position, and landing gear and wing flaps in the most favorable available position.

20. A new § 23.73 is added to read as follows:

§ 23.73 Reference landing approach speed.

(a) For normal, utility, and acrobatic category reciprocating engine-powered airplanes of 6,000 pounds or less maximum weight, the reference landing approach speed, V_{REF}, must not be less than the greater of V_{MC}, determined in § 23.149(b) with the wing flaps in the most extended takeoff position, and 1.3 V_{SO}.

(b) For normal, utility, and acrobatic category reciprocating engine-powered airplanes of more than 6,000 pounds maximum weight, and turbine engine-powered airplanes in the normal, utility, and acrobatic category, the reference landing approach speed, V_{REF}, must not be less than the greater of V_{MC}, determined in § 23.149(c), and 1.3 V_{SO}.

(c) For commuter category airplanes, the reference landing approach speed, V_{REF}, must not be less than the greater of 1.05 V_{MC}, determined in § 23.149(c), and 1.3 V_{SO}.

21. Section 23.75 is amended by revising the introductory text for the section; the introductory text of paragraph (a); and paragraphs (b), (d), (e), and (f); and by deleting paragraph (h); to read as follows:

§ 23.75 Landing distance.

The horizontal distance necessary to land and come to a complete stop from a point 50 feet above the landing surface must be determined, for standard temperatures at each weight and altitude within the operational limits established for landing, as follows:

(a) A steady approach at not less than V_{REF}, determined in accordance with § 23.73(a), (b), or (c), as appropriate, must be maintained down to the 50 foot height and--

* * * * *

(b) A constant configuration must be maintained throughout the maneuver.

* * * * *

(d) It must be shown that a safe transition to the balked landing conditions of § 23.77 can be made from the conditions that exist at the 50 foot height, at maximum landing weight, or at the maximum landing weight for altitude and temperature of § 23.63(c)(2) or (d)(2), as appropriate.

(e) The brakes must not be used so as to cause excessive wear of brakes or tires.

(f) Retardation means other than wheel brakes may be used if that means--

(1) Is safe and reliable; and

(2) Is used so that consistent results can be expected in service.

* * * * *

22. Section 23.77 is revised to read as follows:

§ 23.77 Balked landing.

(a) Each normal, utility, and acrobatic category reciprocating engine-powered airplane of 6,000 pounds or less maximum weight must be able to maintain a steady gradient of climb at sea level of at least 3.3 percent with--

(1) Takeoff power on each engine;

(2) The landing gear extended;

(3) The wing flaps in the landing position, except that if the flaps may safely be retracted in two seconds or less without loss of altitude and without sudden changes of angle of attack, they may be retracted; and

(4) A climb speed equal to V_{REF}, as defined in § 23.73(a).

(b) Each normal, utility, and acrobatic category reciprocating engine-powered airplane of more than 6,000 pounds maximum weight and each normal, utility, and acrobatic category turbine engine-powered airplane must be able to maintain a steady gradient of climb of at least 2.5 percent with--

(1) Not more than the power that is available on each engine eight seconds after initiation of movement of the power controls from minimum flight-idle position;

(2) The landing gear extended;

(3) The wing flaps in the landing position; and

(4) A climb speed equal to V_{REF}, as defined in § 23.73(b).

(c) Each commuter category airplane must be able to maintain a steady gradient of climb of at least 3.2 percent with--

(1) Not more than the power that is available on each engine eight seconds after initiation of movement of the power controls from the minimum flight idle position;

(2) Landing gear extended;

(3) Wing flaps in the landing position; and

(4) A climb speed equal to V_{REF}, as defined in § 23.73(c).

23. Section 23.143 is amended by revising paragraphs (a) and (c) to read as follows:

§ 23.143 General.

(a) The airplane must be safely controllable and maneuverable during all flight phases including--

(1) Takeoff;

(2) Climb;

(3) Level flight;

(4) Descent;

(5) Go-around; and

(6) Landing (power on and power off) with the wing flaps extended and retracted.

* * * * *

(c) If marginal conditions exist with regard to required pilot strength, the control forces required must be determined by quantitative tests. In no case may the control forces under the conditions specified in paragraphs (a) and (b) exceed those prescribed in the following table:

Values in pounds force applied to the relevant control	Pitch	Roll	Yaw
(a) For temporary application			
Stick	60	30	
Wheel (Two hands on rim)	75	50	
Wheel (One hand on rim)	50	25	
Rudder Pedal	-----	-----	150
(b) For prolonged application	10	5	20

24. Section 23.145 is amended by revising paragraphs (b) and (b)(2) through (b)(5); adding a new paragraph (b)(6); and revising paragraphs (c) and (d) to read as follows:

§ 23.145 Longitudinal control.

* * * * *

(b) Unless otherwise required, it must be possible to carry out the following maneuvers without requiring the application of single-handed control forces exceeding those specified in § 23.143(c). The trimming controls must not be adjusted during the maneuvers:

* * * * *

(2) With landing gear and flaps extended, power off, and the airplane as nearly as possible in trim at 1.3 V_{so}, quickly apply takeoff power and retract the flaps as rapidly as possible to the recommended go around setting and allow the airspeed to transition from 1.3 V_{so} to 1.3 V_{s1}. Retract the gear when a positive rate of climb is established.

(3) With landing gear and flaps extended, in level flight, power necessary to attain level flight at 1.1 V_{so}, and the airplane as nearly as possible in trim, it must be possible to maintain approximately level flight while retracting the flaps as rapidly as possible with simultaneous application of not more than maximum continuous power. If gated flap positions are provided, the flap retraction may be demonstrated in stages with power and trim reset for level flight at 1.1 V_{s1} in the initial configuration for each stage--

(i) From the fully extended position to the most extended gated position;

(ii) Between intermediate gated positions, if applicable; and (iii) From the least extended gated position to the fully retracted position.

(4) With power off, flaps and landing gear retracted and the airplane as nearly as possible in trim at 1.4 V_{s1}, apply takeoff power rapidly while maintaining the same airspeed.

(5) With power off, landing gear and flaps extended, and the airplane as nearly as possible in trim at V_{REF}, obtain and maintain airspeeds between 1.1 V_{so} and either 1.7 V_{so} or V_{FE},

whichever is lower without requiring the application of two-handed control forces exceeding those specified in § 23.143(c).

(6) With maximum takeoff power, landing gear retracted, flaps in the takeoff position, and the airplane as nearly as possible in trim at V_{FE} appropriate to the takeoff flap position, retract the flaps as rapidly as possible while maintaining constant speed.

(c) At speeds above V_{MO}/M_{MO}, and up to the maximum speed shown under § 23.251, a maneuvering capability of 1.5 g must be demonstrated to provide a margin to recover from upset or inadvertent speed increase.

(d) It must be possible, with a pilot control force of not more than 10 pounds, to maintain a speed of not more than V_{REF} during a power-off glide with landing gear and wing flaps extended, for any weight of the airplane, up to and including the maximum weight.

* * * * *

25. Section 23.147 is revised to read as follows:

§ 23.147 Directional and lateral control.

(a) For each multiengine airplane, it must be possible, while holding the wings level within five degrees, to make sudden changes in heading safely in both directions. This ability must be shown at 1.4 V_{S1} with heading changes up to 15 degrees, except that the heading change at which the rudder force corresponds to the limits specified in § 23.143 need not be exceeded, with the--

(1) Critical engine inoperative and its propeller in the minimum drag position;

(2) Remaining engines at maximum continuous power;

(3) Landing gear--

(i) Retracted; and

(ii) Extended; and

(4) Flaps retracted.

(b) For each multiengine airplane, it must be possible to regain full control of the airplane without exceeding a bank angle of 45 degrees, reaching a dangerous attitude or encountering dangerous characteristics, in the event of a sudden and complete failure of the critical engine, making allowance for a delay of two seconds in the initiation of recovery action appropriate to the situation, with the airplane initially in trim, in the following conditions:

(1) Maximum continuous power on each engine;

(2) The wing flaps retracted;

(3) The landing gear retracted;

(4) A speed equal to that at which compliance with § 23.69(a) has been shown; and

(5) All propeller controls in the position at which compliance with § 23.69(a) has been shown.

(c) For all airplanes, it must be shown that the airplane is safely controllable without the use of the primary lateral control system in any all-engine configuration(s) and at any speed or altitude within the approved operating envelope. It must also be shown that the airplane's flight characteristics are

not impaired below a level needed to permit continued safe flight and the ability to maintain attitudes suitable for a controlled landing without exceeding the operational and structural limitations of the airplane. If a single failure of any one connecting or transmitting link in the lateral control system would also cause the loss of additional control system(s), the above requirement is equally applicable with those additional systems also assumed to be inoperative.

26. Section 23.149 is revised to read as follows:

§ 23.149 Minimum control speed.

(a) V_{MC} is the calibrated airspeed at which, when the critical engine is suddenly made inoperative, it is possible to maintain control of the airplane with that engine still inoperative, and thereafter maintain straight flight at the same speed with an angle of bank of not more than 5 degrees. The method used to simulate critical engine failure must represent the most critical mode of powerplant failure with respect to controllability expected in service.

(b) V_{MC} for takeoff must not exceed 1.2 V_{S1}, where V_{S1} is determined at the maximum takeoff weight. V_{MC} must be determined with the most unfavorable weight and center of gravity position and with the airplane airborne and the ground effect negligible, for the takeoff configuration(s) with--

(1) Maximum available takeoff power initially on each engine;

(2) The airplane trimmed for takeoff;

(3) Flaps in the takeoff position(s);

(4) Landing gear retracted; and

(5) All propeller controls in the recommended takeoff position throughout.

(c) For all airplanes except reciprocating engine-powered airplanes of 6,000 pounds or less maximum weight, the conditions of paragraph (a) must also be met for the landing configuration with--

(1) Maximum available takeoff power initially on each engine;

(2) The airplane trimmed for an approach, with all engines operating, at V_{REF}, at an approach gradient equal to the steepest used in the landing distance demonstration of § 23.75;

(3) Flaps in the landing position;

(4) Landing gear extended; and

(5) All propeller controls in the position recommended for approach with all engines operating.

(d) A minimum speed to intentionally render the critical engine inoperative must be established and designated as the safe, intentional, one-engine-inoperative speed, V_{SSE}.

(e) At V_{MC}, the rudder pedal force required to maintain control must not exceed 150 pounds and it must not be necessary to reduce power of the operative engine(s). During the maneuver, the airplane must not assume any dangerous attitude and it must be possible to prevent a heading change of more than 20 degrees.

(f) At the option of the applicant, to comply with the requirements of § 23.51(c)(1), V_{MCG} may be determined. V_{MCG} is the

minimum control speed on the ground, and is the calibrated airspeed during the takeoff run at which, when the critical engine is suddenly made inoperative, it is possible to maintain control of the airplane using the rudder control alone (without the use of nosewheel steering), as limited by 150 pounds of force, and using the lateral control to the extent of keeping the wings level to enable the takeoff to be safely continued. In the determination of V_{MCG}, assuming that the path of the airplane accelerating with all engines operating is along the centerline of the runway, its path from the point at which the critical engine is made inoperative to the point at which recovery to a direction parallel to the centerline is completed may not deviate more than 30 feet laterally from the centerline at any point. V_{MCG} must be established with--

(1) The airplane in each takeoff configuration or, at the option of the applicant, in the most critical takeoff configuration;

(2) Maximum available takeoff power on the operating engines;

(3) The most unfavorable center of gravity;

(4) The airplane trimmed for takeoff; and

(5) The most unfavorable weight in the range of takeoff weights.

27. Section 23.153 is amended by revising the introductory paragraph and paragraphs (a), (b), and (c); and by adding new paragraph (d) to read as follows:

§ 23.153 Control during landings.

It must be possible, while in the landing configuration, to safely complete a landing without exceeding the one-hand control force limits specified in § 23.143(c) following an approach to land--

(a) At a speed of V_{REF} minus 5 knots;

(b) With the airplane in trim, or as nearly as possible in trim and without the trimming control being moved throughout the maneuver;

(c) At an approach gradient equal to the steepest used in the landing distance demonstration of § 23.75; and

(d) With only those power changes, if any, that would be made when landing normally from an approach at V_{REF}.

28. Section 23.155 is amended by revising the introductory text of paragraph (b) and paragraph (b)(1), and by adding a new paragraph (c) to read as follows:

§ 23.155 Elevator control force in maneuvers.

* * * * *

(b) The requirement of paragraph (a) of this section must be met at 75 percent of maximum continuous power for reciprocating engines, or the maximum continuous power for turbine engines, and with the wing flaps and landing gear retracted--

(1) In a turn, with the trim setting used for wings level flight at V_o; and

* * * * *

(c) There must be no excessive decrease in the gradient of the curve of stick force versus maneuvering load factor with increasing load factor.

29. Section 23.157 is amended by revising paragraph (d) to read as follows:

§ 23.157 Rate of roll.

* * * * *

(d) The requirement of paragraph (c) must be met when rolling the airplane in each direction in the following conditions--

(1) Flaps in the landing position(s);

(2) Landing gear extended;

(3) All engines operating at the power for a 3 degree approach; and

(4) The airplane trimmed at V_{REF}.

30. Section 23.161 is amended by revising paragraphs (a), (b)(1), (b)(2), (c), the introductory text of paragraph (d), and (d)(4), and by adding a new paragraph (e) to read as follows:

§ 23.161 Trim.

(a) General. Each airplane must meet the trim requirements of this section after being trimmed and without further pressure upon, or movement of, the primary controls or their corresponding trim controls by the pilot or the automatic pilot. In addition, it must be possible, in other conditions of loading, configuration, speed and power to ensure that the pilot will not

be unduly fatigued or distracted by the need to apply residual control forces exceeding those for prolonged application of § 23.143(c). This applies in normal operation of the airplane and, if applicable, to those conditions associated with the failure of one engine for which performance characteristics are established.

(b) * * *

(1) For normal, utility, and acrobatic category airplanes, at a speed of 0.9 V_H, V_C, or V_{MO}/M_{MO}, whichever is lowest; and

(2) For commuter category airplanes, at all speeds from 1.4 V_{S1} to the lesser of V_H or V_{MO}/M_{MO}.

(c) Longitudinal trim. The airplane must maintain longitudinal trim under each of the following conditions:

(1) A climb with--

(i) Takeoff power, landing gear retracted, wing flaps in the takeoff position(s), at the speeds used in determining the climb performance required by § 23.65; and

(ii) Maximum continuous power at the speeds and in the configuration used in determining the climb performance required by § 23.69(a).

(2) Level flight at all speeds from the lesser of V_H and either V_{MO} or V_{MO}/M_{MO} (as appropriate), to 1.4 V_{S1}, with the landing gear and flaps retracted.

(3) A descent at V_{MO} or V_{MO}/M_{MO}, whichever is applicable, with power off and with the landing gear and flaps retracted.

(4) Approach with landing gear extended and with--

(i) A 3 degree angle of descent, with flaps retracted and at a speed of 1.4 V_{S1};

(ii) A 3 degree angle of descent, flaps in the landing position(s) at V_{REF}; and

(iii) An approach gradient equal to the steepest used in the landing distance demonstrations of § 23.75, flaps in the landing position(s) at V_{REF}.

(d) In addition, each multiengine airplane must maintain longitudinal and directional trim, and the lateral control force must not exceed 5 pounds at the speed used in complying with § 23.67(a), (b)(2), or (c)(3), as appropriate, with--

* * * * *

(4) Wing flaps retracted; and

* * * * *

(e) In addition, each commuter category airplane for which, in the determination of the takeoff path in accordance with § 23.57, the climb in the takeoff configuration at V_2 extends beyond 400 feet above the takeoff surface, it must be possible to reduce the longitudinal and lateral control forces to 10 pounds and 5 pounds, respectively, and the directional control force must not exceed 50 pounds at V_2 with--

(1) The critical engine inoperative and its propeller in the minimum drag position;

(2) The remaining engine(s) at takeoff power;

(3) Landing gear retracted;

(4) Wing flaps in the takeoff position(s); and

(5) An angle of bank not exceeding 5 degrees.

31. Section 23.175 is revised to read as follows:

§ 23.175 Demonstration of static longitudinal stability.

Static longitudinal stability must be shown as follows:

(a) Climb. The stick force curve must have a stable slope at speeds between 85 and 115 percent of the trim speed, with--

(1) Flaps retracted;

(2) Landing gear retracted;

(3) Maximum continuous power; and

(4) The airplane trimmed at the speed used in determining the climb performance required by § 23.69(a).

(b) Cruise. With flaps and landing gear retracted and the airplane in trim with power for level flight at representative cruising speeds at high and low altitudes, including speeds up to V_{NO} or V_{MO}/M_{MO}, as appropriate, except that the speed need not exceed V_H--

(1) For normal, utility, and acrobatic category airplanes, the stick force curve must have a stable slope at all speeds within a range that is the greater of 15 percent of the trim speed plus the resulting free return speed range, or 40 knots plus the resulting free return speed range, above and below the trim speed, except that the slope need not be stable--

(i) At speeds less than 1.3 V_{S1}; or

(ii) For airplanes with V_{NE} established under § 23.1505(a), at speeds greater than V_{NE}; or

(iii) For airplanes with V_{NO}/M_{NO} established under § 23.1505(c), at speeds greater than V_{FC}/M_{FC}.

(2) For commuter category airplanes, the stick force curve must have a stable slope at all speeds within a range of 50 knots plus the resulting free return speed range, above and below the trim speed, except that the slope need not be stable--

(i) At speeds less than 1.4 V_{S1}; or

(ii) At speeds greater than V_{FC}/M_{FC}; or

(iii) At speeds that require a stick force greater than 50 pounds.

(c) Landing. The stick force curve must have a stable slope at speeds between 1.1 V_{S1} and 1.8 V_{S1} with--

(1) Flaps in the landing position;

(2) Landing gear extended; and

(3) The airplane trimmed at--

(i) V_{REF}, or the minimum trim speed if higher, with power off; and

(ii) V_{REF} with enough power to maintain a 3 degree angle of descent.

32. Section 23.177 is revised to read as follows:

§ 23.177 Static directional and lateral stability.

(a) The static directional stability, as shown by the tendency to recover from a wings level sideslip with the rudder free, must be positive for any landing gear and flap position appropriate to the takeoff, climb, cruise, approach, and landing configurations. This must be shown with symmetrical power up to maximum continuous power, and at speeds from 1.2 V_{S1} up to the maximum allowable speed for the condition being investigated.

The angle of sideslip for these tests must be appropriate to the type of airplane. At larger angles of sideslip, up to that at which full rudder is used or a control force limit in § 23.143 is reached, whichever occurs first, and at speeds from 1.2 V_{s1} to V_o, the rudder pedal force must not reverse.

(b) The static lateral stability, as shown by the tendency to raise the low wing in a sideslip, must be positive for all landing gear and flap positions. This must be shown with symmetrical power up to 75 percent of maximum continuous power at speeds above 1.2 V_{s1} in the takeoff configuration(s) and at speeds above 1.3 V_{s1} in other configurations, up to the maximum allowable speed for the configuration being investigated, in the takeoff, climb, cruise, and approach configurations. For the landing configuration, the power must be up to that necessary to maintain a 3 degree angle of descent in coordinated flight. The static lateral stability must not be negative at 1.2 V_{s1} in the takeoff configuration, or at 1.3 V_{s1} in other configurations. The angle of sideslip for these tests must be appropriate to the type of airplane, but in no case may the constant heading sideslip angle be less than that obtainable with a 10 degree bank, or if less, the maximum bank angle obtainable with full rudder deflection or 150 pound rudder force.

(c) Paragraph (b) of this section does not apply to acrobatic category airplanes certificated for inverted flight.

(d) In straight, steady slips at 1.2 V_{s1} for any landing gear and flap positions, and for any symmetrical power conditions up to 50 percent of maximum continuous power, the aileron and

rudder control movements and forces must increase steadily, but not necessarily in constant proportion, as the angle of sideslip is increased up to the maximum appropriate to the type of airplane. At larger slip angles, up to the angle at which full rudder or aileron control is used or a control force limit contained in § 23.143 is reached, the aileron and rudder control movements and forces must not reverse as the angle of sideslip is increased. Rapid entry into, and recovery from, a maximum sideslip considered appropriate for the airplane must not result in uncontrollable flight characteristics.

33. Section 23.201 is revised to read as follows:

§ 23.201 Wings level stall.

(a) It must be possible to produce and to correct roll by unreversed use of the rolling control and to produce and to correct yaw by unreversed use of the directional control, up to the time the airplane stalls.

(b) The wings level stall characteristics must be demonstrated in flight as follows. Starting from a speed at least 10 knots above the stall speed, the elevator control must be pulled back so that the rate of speed reduction will not exceed one knot per second until a stall is produced, as shown by either:

(1) An uncontrollable downward pitching motion of the airplane; or

(2) A downward pitching motion of the airplane that results from the activation of a stall avoidance device (for example, stick pusher); or

(3) The control reaching the stop.

(c) Normal use of elevator control for recovery is allowed after the downward pitching motion of (b)(1) or (b)(2) has unmistakably been produced, or after the control has been held against the stop for not less than the longer of two seconds or the time employed in the minimum steady flight speed determination of § 23.49.

(d) During the entry into and the recovery from the maneuver, it must be possible to prevent more than 15 degrees of roll or yaw by the normal use of controls.

(e) Compliance with the requirements of this section must be shown under the following conditions:

(1) Wing flaps. Retracted, fully extended, and each intermediate normal operating position.

(2) Landing gear. Retracted and extended.

(3) Cowl flaps. Appropriate to configuration.

(4) Power:

(i) Power off; and

(ii) 75 percent of maximum continuous power. However, if the power-to-weight ratio at 75 percent of maximum continuous power results in extreme nose-up attitudes, the test may be carried out with the power required for level flight in the landing configuration at maximum landing weight and a speed of

1.4 V_{so}, except that the power may not be less than 50 percent of maximum continuous power.

(5) Trim. The airplane trimmed at a speed as near 1.5 V_{s1} as practicable.

(6) Propeller. Full increase r.p.m. position for the power off condition.

34. Section 23.203 is amended by revising the heading and introductory text and by revising paragraph (a), the introductory text of paragraph (b), paragraphs (b)(4) and (b)(5), the introductory text of paragraph (c), and paragraphs (c)(1) and (c)(4), and by adding new paragraphs (b)(6) and (c)(6) to read as follows:

§ 23.203 Turning flight and accelerated turning stalls.

Turning flight and accelerated turning stalls must be demonstrated in tests as follows:

(a) Establish and maintain a coordinated turn in a 30 degree bank. Reduce speed by steadily and progressively tightening the turn with the elevator until the airplane is stalled, as defined in § 23.201(b). The rate of speed reduction must be constant, and--

(1) For a turning flight stall, may not exceed one knot per second; and

(2) For an accelerated turning stall, be 3 to 5 knots per second with steadily increasing normal acceleration.

(b) After the airplane has stalled, as defined in § 23.201(b), it must be possible to regain wings level flight by

normal use of the flight controls, but without increasing power and without--

* * * * *

(4) Exceeding a bank angle of 60 degrees in the original direction of the turn or 30 degrees in the opposite direction in the case of turning flight stalls;

(5) Exceeding a bank angle of 90 degrees in the original direction of the turn or 60 degrees in the opposite direction in the case of accelerated turning stalls; and

(6) Exceeding the maximum permissible speed or allowable limit load factor.

(c) Compliance with the requirements of this section must be shown under the following conditions:

(1) Wing flaps: Retracted, fully extended, and each intermediate normal operating position;

* * * * *

(4) Power:

(i) Power off; and

(ii) 75 percent of maximum continuous power. However, if the power-to-weight ratio at 75 percent of maximum continuous power results in extreme nose-up attitudes, the test may be carried out with the power required for level flight in the landing configuration at maximum landing weight and a speed of 1.4 V_{so}, except that the power may not be less than 50 percent of maximum continuous power.

* * * * *

(6) Propeller. Full increase r.p.m. position for the power off condition.

§ 23.205 [Removed]

35. Section 23.205 is removed.

36. Section 23.207 is amended by revising paragraphs (c) and (d), and by adding new paragraphs (e) and (f) to read as follows:

§ 23.207 Stall warning.

* * * * *

(c) During the stall tests required by § 23.201(b) and § 23.203(a)(1), the stall warning must begin at a speed exceeding the stalling speed by a margin of not less than 5 knots and must continue until the stall occurs.

(d) When following the procedures furnished in accordance with § 23.1585, the stall warning must not occur during a takeoff with all engines operating, a takeoff continued with one engine inoperative, or during an approach to landing.

(e) During the stall tests required by § 23.203(a)(2), the stall warning must begin sufficiently in advance of the stall for the stall to be averted by pilot action taken after the stall warning first occurs.

(f) For acrobatic category airplanes, an artificial stall warning may be mutable, provided that it is armed automatically during takeoff and rearmed automatically in the approach configuration.

37. Section 23.221 is revised to read as follows:

§ 23.221 Spinning.

(a) Normal category airplanes. A single-engine, normal category airplane must be able to recover from a one-turn spin or a three-second spin, whichever takes longer, in not more than one additional turn after initiation of the first control action for recovery, or demonstrate compliance with the optional spin resistant requirements of this section.

(1) The following apply to one turn or three second spins:

(i) For both the flaps-retracted and flaps-extended conditions, the applicable airspeed limit and positive limit maneuvering load factor must not be exceeded;

(ii) No control forces or characteristic encountered during the spin or recovery may adversely affect prompt recovery;

(iii) It must be impossible to obtain unrecoverable spins with any use of the flight or engine power controls either at the entry into or during the spin; and

(iv) For the flaps-extended condition, the flaps may be retracted during the recovery but not before rotation has ceased.

(2) At the applicant's option, the airplane may be demonstrated to be spin resistant by the following:

(i) During the stall maneuver contained in § 23.201, the pitch control must be pulled back and held against the stop. Then, using ailerons and rudders in the proper direction, it must

be possible to maintain wings-level flight within 15 degrees of bank and to roll the airplane from a 30 degree bank in one direction to a 30 degree bank in the other direction;

(ii) Reduce the airplane speed using pitch control at a rate of approximately one knot per second until the pitch control reaches the stop; then, with the pitch control pulled back and held against the stop, apply full rudder control in a manner to promote spin entry for a period of seven seconds or through a 360 degree heading change, whichever occurs first. If the 360 degree heading change is reached first, it must have taken no fewer than four seconds. This maneuver must be performed first with the ailerons in the neutral position, and then with the ailerons deflected opposite the direction of turn in the most adverse manner. Power and airplane configuration must be set in accordance with § 23.201(e) without change during the maneuver. At the end of seven seconds or a 360 degree heading change, the airplane must respond immediately and normally to primary flight controls applied to regain coordinated, unstalled flight without reversal of control effect and without exceeding the temporary control forces specified by § 23.143(c); and

(iii) Compliance with §§ 23.201 and 23.203 must be demonstrated with the airplane in uncoordinated flight, corresponding to one ball width displacement on a slip-skid indicator, unless one ball width displacement cannot be obtained with full rudder, in which case the demonstration must be with full rudder applied.

(b) Utility category airplanes. A utility category airplane must meet the requirements of paragraph (a) of this section. In addition, the requirements of paragraph (c) of this section and § 23.807(b)(7) must be met if approval for spinning is requested.

(c) Acrobatic category airplanes. An acrobatic category airplane must meet the spin requirements of paragraph (a) of this section and § 23.807(b)(6). In addition, the following requirements must be met in each configuration for which approval for spinning is requested:

(1) The airplane must recover from any point in a spin up to and including six turns, or any greater number of turns for which certification is requested, in not more than one and one-half additional turns after initiation of the first control action for recovery. However, beyond three turns, the spin may be discontinued if spiral characteristics appear.

(2) The applicable airspeed limits and limit maneuvering load factors must not be exceeded. For flaps-extended configurations for which approval is requested, the flaps must not be retracted during the recovery.

(3) It must be impossible to obtain unrecoverable spins with any use of the flight or engine power controls either at the entry into or during the spin.

(4) There must be no characteristics during the spin (such as excessive rates of rotation or extreme oscillatory motion) that might prevent a successful recovery due to disorientation or incapacitation of the pilot.

38. Section 23.233 is amended by revising paragraph (a) to read as follows:

§ 23.233 Directional stability and control.

(a) A 90 degree cross-component of wind velocity, demonstrated to be safe for taxiing, takeoff, and landing must be established and must be not less than 0.2 V_{so}.

* * * * *

39. Section 23.235 is revised to read as follows:

§ 23.235 Operation on unpaved surfaces.

The airplane must be demonstrated to have satisfactory characteristics and the shock-absorbing mechanism must not damage the structure of the airplane when the airplane is taxied on the roughest ground that may reasonably be expected in normal operation and when takeoffs and landings are performed on unpaved runways having the roughest surface that may reasonably be expected in normal operation.

40. A new § 23.237 is added to read as follows:

§ 23.237 Operation on water.

A wave height, demonstrated to be safe for operation, and any necessary water handling procedures for seaplanes and amphibians must be established.

41. Section 23.253 is amended by removing paragraph (b)(1) and by redesignating paragraphs (b)(2) and (b)(3) as paragraphs (b)(1) and (b)(2).

42. Section 23.562 is amended by revising paragraph (d) to read as follows:

§ 23.562 Emergency landing dynamic conditions.

* * * * *

(d) For all single-engine airplanes with a V_{so} of more than 61 knots at maximum weight, and those multiengine airplanes of 6,000 pounds or less maximum weight with a V_{so} of more than 61 knots at maximum weight that do not comply with § 23.67(a)(1);

* * * * *

§ 23.1323 [Amended]

43. Section 23.1323 is amended by removing paragraph (f).

44. Section 23.1325 is amended by revising paragraph (e), by deleting paragraph (f), and by redesignating paragraph (g) as (f), to read as follows:

§ 23.1325 Static pressure system.

* * * * *

(e) Each static pressure system must be calibrated in flight to determine the system error. The system error, in indicated pressure altitude, at sea-level, with a standard atmosphere, excluding instrument calibration error, may not exceed ± 30 feet per 100 knot speed for the appropriate

configuration in the speed range between 1.3 V_{so} with flaps extended, and 1.8 V_{s1} with flaps retracted. However, the error need not be less than 30 feet.

* * * * *

45. Section 23.1511 is amended by revising paragraphs (a)(1) and (a)(2) to read as follows:

§ 23.1511 Flap extended speed.

(a) * * *

(1) Not less than the minimum value of V_F allowed in § 23.345(b); and

(2) Not more than V_F established under § 23.345(a), (c), and (d).

* * * * *

46. Section 23.1521 is amended by revising paragraphs (b)(5) and (e) to read as follows:

§ 23.1521 Powerplant limitations.

* * * * *

(b) * * *

(5) The maximum allowable cylinder head (as applicable), liquid coolant and oil temperatures.

* * * * *

(e) Ambient temperature. For all airplanes except reciprocating engine-powered airplanes of 6,000 pounds or less maximum weight, ambient temperature limitations (including limitations for winterization installations if applicable) must

be established as the maximum ambient atmospheric temperature at which compliance with the cooling provisions of §§ 23.1041 through 23.1047 is shown.

47. Section 23.1543 is amended by adding a new paragraph (c) to read as follows:

§ 23.1543 Instrument markings: general.

* * * * *

(c) All related instruments must be calibrated in compatible units.

48. Section 23.1545 is amended by revising paragraphs (b)(5) and (b)(6) to read as follows:

§ 23.1545 Airspeed indicator.

* * * * *

(b) * * *

(5) For reciprocating multiengine-powered airplanes of 6,000 pounds or less maximum weight, for the speed at which compliance has been shown with § 23.69(b) relating to rate of climb at maximum weight and at sea level, a blue radial line.

(6) For reciprocating multiengine-powered airplanes of 6,000 pounds or less maximum weight, for the maximum value of minimum control speed, V_{MC}, (one-engine-inoperative) determined under § 23.149(b), a red radial line.

* * * * *

49. Section 23.1553 is revised to read as follows:

§ 23.1553 Fuel quantity indicator.

A red radial line must be marked on each indicator at the calibrated zero reading, as specified in § 23.1337(b)(1).

50. Section 23.1555 is amended by revising paragraph (e)(2) to read as follows:

§ 23.1555 Control markings.

* * * * *

(e) * * *

(2) Each emergency control must be red and must be marked as to method of operation. No control other than an emergency control shall be this color.

51. Section 23.1559 is revised to read as follows:

§ 23.1559 Operating limitations placard.

(a) There must be a placard in clear view of the pilot stating--

(1) That the airplane must be operated in accordance with the Airplane Flight Manual; and

(2) The certification category of the airplane to which the placards apply.

(b) For airplanes certificated in more than one category, there must be a placard in clear view of the pilot stating that other limitations are contained in the Airplane Flight Manual.

(c) There must be a placard in clear view of the pilot that specifies the kind of operations to which the operation of the

airplane is limited or from which it is prohibited under § 23.1525.

52. Section 23.1563 is amended by adding a new paragraph (c) to read as follows:

§ 23.1563 Airspeed placards.

* * * * *

(c) For reciprocating multiengine-powered airplanes of more than 6,000 pounds maximum weight, and turbine engine-powered airplanes, the maximum value of the minimum control speed, V_{MC}, (one-engine-inoperative) determined under § 23.149(b).

53. Section 23.1567 is amended by adding a new paragraph (d) to read as follows:

§ 23.1567 Flight maneuver placard.

* * * * *

(d) For acrobatic category airplanes and utility category airplanes approved for spinning, there must be a placard in clear view of the pilot--

(1) Listing the control actions for recovery from spinning maneuvers; and

(2) Stating that recovery must be initiated when spiral characteristics appear, or after not more than six turns or not more than any greater number of turns for which the airplane has been certificated.

54. Section 23.1581 is amended by adding new paragraphs (a)(3) and (c), and by revising the introductory text of paragraph (b)(2) and paragraph (d) to read as follows:

§ 23.1581 General.

(a) * * *

(3) Further information necessary to comply with the relevant operating rules.

(b) * * *

(2) The requirements of paragraph (b)(1) of this section do not apply to reciprocating engine-powered airplanes of 6,000 pounds or less maximum weight, if the following is met:

* * * * *

(c) The units used in the Airplane Flight Manual must be the same as those marked on the appropriate instruments and placards.

(d) All Airplane Flight Manual operational airspeeds, unless otherwise specified, must be presented as indicated airspeeds.

* * * * *

55. Section 23.1583 is amended by revising the introductory text of the section, and paragraphs (a), (a)(3)(i), (b), (c), (c)(3) through (c)(6), (d), (e), (f), and (g); by revising paragraphs (k), (l), and (m) and redesignating them as paragraphs (i), (j), and (k), respectively; and by adding new paragraphs (l), (m), (n), (o), and (p) to read as follows:

§ 23.1583 Operating limitations.

The Airplane Flight Manual must contain operating limitations determined under part 23, including tne following--

(a) Airspeed limitations.

* * * * *

(3) In addition, for turbine powered commuter category airplanes--

(i) The maximum operating limit speed, V_{MO}/M_{MO} and a statement that this speed must not be deliberately exceeded in any regime of flight (climb, cruise or descent) unless a higher speed is authorized for flight test or pilot training;

* * * * *

(b) Powerplant limitations.

* * * * *

(c) Weight.

* * * * *

(3) For normal, utility, and acrobatic category reciprocating engine-powered airplanes of more than 6,000 pounds maximum weight and for turbine engine-powered airplanes in the normal, utility, and acrobatic category, performance operating limitations as follows--

(i) The maximum takeoff weight for each airport altitude and ambient temperature within the range selected by the applicant at which the airplane complies with the climb requirements of § 23.63(c)(1).

(ii) The maximum landing weight for each airport altitude and ambient temperature within the range selected by the

applicant at which the airplane complies with the climb requirements of § 23.63(c)(2).

(4) For commuter category airplanes, the maximum takeoff weight for each airport altitude and ambient temperature within the range selected by the applicant at which--

(i) The airplane complies with the climb requirements of § 23.63(d)(1); and

(ii) The accelerate-stop distance determined under § 23.55 is equal to the available runway length plus the length of any stopway, if utilized; and either:

(iii) The takeoff distance determined under § 23.59(a) is equal to the available runway length; or

(iv) At the option of the applicant, the takeoff distance determined under § 23.59(a) is equal to the available runway length plus the length of any clearway and the takeoff run determined under § 23.59(b) is equal to the available runway length.

(5) For commuter category airplanes, the maximum landing weight for each airport altitude within the range selected by the applicant at which--

(i) The airplane complies with the climb requirements of § 23.63(d)(2) for ambient temperatures within the range selected by the applicant; and

(ii) The landing distance determined under § 23.75 for standard temperatures is equal to the available runway length.

(6) The maximum zero wing fuel weight, where relevant, as established in accordance with § 23.343.

(d) Center of gravity. The established center of gravity limits.

(e) Maneuvers. The following authorized maneuvers, appropriate airspeed limitations, and unauthorized maneuvers, as prescribed in this section.

(1) Normal category airplanes. No acrobatic maneuvers, including spins, are authorized.

(2) Utility category airplanes. A list of authorized maneuvers demonstrated in the type flight tests, together with recommended entry speeds and any other associated limitations. No other maneuver is authorized.

(3) Acrobatic category airplanes. A list of approved flight maneuvers demonstrated in the type flight tests, together with recommended entry speeds and any other associated limitations.

(4) Acrobatic category airplanes and utility category airplanes approved for spinning. Spin recovery procedure established to show compliance with § 23.221(c).

(5) Commuter category airplanes. Maneuvers are limited to any maneuver incident to normal flying, stalls (except whip stalls) and steep turns in which the angle of bank is not more than 60 degrees.

(f) Maneuver load factor. The positive limit load factors in g's, and, in addition, the negative limit load factor for acrobatic category airplanes.

(g) Minimum flight crew. The number and functions of the minimum flight crew determined under § 23.1523.

* * * * *

(i) Maximum operating altitude. The maximum altitude established under § 23.1527.

(j) Maximum passenger seating configuration. The maximum passenger seating configuration.

(k) Allowable lateral fuel loading. The maximum allowable lateral fuel loading differential, if less than the maximum possible.

(l) Baggage and cargo loading. The following information for each baggage and cargo compartment or zone--

(1) The maximum allowable load; and

(2) The maximum intensity of loading.

(m) Systems. Any limitations on the use of airplane systems and equipment.

(n) Ambient temperatures. Where appropriate, maximum and minimum ambient air temperatures for operation.

(o) Smoking. Any restrictions on smoking in the airplane.

(p) Types of surface. A statement of the types of surface on which operations may be conducted. (See § 23.45(g) and § 23.1587(a)(4), (c)(2), and (d)(4)).

56. Section 23.1585 is revised to read as follows:

§ 23.1585 Operating procedures.

(a) For all airplanes, information concerning normal, abnormal (if applicable), and emergency procedures and other pertinent information necessary for safe operation and the

achievement of the scheduled performance must be furnished, including--

(1) An explanation of significant or unusual flight or ground handling characteristics;

(2) The maximum demonstrated values of crosswind for takeoff and landing, and procedures and information pertinent to operations in crosswinds;

(3) A recommended speed for flight in rough air. This speed must be chosen to protect against the occurrence, as a result of gusts, of structural damage to the airplane and loss of control (for example, stalling);

(4) Procedures for restarting any turbine engine in flight, including the effects of altitude; and

(5) Procedures, speeds, and configuration(s) for making a normal approach and landing, in accordance with §§ 23.73 and 23.75, and a transition to the balked landing condition.

(6) For seaplanes and amphibians, water handling procedures and the demonstrated wave height.

(b) In addition to paragraph (a) of this section, for all single-engine airplanes, the procedures, speeds, and configuration(s) for a glide following engine failure, in accordance with § 23.71 and the subsequent forced landing, must be furnished.

(c) In addition to paragraph (a) of this section, for all multiengine airplanes, the following information must be furnished:

(1) Procedures, speeds, and configuration(s) for making an approach and landing with one engine inoperative;

(2) Procedures, speeds, and configuration(s) for making a balked landing with one engine inoperative and the conditions under which a balked landing can be performed safely, or a warning against attempting a balked landing;

(3) The V_{SSE} determined in § 23.149; and

(4) Procedures for restarting any engine in flight including the effects of altitude.

(d) In addition to paragraphs (a) and either (b) or (c) of this section, as appropriate, for all normal, utility, and acrobatic category airplanes, the following information must be furnished:

(1) Procedures, speeds, and configuration(s) for making a normal takeoff, in accordance with § 23.51(a) and (b), and § 23.53(a) and (b), and the subsequent climb, in accordance with § 23.65 and § 23.69(a).

(2) Procedures for abandoning a takeoff due to engine failure or other cause.

(e) In addition to paragraphs (a), (c), and (d) of this section, for all normal, utility, and acrobatic category multiengine airplanes, the information must include the following:

(1) Procedures and speeds for continuing a takeoff following engine failure and the conditions under which takeoff can safely be continued, or a warning against attempting to continue the takeoff.

(2) Procedures, speeds, and configurations for continuing a climb following engine failure, after takeoff, in accordance with § 23.67, or enroute, in accordance with § 23.69(b).

(f) In addition to paragraphs (a) and (c) of this section, for commuter category airplanes, the information must include the following:

(1) Procedures, speeds, and configuration(s) for making a normal takeoff.

(2) Procedures and speeds for carrying out an accelerate-stop in accordance with § 23.55.

(3) Procedures and speeds for continuing a takeoff following engine failure in accordance with § 23.59(a)(1) and for following the flight path determined with § 23.57 and § 23.61(a).

(g) For multiengine airplanes, information identifying each operating condition in which the fuel system independence prescribed in § 23.953 is necessary for safety must be furnished, together with instructions for placing the fuel system in a configuration used to show compliance with that section.

(h) For each airplane showing compliance with § 23.1353(g)(2) or (g)(3), the operating procedures for disconnecting the battery from its charging source must be furnished.

(i) Information on the total quantity of usable fuel for each fuel tank, and the effect on the usable fuel quantity, as a result of a failure of any pump, must be furnished.

(j) Procedures for the safe operation of the airplane's systems and equipment, both in normal use and in the event of malfunction, must be furnished.

57. Section 23.1587 is revised to read as follows:

§ 23.1587 Performance information.

Unless otherwise prescribed, performance information must be provided over the altitude and temperature ranges required by § 23.45(b).

(a) For all airplanes, the following information must be furnished--

(1) The stalling speeds V_{so} and V_{s1} with the landing gear and wing flaps retracted, determined at maximum weight under § 23.49, and the effect on these stalling speeds of angles of bank up to 60 degrees;

(2) The steady rate and gradient of climb with all engines operating, determined under § 23.69(a);

(3) The landing distance, determined under § 23.75 for each airport altitude and standard temperature, and the type of surface for which it is valid;

(4) The effect on landing distances of operation on other than smooth hard surfaces, when dry, determined under § 23.45(g); and

(5) The effect on landing distances of runway slope and 50 percent of the headwind component and 150 percent of the tailwind component.

(b) In addition to paragraph (a) of this section, for all normal, utility, and acrobatic category reciprocating engine-powered airplanes of 6,000 pounds or less maximum weight, the steady angle of climb/descent, determined under § 23.77(a), must be furnished.

(c) In addition to paragraphs (a) and (b) of this section, if appropriate, for normal, utility, and acrobatic category airplanes, the following information must be furnished--

(1) The takeoff distance, determined under § 23.53 and the type of surface for which it is valid.

(2) The effect on takeoff distance of operation on other than smooth hard surfaces, when dry, determined under § 23.45(g);

(3) The effect on takeoff distance of runway slope and 50 percent of the headwind component and 150 percent of the tailwind component;

(4) For multiengine reciprocating engine-powered airplanes of more than 6,000 pounds maximum weight and multiengine turbine powered airplanes, the one-engine-inoperative takeoff climb/descent gradient, determined under § 23.66;

(5) For multiengine airplanes, the enroute rate and gradient of climb/descent with one engine inoperative, determined under § 23.69(b); and

(6) For single-engine airplanes, the glide performance determined under § 23.71.

(d) In addition to paragraph (a) of this section, for commuter category airplanes, the following information must be furnished--

(1) The accelerate-stop distance determined under § 23.55;

(2) The takeoff distance determined under § 23.59(a);

(3) At the option of the applicant, the takeoff run determined under § 23.59(b);

(4) The effect on accelerate-stop distance, takeoff distance and, if determined, takeoff run, of operation on other than smooth hard surfaces, when dry, determined under § 23.45(g);

(5) The effect on accelerate-stop distance, takeoff distance, and if determined, takeoff run, of runway slope and 50 percent of the headwind component and 150 percent of the tailwind component;

(6) The net takeoff flight path determined under § 23.61(b);

(7) The enroute gradient of climb/descent with one engine inoperative, determined under § 23.69(b);

(8) The effect, on the net takeoff flight path and on the enroute gradient of climb/descent with one engine inoperative, of 50 percent of the headwind component and 150 percent of the tailwind component;

(9) Overweight landing performance information (determined by extrapolation and computed for the range of weights between the maximum landing and maximum takeoff weights) as follows--

(i) The maximum weight for each airport altitude and ambient temperature at which the airplane complies with the climb requirements of § 23.63(d)(2); and

(ii) The landing distance determined under § 23.75 for each airport altitude and standard temperature.

(10) The relationship between IAS and CAS determined in accordance with § 23.1323(b) and (c).

(11) The altimeter system calibration required by § 23.1325(e).

58. Section 23.1589 is amended by revising paragraph (b) to read as follows:

§ 23.1589 Loading information.

* * * * *

(b) Appropriate loading instructions for each possible loading condition between the maximum and minimum weights established under § 23.25, to facilitate the center of gravity remaining within the limits established under § 23.23.

Appendix E - [Removed]

59. Appendix E is removed.

Issued in Washington, DC, on

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revised February 11, 1994

U.S. Department
of Transportation

**Federal Aviation
Administration**

Memorandum

JUL 27 1993

Subject: INFORMATION: Regulatory Evaluation of the Proposed Rule for Part 23 Flight Harmonization

Date:

From: Manager, Aircraft Regulatory Analysis Branch, APO-320

Reply to Attn. of:

To: Manager, Standards Office, ACE-110

Attached are the Preliminary Regulatory Evaluation, Initial Regulatory Flexibility Determination, and Trade Impact Assessment for the proposed rule. Also attached are corresponding summaries for insertion into the preamble. If you have any questions, please contact Marilyn DonCarlos at (202) 267-3319.

Ward L. Keech

Ward L. Keech

Attachments

PREAMBLE SUMMARIES

Preliminary Regulatory Evaluation, Initial Regulatory Flexibility Determination, and Trade Impact Assessment

Three principal requirements pertain to the economic impacts of regulatory changes to the FARs. First, Executive Order 12291 directs Federal agencies to promulgate new regulations or modify existing regulations only if the expected benefits to society outweigh the expected costs. Second, the Regulatory Flexibility Act of 1980 requires agencies to analyze the economic impact of regulatory changes on small entities. Finally, the Office of Management and Budget directs agencies to assess the effects of regulatory changes on international trade. In conducting these analyses, the FAA has determined that this rule: 1) would generate benefits exceeding costs and is neither major as defined in the Executive Order nor significant as defined in DOT's Policies and Procedures; 2) would not have a significant impact on a substantial number of small entities; and 3) would lessen restraints on international trade. These analyses, available in the docket, are summarized below.

Regulatory Evaluation Summary

Of the 55 sections that would be amended or added in this proposed rule, the FAA has identified 15 that could result in additional compliance costs to one or more airplane categories. Amendments to five sections could result in cost savings. The greatest costs would be incurred by manufacturers of WAT limited airplanes (e.g., multiengine airplanes with maximum weights of more than 6,000 pounds). When amortized over a production run, the quantified incremental

costs would be relatively modest -- less than $100 per airplane. The FAA solicits comments concerning the incremental certification/development costs attributable to the proposed rule.

The primary benefit of the proposed rule would be the cost efficiencies of harmonization with the JAR for those manufacturers that choose to market airplanes in JAA countries as well as to manufacturers in JAA countries that choose to market airplanes in the U.S. Other benefits of the proposed rule would be decreased reliance on special conditions, simplification of the certification process through clarification of existing requirements, and increased flexibility through optional designs.

Regulatory Flexibility Determination

The Regulatory Flexibility Act of 1980 (RFA) was enacted by Congress to ensure that small entities are not unnecessarily and disproportionately burdened by Federal regulations. The RFA requires a Regulatory Flexibility Analysis if a proposed rule would have a significant economic impact, either detrimental or beneficial, on a substantial number of small entities. Based on FAA Order 2100.14A, Regulatory Flexibility Criteria and Guidance, the FAA has determined that the proposed amendments would not have a significant economic impact on a substantial number of small entities.

International Trade Impact Assessment

The proposed rule would not constitute a barrier to international trade, including the export of American airplanes to foreign countries and the import of foreign airplanes into the United States. Instead, the proposed flight

certification procedures have been harmonized with those of the JAA and would lessen restraints on trade.

PRELIMINARY REGULATORY EVALUATION, INITIAL REGULATORY FLEXIBILITY DETERMINATION, AND TRADE IMPACT ASSESSMENT

PROPOSED RULE
AIRWORTHINESS STANDARDS: FLIGHT

14 CFR
PART 1
PART 23

OFFICE OF POLICY, PLANS, AND MANAGEMENT ANALYSIS
AIRCRAFT REGULATORY ANALYSIS BRANCH, APO-320
Marilyn DonCarlos
July 1993

TABLE OF CONTENTS

EXECUTIVE SUMMARY

This regulatory evaluation examines the economic impacts of a proposed rule that would amend the flight airworthiness standards of part 23 of the Federal Aviation Regulations (FAR). The proposed rule would provide nearly uniform flight airworthiness standards for airplanes certificated in the United States and in the countries of the Joint Aviation Authorities (JAA). In addition, it would formalize standards already being practiced by manufacturers, enhance design flexibility, decrease reliance on special conditions, clarify existing requirements, add definitions, and correct editorial errors. Finally, the proposed rule is expected to enhance safety.

The per airplane costs of the proposed rule, when amortized over the production run of a type certification, would be minor when compared with the expected benefits. The FAA estimates that the average incremental costs per airplane would be less than $100.

The primary benefit would be harmonization with the Joint Aviation Requirements (JAR) of the JAA, resulting in cost efficiencies for U.S. manufacturers that choose to market their airplanes in JAA countries.

The proposed rule would not have a significant economic impact on a substantial number of small entities. By providing harmonization with the JAR, it would less the restraints on international trade.

I. INTRODUCTION

This document summarizes an economic analysis of a proposed rule that would harmonize the flight airworthiness standards of part 23 of the Federal Aviation Regulations (FAR) and the Joint Aviation Requirements (JAR) for normal, utility, acrobatic, and commuter category airplanes. The proposed rule is part of joint efforts of the Federal Aviation Administration (FAA), the Joint Aviation Authorities (JAA), and the Aviation Rulemaking Advisory Committee (ARAC) to provide more uniform flight airworthiness standards for airplanes certificated in the U.S. and in JAA countries under the FAR and JAR, respectively. The proposed rule would therefore simplify airworthiness approval of small airplanes for both import and export.

Most of the proposed amendments would result either in no costs or negligible incremental costs, and some could result in cost savings. Descriptions of the proposed amendements and FAA's estimates of their incremental costs are presented in Section II. The benefits of the amendments, consisting primarily of international harmonization, are presented in Section III -- Benefits. Section IV discusses the Regulatory Flexibility Determination and Section V presents the Trade Impact Assessment. An appendix summarizes the amendments and their impacts and indicates which amendments would result in additional compliance costs.

II. PROPOSED AMENDMENTS AND ESTIMATED COSTS

The proposed rule would revise part 23 by amending 47 sections, adding 6 new sections, and removing 1 section. The proposed rule would also amend one section of part 1. The major objective of the proposed rule is to harmonize FAA flight airworthiness standards with those of the JAA while enhancing safety. Additionally, the rule would formalize standards already being met by manufacturers, clarify existing requirements, add definitions, correct editorial errors, and move some requirements to more appropriate places in part 23.

Several sections are proposed to be be revised to include weight, altitude, and temperature (WAT) performance accountability for reciprocating engine normal, utility, and acrobatic airplanes of 6,000 pounds or more and all turbine engine airplanes. Demonstrating compliance with these proposed new WAT limited requirements could result in additional flight testing and certification costs.

In estimating the costs of flight testing as presented in this section, the FAA makes the following assumptions:

- Commuter category airplanes -- $500 per hour for two test pilots plus $180 per hour for 100 gallons of jet fuel at $1.80 per gallon;

- o Turbine multiengine airplanes -- $500 per hour for two test pilots plus $135 per hour for 75 gallons of jet fuel at $1.80 per gallon;
- o Reciprocating multiengine airplanes -- $500 per hour for two test pilots plus $100 per hour for 50 gallons of avgas at $2.00 per gallon;
- o Turbine single-engine airplanes -- $500 per hour for two test pilots plus $90 per hour for 50 gallons of jet fuel at $1.80 per gallon; and
- o Reciprocating single-engine airplanes -- $500 per hour for two test pilots plus $40 per hour for 20 gallons of avgas at $2.00 per gallon.

In estimating the costs of analyzing data (by an aerospace engineer) and preparing performance charts, tables, and graphs (by a draftsman), the FAA uses the following burdened salary costs:

- o Aerospace engineer -- $60 per hour; and
- o Draftsman -- $30 per hour.

PART 1

§ 1.1 General definitions

The proposed rule would amend § 1.1 to add a definition of maximum speed for stability characteristics. This speed, V_{FC}/M_{FC}, is currently

contained in § 23.175(b)(2) and § 25.253(b). No costs are attributed to this definitional amendment.

PART 23

SUBPART 1 -- GENERAL

§ 23.1 Applicability

The proposed rule would make an editorial change in this section and revise it to incorporate the seat and weight requirements of § 23.3(a), (b), and (c), with no change in requirements. No costs are attributed to these changes.

§ 23.3 Airplane categories

Under the proposed rule, dual type certification for commuter category airplanes would no longer be allowed. While no applicant has ever petitioned for dual certification in the commuter and any other category, this change would eliminate possible confusion among pilots and operators about appropriate performance limitations under each certification. No costs are attributed to this change.

SUBPART B -- FLIGHT

General

§ 23.25 Weight limits

The proposed rule would make clarifying editorial changes to § 23.25(a) and remove references to commuter category zero fuel weight and standby

power rocket engines. In another current harmonization rulemaking (part 23 -- Airworthiness Standards: Airframe), the FAA proposes to move the commuter zero fuel weight requirements to § 23.343. Standby power rocket engines are rare and obsolete; therefore, there is no longer a need to reference them. No costs are attributed to these proposed changes.

§ 23.33 Propeller speed and pitch limits

V_Y, the speed for the best rate of climb, would be replaced with an all engine(s) operating climb speed, defined in proposed § 23.65 as the greater of 1.1 V_{MC} and 1.2 V_{S1} for multiengine airplanes and 1.2 V_{S1} for single-engine airplanes. During takeoff and initial climb at the operating climb speed, the propeller must limit the engine r.p.m. to a specified maximum. There would be no effective change in requirements as a result of modifying the climb speed; therefore, no costs are attributed to this provision.

Performance

§ 23.45 General

The proposed rule would require weight, altitude, and temperature (WAT) performance accountability for turbine-engined airplanes and normal, utility, and acrobatic airplanes of maximum takeoff weight over 6,000 pounds. Manufacturers currently determine this performance information and include it in the pilot's operating handbook as required by

§§ 23.1587 and 23.1583 and as specified by the General Aviation Manufacturers Association.[1]

If the manufacturer authorizes operation on surfaces other than smooth, dry, hard-surfaced runways, proposed § 23.45(g) would require the determination or derivation of the effect of these surfaces on takeoff, accelerate-stop (for commuters only), and landing distances and runs. The FAA estimates that it would take an aerospace engineer 80 hours at a burdened rate of $60 per hour, a total cost of $4,800, to derive this information.

§ 23.49 Stalling speed

The proposed rule would clarify and make editorial changes to this section. No costs are attributed to these changes.

§ 23.51 Takeoff speeds

The takeoff speed requirements of current § 23.53 would be moved to this section. The proposed rule would modify the rotation speeds, V_R, for all airplane categories and the minimum speed at 50 feet. The proposed speeds are based on the same speeds as those in the current rule (e.g., V_{MC}, V_{S1}); therefore, the proposed changes would not result in additional compliance costs.

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[1] General Aviation Manufacturers Association. **SPECIFICATION FOR PILOT'S OPERATING HANDBOOK. GAMA Specification No. 1**. Washington, DC. 1984.

Current requirements that are more appropriate to the Airplane Flight Manual (AFM) would be moved to subpart G. No costs are attributed to these proposed changes.

§ 23.53 Takeoff performance

The proposed rule would change the title of this section from Takeoff speeds, move takeoff speed requirements to § 23.51, and clarify general takeoff conditions. No costs are associated with the proposed changes.

§ 23.55 Accelerate-stop distance

This section would be revised to separate the accelerate-stop maneuver into three segments -- airplane at rest to V_{EF}, V_{EF} to V_1, and V_1 to airplane at rest. The proposed changes would clarify, but not change, the requirements, resulting in no additional compliance costs.

§ 23.57 Takeoff path

The current rule permits the takeoff path for commuter category airplanes to be determined by a continuous demonstration or by synthesis. The proposed rule would clarify and specify the methods of determining the takeoff path. The first segment, from rest to 35 feet, would be determined by a continuous takeoff, while the second segment, from 35 to 400 feet, would be determined by synthesis from segments. This is the most common and most desirable method of determining takeoff path. There would be no costs associated with these changes.

§ 23.59 Takeoff distance and takeoff run

The proposed rule would clarify this section, with no changes in requirements or costs.

§ 23.63 Climb: general

This new section would incorporate by reference the climb requirements into a single section and differentiate between WAT limited airplanes and those that are not WAT limited. No costs are attributed to this section.

§ 23.65 Climb: all engines operating

The proposed rule would revise climb requirements and configurations for normal, utility, and acrobatic reciprocating-engine airplanes based on maximum weight and all turbine-engine powered airplanes. The FAA estimates that it would take an aerospace engineer 40 hours at a burdened rate of $60 per hour, a total of $2,400, to determine the WAT charts that would demonstrate compliance with the climb gradient requirements of proposed § 23.65(b). These costs would be incurred by manufacturers of WAT limited airplanes, i.e., normal, utility, and acrobatic category airplanes of more than 6,000 pounds maximum weight and all turbine engine-powered airplanes.

§ 23.66 Takeoff climb: one-engine inoperative

This new section would require the determination of the one-engine inoperative takeoff climb capability of all WAT limited reciprocating engine-powered and all turbine engine-powered normal, utility, and acrobatic category airplanes. This requirement would be for the pilot's information, and would not be a limitation. The FAA estimates that it would take 3 hours of flight testing and 40 hours of analysis to determine the one-engine inoperative takeoff climb capability, costing between $4,200 and $4,305.[2] These costs would not be incurred by applicants whose airplanes have autofeathering propellers, because the flight condition duplicates the requirements of § 23.67.

§ 23.67 Climb: one engine inoperative

The current section would be reorganized to harmonize with the JAR and to separate smaller airplanes from those where WAT criteria apply. There would be minor configuration changes (e.g., from "most favorable position" to "flaps up"). In addition, the proposed rule would specify certain climb speeds.

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[2] The FAA estimates that flight tests for a WAT-limited airplane to determine the steady gradient of climb or descent with one engine inoperative would cost $500 per hour for two test pilots and between $100 and $135 per hour for fuel. Three hours of flight tests would cost between $1,800 and $1,905.

The data reduction and analysis would take an aerospace engineer 40 hours at a burdened rate of $60 per hour, or a total of $2,400.

Total costs for flight tests and data reduction and analysis would cost between $4,200 and $4,305.

Proposed § 23.67(a) would specify the climb requirements for normal, utility, and acrobatic category reciprocating engine powered airplanes of 6,000 pounds or less (i.e., airplanes that are not WAT limited). There would be no change in requirements; hence, there would be no additional compliance costs.

Proposed § 23.67(b) would apply to normal, utility, and acrobatic category WAT limited airplanes. The FAA estimates that compliance with the requirements of proposed § 23.67(b)(1), which would specify a measurably positive gradient of climb at 400 feet above the takeoff surface, would take 3 hours of flight testing and 40 hours of analysis to determine the one-engine inoperative climb capability of an affected airplane, a total cost ranging between $4,170 and $4,305 (see the discussion in § 23.66 above). Compliance with the requirements of proposed § 23.67(b)(2), which would specify a steady gradient of climb of not less than 0.75 percent at 1,500 feet above the takeoff surface, would not require additional flight testing, but would require an estimated 40 hours of analysis by an aerospace engineer at a burdened rate of $60 per hour, or a total cost of $2,400. Total compliance costs of this proposed subsection, therefore, would range between $6,570 and $6,705 (($4,170 to $4,305) + $2,400 = $6,570 to $6,705).

Proposed § 23.67(c) would apply to commuter category airplanes and would make minor changes to current requirements. No costs are associated with these proposed changes.

§ 23.69 Enroute climb/descent

This proposed new section would apply to all part 23 airplanes, requiring the determination of climb/descent rates for all engines operative and one engine inoperative at each weight, altitude, and ambient temperature within the operational limits established by the applicant. Because this information is already required by the current §§ 23.65, 23.67, and 23.1587(a)(2), no additional costs are attributed to these changes.

§ 23.71 Glide: single-engine airplanes

This proposed new section would require the determination of best glide, i.e., the speed necessary to achieve the maximum horizontal distance with the propeller in the minimum drag position, gear and flaps in the most favorable position, and engine inoperative. The FAA estimates that this information could be determined by analysis by an aerospace engineer in 40 hours at a burdened rate of $60 per hour, or a total cost of $2,400.

§ 23.73 Reference landing approach speed

This proposed new section would define reference landing speeds (V_{REF}) for all airplane categories and weights. These speeds would include consideration of both V_{SO} and V_{MC}. There would be no costs associated with this section.

§ 23.75 Landing distance

This section would revise the conditions for determining the horizontal stopping distance from a point 50 feet above the landing surface. A new condition would include standard temperatures at each weight and altitude, given an approach speed of V_{REF}. No costs would be incurred from the requirement to take into account weight and altitude in determining stopping distance, because the current rule under 23.1587(a)(5) already requires it. Other parts of this section would be revised for clarification or to reflect current practice and would not result in additional compliance costs.

§ 23.77 Balked landing

The proposed rule would add balked landing requirements for WAT limited airplanes. Non-WAT limited airplanes would be required to maintain a climb of at least 3.3 percent at sea level (equivalent to the current rule), and non-commuter WAT limited airplanes would be required to maintain a climb of at least 2.5 percent at all altitudes and temperatures. Commuter category airplanes would be required to maintain

a climb of at least 3.2 percent, rather than the 3.3 percent required by the current rule. These proposed requirements would harmonize with the JAR and would result in additional certification costs to compute WAT limits. The FAA estimates that an aerospace engineer would take 40 hours at a burdened rate of $60 per hour, a total cost of $2,400.

Controllability and Maneuverability

§ 23.143 General

This proposed section would add balked landings to the list of phases of flight for which an airplane must be safely controllable and maneuverable. This proposed change would not result in additional compliance costs, because this evaluation is already required by current § 23.77.

§ 23.145 Longitudinal control

This section, which defines a series of flight configurations to test for longitudinal control, would be revised by modifying the airspeeds at which various tests are conducted. These revised tests would not add compliance costs. However, the FAA estimates that it would take one hour of flight testing to demonstrate a maneuvering capability of 1.5 g from V_{MO}/M_{MO} to V_D/M_D, a proposed new requirement. The cost of this

flight test would range between $540 and $680, depending on the category and size of the airplane.[3]

§ 23.147 Directional and lateral control

The proposed rule would add two new paragraphs. Under proposed § 23.147(b), given a certain flight configuration, after a delay of two seconds, it must be possible to regain full control of a multiengine airplane without exceeding a bank angle of 45 degrees, or reaching a dangerous attitude or encountering dangerous characteristics in the event of sudden failure of the critical engine. The FAA estimates that this requirement would add one hour of flight testing, a cost of approximately $600 for a multiengine reciprocating airplane, $635 for a multiengine turbine airplane, and $680 for a commuter category airplane.

Under proposed § 23.147(c), an airplane must be controllable without the primary lateral control system in any or all engine configurations at any speed or altitude within the operating envelope. The FAA estimates that one hour of flight testing would be required, with costs ranging

[3] The FAA estimates that a flight test of a reciprocating single-engine airplane would cost $500 per hour for two test pilots and $40 per hour for fuel (20 gallons x $2.00 per gallon), a total of $540. A flight test of a turbine single engine airplane would cost $500 per hour for two test pilots and $90 for fuel (50 gallons x $1.80 per gallon), a total of $590. A flight test of a reciprocating multiengine airplane would cost $500 per hour for two test pilots and $100 for fuel (50 gallons x $2.00 per gallon), a total of $600. A flight test of a turbine multiengine airplane would cost $500 per hour for two test pilots and $135 for fuel (75 gallons x $1.80 per gallon), a total of $635. The flight test of a commuter category airplane would cost $500 per hour for two test pilots and $180 for fuel (100 gallons x $1.80 per gallon), a total of $680.

between $540 for a reciprocating single-engine airplane and $680 for a commuter category airplane (see Footnote 3 in the discussion of proposed § 23.145 for a description of these costs).

§ 23.149 Minimum control speed

The proposed rule would impose additional requirements for establishing V_{MC} in the landing configuration for WAT limited airplanes. The FAA estimates that it would take 2 hours of flight testing to determine this V_{MC}, a requirement of proposed § 23.149(c). Using the costs presented in the discussion in the previous section, these flight tests would cost $1,360 for a commuter category airplane, $1,270 for a turbine multiengine airplane, $1,200 for a reciprocating multiengine airplane, $1,180 for a single-engine turbine airplane, and $1,080 for a reciprocating single-engine airplane.

Proposed § 23.149(f) would provide a method to determine V_{MCG} (the minimum control speed on the ground) for commuter category airplanes. V_{MCG} could be used to determine V_{EF}, the calibrated airspeed at which the critical engine is assumed to fail, a requirement of proposed § 23.51(c)(1). Because this is an option, no costs are attributed to this paragraph.

Other proposed clarifying changes to this section would not result in additional compliance costs.

§ 23.153 Control during landings

The proposed rule would revise the speed at which it must be possible to complete a landing without exceeding the one hand control forces specified in § 23.143(c). There would be no additional compliance costs associated with this proposed change.

§ 23.155 Elevator control force in maneuvers

The proposed rule would specify the maximum power to be used to demonstrate elevator control force, rather than permit the applicant to select the power as an operating limitation. This would simplify operations for the pilot. A new requirement would be added to ensure that lightening of stick forces is not excessive. Neither of these proposed changes would result in additional compliance costs.

§ 23.157 Rate of roll

The proposed rule would revise the power and trim requirements to be used when demonstrating rate of roll on approach. The changes more accurately reflect the approach configuration and would not result in additional compliance costs.

Trim

§ 23.161 Trim

The proposed rule would make several changes to the power, configuration, and speed requirements of this section to more accurately reflect the conditions during climb, level flight, descent, and approach for which an airplane must maintain lateral, directional, and longitudinal trim. Many of these proposed changes are clarifying and none are expected to result in additional compliance costs.

A proposed requirement for commuter category airplanes would limit the control forces necessary for extended takeoff climbs beyond 400 feet AGL with the critical engine inoperative. This requirement, defined in proposed § 23.161(e), could result in additional development and/or certification costs. The FAA cannot reasonably determine the potential cost impact of the proposed requirement, and solicits cost information from interested parties.

Stability

§ 23.175 Demonstration of static longitudinal stability

The proposed rule would make minor changes to power, configurations, and speeds with no additional compliance costs.

The proposed rule would also delete the requirement to test for stability in cruise with gear extended because it does not represent a

likely operational scenario. The FAA estimates that this would eliminate 1 hour of flight testing per certification, with cost savings of $540 for reciprocating single-engine airplanes, $600 for reciprocating multiengine airplanes, $590 for single-engine turbine airplanes, $635 for multiengine turbine airplanes, and $680 for commuter category airplanes.

§ 23.177 Static directional and lateral stability

The proposed rule would delete requirements for two-control airplanes, specifying an exclusion for acrobatic category airplanes, and make minor clarifying changes. No two-control airplane has been certified in several decades and no need for such requirements is anticipated. There would be no additional compliance costs resulting from these proposed changes.

Stalls

§ 23.201 Wings level stall

The proposed rule would delete requirements for two-control airplanes (see the discussion of proposed § 23.177) and for altitude loss. It would also make clarifying changes. Finally, the 75 percent maximum continuous power required for stall recovery could be reduced to as little as 50 percent by the applicant if the power-to-weight ratio results in extreme nose-high attitudes. This proposed changes could result in cost savings by the elimination of complex stall-avoidance

devices (e.g., stick pushers). The FAA solicits cost information on potential cost savings.

§ 23.203 Turning flight and accelerated turning stalls

The proposed rule would clarify the requirements for turning flight and accelerated stalls. Turning flight and accelerated turning stalls would have to be demonstrated with both the power off (a new requirement) and with 75 percent maximum continuous power or less (a revised requirement). The FAA estimates that demonstration of a power-off accelerated stall would take 15 minutes' time. The cost of this flight test would be $170 for a commuter category airplane, $158 for a multiengine turbine airplane, $150 for a multiengine reciprocating engine airplane, $148 for a single-engine turbine airplane, and $135 for a single-engine reciprocating airplane.[4]

§ 23.205 Critical engine inoperative stalls

This section would be removed. The requirements of the current rule for stalls with the critical engine inoperative (e.g., level flight, power asymmetry that permits wing level flight at the stalling speed) do not replicate the conditions most likely to accompany an inadvertent stall in service. Typically, stalls with significant power asymmetry can

[4] The FAA has published an NPRM that would eliminate the requirement to demonstrate an accelerated stall for certification of commuter category airplanes (58 CFR 32034, June 7, 1993). If that proposed rule is adopted, applicants for certification of commuter category airplanes would not incur the cost of demonstrating an accelerated stall.

result in spins and the current rule's requirement is not effective in ensuring that such stalls will be recoverable.

The FAA estimates that removal of a critical engine inoperative stall would eliminate 2 hours of flight testing, a cost savings of $1,270 for multiengine turbine airplanes, $1,200 for multiengine reciprocating airplanes, and $1,360 for commuter category airplanes.

§ 23.207 Stall warning

The proposed rule would no longer require a specified upper limit of the stall speed warning for one knot per second decelerations, leaving the margin at least 5 knots above stall. For decelerations greater than one knot per second, the proposed rule would delete a quantified lower limit to ensure that, with the determined lower limit, the pilot has time to take corrective action. This proposed deletion could result in less expensive stall warning systems. The FAA solicits information about the potential cost savings of less complicated stall warning systems.

Proposed § 23.207(f) would permit mutable warnings for acrobatic airplanes, provided the warning is armed for takeoff and rearmed for landing. This could be easily achieved in a retractable gear airplane, where the warning switch could be coupled to the landing gear. The FAA estimates that the cost to do so would be negligible.

In the case of a fixed gear acrobatic airplane, however, a separate switch would be required. The FAA estimates that one potential, but simple, solution -- a mercury switch, armed when the airplane is upright -- would cost $200 per airplane, including parts and installation. The FAA solicits comments concerning suggested technologies that could meet this proposed requirement and their costs.

Spinning

§ 23.221 Spinning

The proposed rule would revise the point at which the count for the one-turn-spin recovery requirement begins. One additional turn would be permitted after initiation of the first control action for recovery, rather than "after the controls have been applied," as the current rule requires. This would ensure, for an airplane with a multiple step recovery procedure, that the airplane could not be recovered before the start of the recovery count in order to meet the requirement. This proposed requirement could impose more stringent criteria on future designs. The FAA solicits information from interested parties concerning the potential cost impact of the proposed revision.

Another proposed change would revise the requirement that there must be no excessive back pressure during spin recovery. Instead, the proposed rule would specify that no control force or characteristic may adversely affect prompt recovery. This proposed change would give manufacturers

slightly more design latitude, with no loss in safety. No costs are attributed to this proposed change.

Acrobatic airplanes would be required to demonstrate recovery from six-turn (or more) spins in 1 1/2 turns after initiation of the first control action for recovery. The proposed rule would permit demonstration with either flaps retracted or flaps extended, but it would delete the option to retract flaps during recovery. No costs are attributed to this proposed change.

Finally, the proposed rule would delete the requirements for an airplane "characteristically incapable of spinning." The current alternative option, that of spin resistance, represents more technologically advanced criteria. No costs are attributed to this proposed change.

Ground and Water Handling Characteristics

§ 23.235 Operation on unpaved surfaces

The proposed rule would move water operating requirements to § 23.237, and change the section title to reflect the fact that the proposed requirement relates to operation on unpaved surfaces. No costs are attributed to these proposed changes.

§ 23.237 Operation on water

This proposed new section contains the same requirements as found in the existing § 23.235(b) for water operations. No costs are attributed to these proposed changes.

Instruments: Installation

§ 23.1323 Airspeed indicating system

The proposed rule would remove paragraph (f), which requires airspeed system calibration information to be placed in the Airplane Flight Manual (AFM). The requirement is included in proposed § 23.1587(d)(10). No cost is attributed to this change.

§ 23.1325 Static pressure system

The proposed rule would clarify § 23.1325(e) to require the calibration of the static pressure system to be conducted in flight. Because this is standard certification practice, no cost is attributed to this proposed change. The requirement for altimeter system calibration for commuter category airplanes to be shown in the AFM would be removed, because the results of the calibration would be required to be shown in the AFM under proposed § 23.1587(d)(11). No cost is attributed to this proposed change.

SUBPART G -- OPERATING LIMITATIONS AND INFORMATION

§ 23.1511 Flap extended speed

The proposed rule would delete references to § 23.457. Another proposed harmonization rulemaking (part 23 -- Airworthiness Standards: Airframe) would remove § 23.457 and incorporate its requirements into § 23.345 High lift devices, which would continue to be referenced in proposed § 23.1511. No cost is attributed to this proposed change.

§ 23.1521 Powerplant limitations

The proposed rule would require that a maximum temperature be established for takeoff without regard to the time for takeoff operations. The current rule requires a maximum allowable temperature be established if the takeoff operation exceeds two minutes. Ambient temperature limits would be required to be established for reciprocating engine airplanes weighing over 6,000 pounds. The current rule requires the establishment of limits for only turbine engines.

The proposed change could result in additional development costs or changes in takeoff operating procedures for WAT limited airplanes with reciprocating engines. These changes could include the use of cowl flaps, a richer mixture, or redesigned cowl flaps to improve engine cooling. The FAA is unable to reasonably determine the costs of such changes and solicits information from interested parties concerning the costs to comply with this proposed requirement.

Markings and Placards

§ 23.1543 Instrument markings: general

The proposed rule would add a new paragraph (c) that would require all related instruments to be calibrated in compatible units. This requirement would be necessary for safe flight information. Instruments with compatible units are currently available and in common use today. No incremental costs are attributed to this proposed requirement.

§ 23.1545 Airspeed indicator

The requirement for markings for one-engine inoperative best rate of climb speeds V_Y for WAT limited airplanes would be deleted, since these airplanes already would have scheduled speeds in case of an engine failure. Rather than an arc for a range of altitudes, a line marking for a climb speed at maximum weight and sea level for non-WAT limited multiengine airplanes would be required. This simplification could result in cost savings to manufacturers of non-WAT limited multiengine airplanes. The FAA solicits information concerning potential cost savings resulting from this proposed change.

The proposed rule would also delete the requirement for V_{MC} marking for WAT limited airplanes, since they already have scheduled speeds in case of engine failure. No cost savings would be realized from this proposed change.

§ 23.1553 Fuel quantity indicator

The proposed rule would replace the use of an arc to show exceedances of unusable fuel with a red radial line. This change would not result in either additional costs or cost savings.

§ 23.1555 Control markings

The proposed rule would add the requirement that only emergency controls should be red. This proposed change would not result in additional costs.

§ 23.1557 Miscellaneous markings and placards

The proposed rule would delete § 23.1557(f), which requires a placard about unusable fuel. Negligible cost savings are attributed to this change.

§ 23.1559 Operating limitations placard

The proposed rule would simplify, without substantive change, the requirements for operating limitations placards and delete duplicative material. No costs are attributed to this change.

§ 23.1563 Airspeed placards

The proposed rule would add a new paragraph to this section, requiring that airspeed placards list the maximum V_{MC} for WAT limited airplanes. This proposed change would not result in additional costs.

§ 23.1567 Flight maneuver placards

The proposed rule would add a requirement for a placard for acrobatic airplanes that would list the control actions for recovery from spins and state when recovery from spins should be initiated. This requirement is equivalent to § 23.1583(e)(3). No costs are attributed to this provision.

Airplane Flight Manual and Approved Manual Material

§ 23.1581 General

The proposed rule would add the requirement that the Airplane Flight Manual contain information necessary to comply with relevant operating rules. This proposed addition would represent no change in current U.S. requirements, because such information is already required under current § 23.1581(a)(2), but would harmonize with the JAR's. No costs are attributed to this provision.

The proposed rule would require flight manuals of WAT limited airplane to contain data necessary for determining WAT limits. The FAA has estimated the costs of preparing graphs, tables, and charts for inclusion in the AFM. These costs are presented in the sections below.

The proposed rule would add a requirement that the units used in the AFM be the same as those marked on the appropriate instruments and placards on the airplane. No costs are attributed to this provision.

The requirement for an AFM table of contents would be deleted, because it is considered advisory material. Current § 23.1581(d) would be replaced by a requirement to present all operational airspeeds as indicated airspeeds. No costs are attributed to these changes.

§ 23.1583 Operating limitations

The proposed rule would require operating limitations for WAT limited airplanes to be included in the AFM. Additional information, such as baggage and cargo loading, ambient temperature limitations, any smoking restrictions, and allowable runway surface types, would be required to be included in the AFM. Most of the additional information would be determined under either current or proposed requirements (see, for example, the discussion of baggage and cargo compartments in the regulatory evaluation of another proposed harmonization rulemaking (part 23 -- Airworthiness Standards: Systems).

The FAA has identified only one potential operating limitation, a minimum ambient air temperature, that would be required in the AFM that would not have been determined by other certification requirements. The minimum operating ambient air temperature could be determined by analysis by an aerospace engineer in 20 hours at a burdened rate of $60 per hour, a total cost of $1,200.

The FAA estimates that an aerospace engineer and a draftsman would require 200 hours each to prepare graphs, tables, and charts for inclusion in the AFM. The FAA estimates that the cost of preparing this information would be $18,000.[5] The costs to include the additional pages in the AFM would be negligible.

Many manufacturers of turbine and commuter category airplanes are currently including WAT operating limitations in their AFM's. The FAA anticipates that manufacturers of WAT limited reciprocating engine airplanes would be most affected by this proposed requirement.

§ 23.1585 Operating procedures

This proposed section would be substantially reorganized with little actual change in requirements. Water handling procedures and demonstrated wave heights for seaplanes and amphibians would be required to be included in the AFM. Procedures for carrying out an accelerate-stop would be required for commuter AFM's. The FAA estimates that an aerospace engineer and a draftsman would require 10 hours each to develop the accelerate-stop procedures at a total cost of $900. The cost of the additional pages in the AFM would be negligible.

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[5] The FAA estimates that the burdened cost of an aerospace engineer is $60 per hour, and the burdened cost of a draftsman is $30 per hour. The total cost for 200 hours' labor for each of these persons would be $18,000 ($60 x 200 + $30 x 200 = $18,000).

Finally, proposed § 23.1585(j) would require the AFM to contain procedures for the safe operation of the airplane's systems and equipment. This requirement is included in the current rule in § 23.1585(a), and would be added for emphasis. No costs are attributed to this provision.

§ 23.1587 Performance information

The proposed section would be rearranged for clarification and would require new performance items to be included in the AFM. Many of the new performance items are determined as a result of other proposed requirements (e.g., the effect on landing distances on other than smooth hard surfaces is required to be determined under proposed § 23.45). Other new performance items, such as the effect on landing distances of runway slope and 50 percent of the headwind component and 150 percent of the tailwind component, would have to be determined and included in the AFM. The FAA estimates that an aerospace engineer and a draftsman would require 10 hours each to determine the performance information and prepare it for inclusion in the AFM, a total cost of $900 per certification.

§ 23.1589 Loading information

The proposed rule would make editorial changes to requirements for loading information in the AFM. No costs are attributed to these changes.

Summary of Costs

The estimated costs per type certification of the proposed rule are summarized in the table below. The costs are not additive; some costs apply only to one part 23 airplane category, while other costs apply to most, if not all categories. These estimates exclude certain development costs, which the FAA was unable to quantify. The FAA solicits comments on these and other certification/development costs that might result from the proposed rule.

Most of the proposed amendments would result either in no costs or negligible incremental costs, and some could result in cost savings. Many of the proposed changes are clarifying in nature and many would merely formalize current procedures. Others modify performance specifications without requiring additional testing or analysis. The most significant changes are those that would require manufacturers to consider weight, altitude, and temperature when determining performance and those that would add such information to the airplane flight manual.

Industry representatives estimate that the total cost to certify an airplane to current part 23 requirements varies between $0.5 million for simple, single-engine VFR-only airplanes to $10 million for commuter airplanes. Based on the costs estimated in this evaluation, the FAA anticipates that the per airplane incremental costs of the proposed

TABLE II-1

SUMMARY OF COSTS PER TYPE CERTIFICATION 1/

SECTION	TYPE OF COST				COST BY CATEGORY OF AIRPLANE			
	ANALYSIS	FLIGHT TEST	HARDWARE	DESIGN	NORMAL/UTILITY/ACROBATIC		COMMUTER	
23.45	X				$4,800	2/		
23.65	X				$2,400	2/		
23.66	X	X			$4,200-$4,305	3/		
23.67	X	X			$6,600-$6,705	3/		
23.71	X				$2,400	4/		
23.77	X				$2,400	2/	$2,400	
23.145		X			$540-$635		$680	
23.147(b)		X			$600-$635	5/	$680	
23.147(c)		X			$540-$635		$680	
23.149		X			$1,080-$1,270	2/	$1,360	
23.161				X	UNKNOWN			
23.175		(X)			($540-$635)		($680)	
23.201			(X)		(UNKNOWN)			
23.203		X			$135-$158		$170	6/
23.205		(X)			($1,200-$1,270)	4/	($1,360)	
23.207			(X)		(UNKNOWN)	7/		
23.1521	X			X	UNKNOWN			
23.1545	(X)				(UNKNOWN)			
23.1583	X				$19,200	2/	$19,200	
23.1585	X						$900	
23.1587	X				$900		$900	

1/ = Parenthesis indicate cost savings
2/ = Applies to WAT limited airplanes only
3/ = Applies to WAT limited multiengine airplanes only
4/ = Applies to single-engine airplanes only
5/ = Applies to multiengine airplanes only
6/ = See footnote 4 in text
7/ = Some acrobatic airplanes may incur costs

Source: Federal Aviation Administration, APO-320. July 1993.

rule, amortized over the production run of a certification, would have a modest impact on airplane price, less than $100 per airplane.

III. BENEFITS

The FAA holds that the benefits of the proposed rule, although not directly quantifiable, would be significant and would far outweigh its relatively low costs.

The primary benefit of the proposed rule would be harmonization. By providing nearly uniform flight airworthiness standards for airplanes certificated in the United States and in the JAA countries under JAR 23, the proposed rule would simplify airworthiness approvals for import and export purposes. Manufacturers would not have to design airplanes to two sets of standards or document that the designs certificated to U.S. standards also meet the requirements of the JAA. This standardization would result in cost savings to U.S. manufacturers who choose to market their airplanes to JAA countries as well as to manufacturers in JAA countries who choose to market their airplanes in the U.S.

Another benefit of the proposed rule would be decreased reliance on special conditions prescribed for certifications of novel or unusual designs. By explicitly codifying the requirements in part 23, manufacturers would be able to determine the design standards the FAA

finds acceptable for certification. The proposed rule could also simplify the certification process by clarifying requirements and eliminating potential confusion about the intent of the requirements.

Some of the proposed changes are expected to enhance safety. For example, under proposed § 23.147, it must be possible for the pilot of a multiengine airplane to regain full control of the airplane without exceeding a bnak angle of 45 degrees, reaching a dangerous attitude, or encountering dangerous characteristics in the event of a sudden failure of the critical engine. All related instruments would have to be calibrated in compatible units under proposed § 23.1543.

IV. REGULATORY FLEXIBILITY DETERMINATION

The Regulatory Flexibility Act of 1980 (RFA) was enacted by Congress to ensure that small entities are not unnecessarily or disproportionately burdened by Federal regulations. The RFA requires a Regulatory Flexibility Analysis if a proposed rule would have a significant economic impact, either detrimental or beneficial, on a substantial number of small entities. Based on FAA Order 2100.14A, Regulatory Flexibility Criteria and Guidance and the estimated costs presented in Section II of this evaluation, the FAA has determined that the proposed amendments would not have a significant economic impact on a substantial number of small entities.

V. TRADE IMPACT ASSESSMENT

The proposed rule would not constitute a barrier to international trade, including the export of American airplanes to foreign countries and the import of foreign airplanes into the United States. Instead, the proposed flight certification procedures have been harmonized with those of the JAA and would lessen the restraints on trade.

APPENDIX

SMALL AIRPLANE AIRWORTHINESS STANDARDS: FLIGHT HARMONIZATION
NOTICE OF PROPOSED RULEMAKING

Section/Title	Amendment	Impact	Cost
PART 1 -- DEFINITIONS			
1.1 General definitions	Adds definition for maximum speed for stability characteristics	Definition	None
SUBPART A -- GENERAL			
23.1 Applicability	Incorporates weight and seat requirements	Editorial	None
23.3 Airplane categories	Deletes chandelles and lazy eights from commuter requirements; prohibits dual certification of commuters	Clarification	None
SUBPART B -- FLIGHT			
General			
23.25 Weight limits	Clarifies maximum weight	Clarification Editorial	None
23.33 Propeller speed and pitch limits	Replaces V_Y with all engines operating climb speed	Clarification	None
Performance			
23.45 General	Requires WAT performance accountability for commuters and normal, utility, and acrobatic airplanes over 6,000 pounds maximum weight and turbine-engined airplanes	Sets operating limitations	Minor costs

SMALL AIRPLANE AIRWORTHINESS STANDARDS: FLIGHT HARMONIZATION
NOTICE OF PROPOSED RULEMAKING

Section/Title		Amendment	Impact	Cost
23.49	Stalling speed	Requirements rearranged	Clarification/ Editorial	None
23.51	Takeoff speeds	Rotation speed V_R and speed at 50 feet modified	Minor changes	None
23.53	Takeoff performance	Title changed from takeoff speeds; sets conditions for takeoff performance	Simplification Reorganization	None
23.55	Accelerate-stop distance	Clarifies accelerate stop segments	Clarification	None
23.57	Takeoff path	Specifies methods of determining takeoff path segments for commuters	Clarification Specification	None
23.59	Takeoff distance and takeoff run	Revises text for clarification	Clarification	None
23.63	Climb: general	References all climb requirements into new section	Clarification	None
23.65	Climb: all engines operating	Revises minimum climb speed for multi-engine airplanes; specifies gear down climb configuration for larger airplanes	More stringent requirements	Minor costs
23.66	Takeoff climb: one engine inoperative	Requires determination of one-engine inoperative climb capability of WAT limited airplanes	Informational	Minor costs

SMALL AIRPLANE AIRWORTHINESS STANDARDS: FLIGHT HARMONIZATION
NOTICE OF PROPOSED RULEMAKING

Section/Title		Amendment	Impact	Cost
23.67	Climb: one engine inoperative	Reorganized requirements with minor changes to configurations	Harmonization Simplification	Minor costs
23.69	Enroute climb/descent	Requires establishment of climb and descent rates and gradients	Informational	None
23.71	Glide: Single-engine airplanes	Requires determination of glide distance and speed	Informational	Minor costs
23.73	Reference landing approach speed	Establishes approach speeds for airplane categories/weights	Informational	None
23.75	Landing distance	Sets additional conditions for determining landing distance	Harmonization Informational Clarification	None
23.77	Balked landing	Adds requirements for WAT limited airplanes	Harmonization	Minor costs
Controllability and Maneuverability				
23.143	General	Adds balked landing to conditions where airplane must be controllable and maneuverable	Harmonization	None
23.145	Longitudinal control	Modifies airspeeds at which longitudinal control must be tested; adds g-force test from, V_{MO}/M_{MO} to V_D/M_D	Harmonization	Minor costs

SMALL AIRPLANE AIRWORTHINESS STANDARDS: FLIGHT HARMONIZATION
NOTICE OF PROPOSED RULEMAKING

Section/Title		Amendment	Impact	Cost
23.147	Directional and lateral control	Adds requirements for lateral control after failure of primary lateral control system; adds requirement for directional control of multiengine airplanes after critical engine failure	Increased safety	Minor costs
23.149	Minimum control speed	Imposes additional requirements for establishing V_{MCG} for WAT limited airplanes	Information Clarification	Minor costs
23.153	Control during landings	Revises speed for control forces during landings	Harmonization	None
23.155	Elevator control force in maneuvers	Specifies maximum power to demonstrate elevator control force; ensures stick force lightening not excessive	Simplification	None
23.157	Rate of roll	Revises power and trim requirements rate of roll on approach	Clarification	None
Trim				
23.161	Trim	Revises power, configuration, and speed requirements; adds control force requirements for commuters during extended one-engine climbs	Clarification Possible design changes	Unkn. costs

SMALL AIRPLANE AIRWORTHINESS STANDARDS: FLIGHT HARMONIZATION
NOTICE OF PROPOSED RULEMAKING

Section/Title		Amendment	Impact	Cost
Stability				
23.175	Demonstration of static longitudinal stability	Revises power, configuration, and speed requirements; deletes test for stability at gear down cruise	Simplification	Minor savings
23.177	Static directional and lateral stability	Deletes requirements for two-control airplanes; excludes acrobatic airplanes	Clarification	None
Stalls				
23.201	Wings level stall	Deletes requirement for two-control airplanes; revises power required for stall recovery	Clarification May eliminate stall-avoidance devices	Possible savings
23.203	Turning flight and accelerated turning stalls	Clarifies requirements; revises power required for stall recovery	Clarification	Minor costs
23.205	Critical engine inoperative stalls	Removes section	Relief	Minor savings
23.207	Stall warning	Modifies stall warning speeds; adds requirement for automatically armed mutable warnings for acrobatic category airplanes	New equipment	Unknown costs/ savings
Spinning				
23.221	Spinning	Revises spin recovery requirements; deletes option for airplanes incapable of spinning	Clarification More stringent criteria	Unknown costs/ savings

SMALL AIRPLANE AIRWORTHINESS STANDARDS: FLIGHT HARMONIZATION
NOTICE OF PROPOSED RULEMAKING

Section/Title	Amendment	Impact	Cost
Ground and Water Handling Characteristics			
23.235 Operation on unpaved surfaces	Moves water taxiing requirements to proposed § 23.237	Editorial	None
23.237 Operation on water	Incorporates water taxiing requirements from existing § 23.235	Editorial	None
SUBPART F -- EQUIPMENT			
Instruments: Installation			
23.1323 Airspeed indicating system	Removes airspeed calibration requirements for commuter category	Editorial deletion	None
23.1325 Static pressure system	Requires system calibration in flight; Removes altimeter system calibration requirements for commuter category	Clarification; Editorial deletion	None
SUBPART G -- OPERATING LIMITATIONS AND INFORMATION			
23.1511 Flap extended speed	Removed reference to section proposed to be deleted	Editorial	None
23.1521 Powerplant limitations	Removes time period before establishment of maximum allowable engine-related temperatures; requires ambient temperature limit for large reciprocating engine airplanes	Sets new temperature limit	Unknown costs

SMALL AIRPLANE AIRWORTHINESS STANDARDS: FLIGHT HARMONIZATION
NOTICE OF PROPOSED RULEMAKING

Section/Title	Amendment	Impact	Cost
Markings and Placards			
23.1543 Instrument markings: general	Requires instruments to be marked in compatible units	Uniformity and safety	None
23.1545 Airspeed indicator	Deletes V_Y and V_{MC} for WAT limited airplanes	Simplification	Unknown savings
23.1553 Fuel quantity indicator	Replaces unusable fuel indicator arc with line	Simplification	None
23.1555 Control markings	Adds requirement that only emergency controls should be red	Emphasis	None
23.1557 Miscellaneous markings and placards	Deletes requirement for placards about unusable fuel	Clarification	Minor savings
23.1559 Operating limitations placard	Simplifies section without substantive change	Simplification	None
23.1563 Airspeed placards	Add V_{MC} to airspeed placard for WAT limited airplanes	Information	None
23.1567 Flight maneuver placard	Specifies content of placard for spinning; requirement moved from 23.1583	Clarification	None
Airplane Flight Manual and Approved Manual Material			
23.1581 General	Recognizes WAT limited and non-WAT limited airplanes	Emphasis	None

SMALL AIRPLANE AIRWORTHINESS STANDARDS: FLIGHT HARMONIZATION
NOTICE OF PROPOSED RULEMAKING

Section/Title	Amendment	Impact	Cost
23.1583 Operating limitations	Requires additional operating limitations in AFM	Information	Costs
23.1585 Operating procedures	Requires additional operating procedures in AFM	Information	Minor costs
23.1587 Performance information	Adds performance information to AFM	Informational	Minor costs
23.1589 Loading information	Edits text; no change in requirements	Editorial	None

14 CFR Parts 1 and 23

[Docket No. 27807; Amendment Nos. 1–43, 23–50]

RIN 2120–AE61

Airworthiness Standards; Flight Rules Based on European Joint Aviation Requirements

AGENCY: Federal Aviation Administration, DOT.

ACTION: Final rule.

SUMMARY: This final rule amends the flight airworthiness standards for normal, utility, acrobatic, and commuter category airplanes. This amendment completes a portion of the Federal Aviation Administration (FAA) and the European Joint Aviation Authorities (JAA) effort to harmonize the Federal Aviation Regulations and the Joint Aviation Requirements (JAR) for airplanes certification in these categories. This amendment will provide nearly uniform flight airworthiness standards for airplanes certificated in the United States under 14 CFR part 23 and in the JAA countries under Joint Aviation Requirement 23, simplifying international airworthiness approval.

EFFECTIVE DATE: March 11, 1996.

FOR FURTHER INFORMATION CONTACT: Lowell Foster, ACE–111, Small Airplane Directorate, Aircraft Certification Service, Federal Aviation Administration, 601 East 12th Street, Kansas City, Missouri 64106; telephone (816) 426–5688.

SUPPLEMENTARY INFORMATION:

Background

This amendment is based on Notice of Proposed Rulemaking (NPRM) No. 94–22 (59 FR 37878, July 25, 1994). All comments received in response to Notice 94–22 have been considered in adopting this amendment.

This amendment completes part of an effort to harmonize the requirements of part 23 and JAR 23. The revisions to part 23 in this amendment pertain to flight airworthiness standards. Three other final rules are being issued in this **Federal Register** that pertain to airworthiness standards for systems and equipment powerplant, and airframe. These related rulemakings are also part of the harmonization effort. Interested persons should receive all four final rules to ensure that all revisions to part 23 are recognized.

The harmonization effort was initiated at a meeting in June 1990 of the JAA Council (consisting of JAA members from European countries) and

the FAA, during which the FAA Administrator committed the FAA to support the harmonization of the United States regulations with the JAR that were being developed. In response to the commitment, the FAA Small Airplane Directorate established an FAA Harmonization Task Force to work with the JAR 23 Study Group to harmonize part 23 with the proposed JAR 23. The General Aviation Manufacturers Association (GAMA) also established a JAR 23/part 23 committee to provide technical assistance.

The FAA, JAA, GAMA, and the Association Europeanne des Constructeurs de Material Aerospatial (AECMA), an organization of European airframe manufacturers, met on several occasions in a continuing harmonization effort.

Near the end of the effort to harmonize the normal, utility, and aerobatic category airplane airworthiness standards, the JAA requested and received recommendations from its member countries on proposed airworthiness standards for commuter category airplanes. Subsequent JAA and FAA meetings on this issue resulted in proposals that were reflected in Notice No. 94–22 to revise portions of the part 23 commuter category airworthiness standards. Accordingly, this final rule adopts the flight airworthiness standards for all part 23 airplanes.

In January 1991, the FAA established the Aviation Rulemaking Advisory Committee (ARAC) (56 FR 2190, January 22, 1991). At an FAA/JAA Harmonization Conference in Canada in June 1992, the FAA announced that it would consolidate the harmonization effort within the ARAC structure. The FAA assigned to ARAC the rulemakings related to JAR/part 23 harmonization, which ARAC assigned to the JAR/FAR 23 Harmonization Working Group. The proposal for flight airworthiness standards contained in Notice No. 94–22 were a result of both the working group's efforts and the efforts at harmonization that occurred before the formation of the working group.

The JAA submitted comments to the FAA on January 20, 1994, in response to the four draft proposals for harmonization of the part 23 airworthiness standards. The JAA submitted comments again during the comment period of the NPRM. At the April 26, 1995, ARAC JAR/FAR 23 Harmonization Working Group meeting, the JAA noted that many of the comments in the January 20 letter had been satisfied or were no longer relevant. The few remaining items concern issues that are considered beyond the scope of this rulemaking and, therefore, will be dealt with at future FAA/JAA Harmonization meetings.

Discussion of Comments

General

Interested persons were invited to participate in the development of these final rules by submitting written data, views, or arguments to the regulatory docket on or before November 21, 1994. Four commenters responded to Notice No. 94–22. Minor technical and editorial changes have been made to the proposed rules based on relevant comments received, consultation with ARAC, and further review by the FAA.

Discussion of Amendments

Section 1.1 General Definitions

The FAA proposed to amend § 1.1 to add a definition of "maximum speed for stability characteristics, V_{FC}/M_{FC}." This change harmonizes part 1 and JAR 1. The definition is deleted from § 23.175(b)(2).

No comments were received on the proposal for this section, and it is adopted as proposed.

Section 23.3 Airplane Categories

The FAA proposed to revise § 23.3(b)(2) to add an outside limit of 90 degrees in angle of bank for lazy eights, chandelles, and seep turns.

The FAA proposed to revise § 23.3(d) to remove chandelles and lazy eights as approved operations in commuter category airplanes. The FAA does not anticipate any operational need for such maneuvers.

The FAA proposed to revise § 23.3(e) to prohibit type certification of commuter category airplanes in any other category. This rule change will not preclude the type certification of similar airplanes with different model numbers, such as the present Cessna models 500 and 501.

No comments were received on the proposals for this section, and they are adopted as proposed.

Section 23.25 Weight Limits

The FAA proposed to revise § 23.25(a) to clarify that the maximum weight that must be selected is the least of the three choices given in § 23.25(a)(1). The FAA proposed to remove the commuter category zero fuel weight requirement from current § 23.25(a). The requirement was proposed to be removed to § 23.343 by the airframe NPRM, Notice No. 94–20 (59 FR 35198, July 8, 1994). The FAA proposed to remove the reference to standby power rocket engines in § 23.25(a)(1)(iii) and to remove appendix E because this is a rare and obsolete design feature. If a manufacturer proposed to use this approach, the FAA would issue special conditions to ensure adequate airworthiness.

No comments were received on the proposals for this section, and they are adopted as proposed.

Section 23.33 Propeller Speed and Pitch Limits

The FAA proposed to revise § 23.33(b)(1) to remove the reference to V_Y and to replace it with "the all engine(s) operating climb speed specified in § 23.65," to be consistent with other changes in performance requirements. The FAA proposed to revise § 23.33(b)(2) to use "V_{NE}" in place of "never exceed speed," since V_{NE} is defined in part 1, and to remove the word "placarded," which is unnecessary.

No comments were received on the proposals for this section, and they are adopted as proposed.

Section 23.45 General

In Notice of Proposed Rulemaking, Small Airplane Airworthiness Review Program Notice No. 4, Notice No. 90–18 (55 FR 26534, June 28, 1990), the FAA requested comments on the need for weight, altitude, and temperature (WAT) criteria, as information or as a limitation on piston-powered, twin-engine part 23 airplanes. The FAA also requested comments about WAT criteria on turbine-powered twin-engine part 23 airplanes, specifically during takeoff and landing.

WAT criteria is used to determine the maximum weight an airplane can have in relation to altitude and temperature for safe takeoff. This criteria provides pilots with the information needed to determine if a takeoff and climb can be successfully completed if one engine becomes inoperative. WAT criteria has been required under part 23 for commuter category airplanes, at all approved altitudes. A limited WAT criteria has been required for turbine engine powered airplanes at 5,000 feet and at standard temperature plus 40°F, but not for higher altitudes or temperatures. For multiengine powered airplanes, WAT data has been provided by the manufacturer as information to pilots.

The FAA received three comments on mandating WAT criteria in part 23 and addressed these comments in detail in the preamble to Notice 94–22.

Based on statistics and conclusions from an FAA 1991 study (discussed in detail in Notice 94–22) and on comments, the FAA determined that

WAT limits are necessary for safe operation of multiengine airplanes of the type that will be involved in transporting passengers for hire.

The FAA proposed a complete revision of § 23.45 to require weight, altitude, and temperature (WAT) performance accountability for normal, utility, and acrobatic airplanes with a maximum takeoff weight over 6,000 pounds and all turbine-powered airplanes.

No comments were received on the proposal for this section, and it is adopted as proposed.

Section 23.49 Stalling Speed

The FAA proposed to revise § 23.49 by reorganizing and editing it for clarification. The FAA's proposed clarification merges, in paragraph (a), the V_{SO} and V_{S1} requirements, which were separated with parallel configuration items under paragraphs (a) and (d).

Other proposed changes to paragraph (a) are as follows:

(1) Proposed paragraph (a)(4) is a requirement that the airplane be in the condition existing in the test, in which V_{SO} and V_{S1} are being used.

(2) Proposed paragraph (a)(5) is a revised version of current paragraph (a)(6). The current requirement states that the center of gravity must be in the most unfavorable position within the allowable landing range. The proposed requirement would state that the center of gravity must be in the position that results in the highest value of V_{SO} and V_{S1}.

(3) Current paragraph (a)(5) is moved to § 23.45(c).

These changes are clarifying and are not an increase in requirements. The only comment received was from JAA, noting the existing disharmony between the JAR and the FAR concerning a V_{SO} more than 61 knots for single-engine airplanes and multiengine airplanes of 6,000 pounds maximum weight or less than do not meet the required minimum rate of climb.

The proposal is adopted as proposed.

Section 23.51 Takeoff Speeds

The FAA proposed to change the paragraph heading from "Takeoff" to "Takeoff speeds" and to incorporate the takeoff speed requirements currently contained in § 23.53. This revision to the heading and the reorganization of takeoff requirements is proposed for harmony with JAR 23.

The FAA proposed to move current § 23.51(a) to § 23.53(a). Current paragraph (a) requires that the distance required to take off and climb over a 50-foot obstacle must be determined with the engines operating within approved operating limitations and with cowl flaps in the normal takeoff position. These requirements for power and cowl flaps are now covered in final § 23.45, paragraphs (c) and (d), and in § 23.1587.

The FAA proposed to remove current § 23.51(b) on measuring seaplane and amphibian takeoff distances. It is a statement of an acceptable method of compliance, and there is no need to address a separate seaplane starting point.

The FAA proposed to remove current § 23.51(c) concerning pilot skills and conditions. It is covered under the general requirements in proposed § 23.45(f).

The FAA proposed to remove current § 23.51(d). The requirements are covered under § 23.45 in commuter category performance and other performance requirements, and the information requirements are covered under § 23.1587.

For multiengine normal, utility, and acrobatic category airplanes, the FAA proposed to transfer the determination of V_R from § 23.53(a) to § 23.51(a) with minor changes in the specified rotation speed. For multiengine airplanes in proposed paragraph (a)(1), the margin between rotation speed and V_{MC} or a margin of 1.10 V_{S1} is established between V_R and stall.

The FAA proposed to define V_R, in proposed paragraph (a), as the speed at which the pilot makes a control input with the intention of lifting the airplane out of contact with the runway or water surface. This definition would apply to tail wheel and tricycle gear airplanes, seaplanes, and single-engine airplanes.

The FAA also proposed to include rotation speeds for single-engine airplanes, seaplanes, and amphibians in paragraph (a). This extends V_R applicability to all part 23 airplanes to establish a safe and standardized procedure that can be used by pilots to achieve AFM takeoff performance. This use of rotation speed is consistent with part 25.

In proposed paragraph (b), the speed at 50 feet is based on current § 23.53(b) with no change in requirements.

For commuter category airplanes, the FAA proposed to move the takeoff speed requirements from § 23.53(c) to proposed § 23.51(c) with editorial changes. The option is added, in proposed (c)(1)(i), for an applicant to determine a V_{MCG} and to establish a V_1 based on V_{MCG} rather than a margin above V_{MCA}.

The only comment on this section was a non-substantive one, in which FAA concurred.

The proposal is adopted as proposed.

Section 23.53 Takeoff Performance

The FAA proposed a new heading for § 23.53 and a content based primarily on the general takeoff performance requirement of the current § 23.51.

The FAA proposed to remove the takeoff speed requirements from current § 23.53 and to place them in § 23.51. (See discussion for § 23.51.) Section 23.53 provides general takeoff performance requirements for normal, utility, acrobatic, and commuter category airplanes. Proposed paragraph (a) is based on current § 23.51(a). Proposed paragraph (b) is a modification of current § 23.1587(a)(5). Proposed paragraph (c) is based on current § 23.51(d).

No comments were received on the proposals for this section, and they are adopted as proposed.

Section 23.55 Accelerate-Stop Distance

The FAA proposed to revise § 23.55 to clarify the accelerate-stop segments and to make editorial changes.

The proposed requirement divides the accelerate-stop maneuver into three segments, rest to V_{EF} (paragraph (a)(1)), V_{EF} to V_1 (paragraph (a)(2)), and V_1 to rest (paragraph (a)(3)). The FAA proposed to remove the following four phrases: First, remove the phrase "in the case of engine failure," from current § 23.55(a)(2) because it is included in paragraph (a)(2). Second, remove the phrase "assuming that * * * the pilot has decided to stop as indicated by application of the first retarding means at the speed V_1," from § 23.55(a)(2) because it is stated in § 23.51(c)(1)(ii). Third, remove the phrase "exceptional skill" from § 23.55(b)(3) because it remains in § 23.45(h)(5)(i). Fourth, remove the phrase "if that means is available with the critical engine inoperative" from § 23.55(b) because it is covered by the safe and reliable requirements of § 23.55(b)(1).

No comments were received on the proposals for this section, and they are adopted as proposed.

Section 23.57 Takeoff Path

The FAA proposed to revise § 23.57 to clarify and to specify the takeoff path segments that must be determined in flight. Proposed paragraph (a) clarifies that the transition to the enroute configuration should be completed on or before reaching 1500 feet above the takeoff surface. Section 23.57(c)(1) requires the slope of the airborne part of the takeoff path to be "positive at each point"; proposed paragraph (c)(1) is revised to "not negative at any point," to allow acceleration in level flight,

which is implied by current § 23.61(c). Proposed § 23.57(c)(3) specifies that the climb gradient "must not be less than * * *," as opposed to "may not be less than * * *." The option, in current § 23.57(d), to determine the takeoff path either by continuous demonstration or by synthesis from segments, does not reflect current practice. The best method to determine the takeoff path from rest to 35 feet above the takeoff surface is by a continuous demonstration. The most practical method to determine the takeoff path from 35 feet to 1500 feet above the takeoff surface is by synthesis from segments. Accordingly, § 23.57, paragraphs (d) and (e), incorporates these changes.

No comments were received on the proposals for this section, and they are adopted as proposed.

Section 23.59 Takeoff Distance and Takeoff Run

The FAA proposed to clarify § 23.59 with no substantial change in requirements. A change to the opening text is proposed to clarify that the determination of takeoff run is the applicant's option since the applicant may choose not to present clearway data. In current § 23.59 (a)(2) and (b)(2), the reference to "along the takeoff path," in a takeoff with all engines operating, is proposed to be removed since takeoff path is a one-engine-inoperative condition. Additionally, the FAA proposed to replace the reference to V_{LOF} with the words "liftoff point" to clarify that the requirements specify a point and related distance, not a speed.

No comments were received on the proposals for this section, and they are adopted as proposed.

Section 23.63 Climbs: General

The FAA proposed a new § 23.63 to assemble general climb requirements from current §§ 23.65 and 23.67 into a single section and to differentiate between WAT limited airplanes and those airplanes that are not WAT limited. (See discussion under § 23.45.) As proposed, new § 23.63(a)(1) requires that compliance be shown out of ground effect. This requirement is in current § 23.67(e), which applies to commuter category airplanes. New § 23.63(a)(3) requires that compliance must be shown, unless otherwise specified, with one engine inoperative, at a bank angle not exceeding 5 degrees. This requirement is in current § 23.149 and has been applied generally to part 23 airplanes except commuter category airplanes in certain circumstances.

No comments were received on the proposals for this section, and they are adopted as proposed.

Section 23.65 Climb: All Engines Operating

The FAA proposed to change the applicability of § 23.65(a) from "each airplane," as adopted in Amendment No. 23–45 (58 FR 42136, August 6, 1993), to "each normal, utility, and acrobatic category reciprocating engine-powered airplane of 6,000 pounds or less maximum weight." The FAA also proposed to change the phrase "angle of climb" to "climb gradient" and to establish the climb gradient at 8.3 percent for landplanes and 6.7 percent for seaplanes and amphibians with certain specified performance conditions.

In paragraph (a)(4), the FAA proposed to establish a minimum climb speed for multiengine airplanes of not less than the greater of 1.1 V_{MC} and 1.2 V_{S1}, which provides a margin above V_{MC}.

The FAA proposed to move cowl flap requirements, in current paragraph (a)(5), to proposed § 23.45(c).

The FAA proposed to remove § 23.65(b) since these requirements should have been removed in Amendment No. 23–45 (58 FR 42136, August 6, 1993). Since the adoption of Amendment No. 23–45, there is no longer a rate of climb requirement in § 23.65(a).

The FAA proposed to add WAT limits to § 23.65(b), for reciprocating engine-powered airplanes of more than 6,000 pounds maximum weight and turbine engine-powered airplanes. (See § 23.45 discussion.)

The FAA proposed to move § 23.65(c) to § 23.65(b) and to remove the temperature and altitude requirements since WAT limits are required for turbine engine-powered airplanes and the four percent gradient applies at any approved takeoff ambient condition. In § 23.65(b)(2), the FAA proposed to require the landing gear be down for the test unless the gear can be retracted in not more than seven seconds. This is more stringent than the present requirement, but the same as the proposed one-engine-inoperative takeoff climb requirements, and is considered appropriate to this weight and class of airplane with WAT limits.

The FAA proposed to remove § 23.65(d) since the requirements are covered in amended § 23.45(h)(2) and in current § 23.21.

No comments were received on the proposals for this section, and they are adopted as proposed.

Section 23.66 Takeoff Climb; One-Engine Inoperative

The FAA proposed a new § 23.66 to require the determination of the one-engine-inoperative climb capability of all WAT limited reciprocating engine-powered and turbine engine-powered airplanes immediately after takeoff. Since most reciprocating engine-powered airplanes do not have autofeather, the condition immediately after takeoff can be critical. There is not a minimum climb requirement in this configuration, only the determination of the climb or decent gradient. This information is provided to the pilot in the AFM (see § 23.1587) to allow the pilot to make informed judgments before takeoff.

No comments were received on the proposal for this section, and it is adopted as proposed.

Section 23.67 Climb: One Engine Inoperative

The FAA proposed to reorganize § 23.67 for harmonization with the JAR; to require WAT limits for some airplanes; to require wings level climb up to 400 feet for commuter category airplanes; and to make minor changes in airplane configuration requirements.

Revised § 23.67(a) specifies the climb requirements for non-WAT airplanes with no change in requirements for those airplanes.

Revised § 23.67(b) specifies climb requirements for WAT airplanes. WAT criteria are applied for both reciprocating engine-powered airplanes of more than 6,000 pounds maximum weight and turbine engine-powered airplanes. (See the discussion under § 23.45.) Turbine engine-powered airplanes have been subject to limited WAT limitations under § 23.67(c), which the FAA proposed to incorporate into § 23.67(b).

The FAA proposed to change the takeoff flap position for normal, utility, and acrobatic category reciprocating engine-powered airplanes of 6,000 pounds or less to "wing flaps retracted" from "most favorable position" (§ 23.67(a)(4)). Wing flaps retracted is the position most used in certification and in service for this size of airplane (see new § 23.67 (a)(1)(iv) and (a)(2)(iv)).

The FAA proposed to remove § 23.67(d) since all climb speeds (both all-engine and one engine inoperative) are scheduled and the determination of V_Y is no longer required.

The FAA proposed to redesignate § 23.67(e) for commuter category airplanes as § 23.67(c) with no change in requirements except that the takeoff climb with landing gear extended must be conducted with the landing gear doors open. This is a conservative approach offered by the JAA to specify a definite gear door configuration and to remove the requirement to determine

performance during the transient condition of gear doors opening and closing. The FAA proposed to specify, in § 23.67(c)(1), that the first segment climb must be conducted with the wings level and to further specify that the climb speed for the segment must be V_2 instead of the requirement for a range of speeds from V_{LOF} and whatever the applicant selects at gear retraction. Also, the FAA proposed, in § 23.67(c)(2), to require conducting the second segment climb with wings level, which is appropriate for operational scenarios.

The FAA proposed to revise § 23.67 by removing paragraph (e)(1) and by moving the requirements to § 23.67(c) and § 23.63 (a)(1) and (d).

In proposed § 23.67(c)(3), enroute climb, the FAA added a minimum climb speed to ensure an adequate margin above stall speed.

The FAA proposed to redesignate § 23.67(e)(3) as § 23.67(c)(4) and to remove the paragraph heading "Approach" and add "Discontinued approach" in its place. The FAA proposed to clarify, in new § 23.67(c)(4), that the climb gradients must be met at an altitude of 400 feet above the landing surface.

No comments were received on the proposals for this section, and they are adopted as proposed.

Section 23.69 Enroute Climb/Descent

The FAA proposed a new § 23.69 to require the determination of all engine and one-engine-inoperative climb/descent rates and gradients in the enroute configuration under all operational WAT conditions. This information is necessary for enroute flight planning and dispatch. Climb speeds are specified to provide a margin above V_{S1}.

No comments were received on the proposal for this section, and it is adopted as proposed.

Section 23.71 Glide: Single-Engine Airplanes

The FAA proposed a new § 23.71 to require the determination of glide distance and speed for single-engine airplanes. The information is necessary for flight planning and to provide the pilot with information from which to make informed decisions.

No comments were received on the proposal for this section, and it is adopted as proposed.

Section 23.73 Reference Landing Approach Speed

The FAA proposed a new § 23.73 to define the reference landing approach speeds, V_{REF}. Establishing a definition for these speeds simplifies the use of V_{REF} in other portions of the rule. The V_{REF} speeds for the various category airplanes are established as not less than 1.3 V_{S0}. Also, the established speeds consider the appropriate relationship to V_{MC} determined under § 23.149.

No comments were received on the proposal for this section, and it is adopted as proposed.

Section 23.75 Landing Distance

The FAA proposed to revise the heading, reorganize § 23.75 for harmonization with the JAR, add the landing reference speed, V_{REF}, and move the portion on brake pressure to § 23.735, Brakes.

The FAA proposed to remove the reference to the AFM from the introductory paragraph. Part 23, subpart B, is generally used to specify flight test requirements, and part 23, subpart G, is generally used to specify the AFM requirements. The FAA also proposed to revise the introductory paragraph to require landing distances to be determined at standard temperature for each weight and altitude. Service experience has shown that landing distances are not sensitive to temperatures. The use of standard temperature is consistent with WAT requirements. The FAA proposed to remove from the introductory paragraph the reference to "approximately 3 knots" for seaplanes and amphibians because this information is considered advisory material on acceptable methods of compliance.

The FAA proposed to revise § 23.75(a) to add V_{REF} and to require its use. (See § 23.73.)

The FAA proposed to remove § 23.75(b) because § 23.45 specifies these general requirements. New § 23.75(b) clarifies that a constant configuration must be maintained throughout the maneuver.

The FAA proposed to revise § 23.75(d) by adding the requirement to specify the weight that must be considered for the transition to the balked landing conditions. This requirement reflects current industry practice.

The FAA proposed new § 23.75(e) as a general requirement to ensure the reliability of the brakes and tires.

The FAA proposed to revise § 23.75(f) to remove the first use of the word "means" and to add the phrase "retardation means" in its place, and to remove paragraph (f)(3). Paragraph (f)(3) required that no more than average skill shall be required to control the airplane. This topic is covered in § 23.45(f).

The FAA proposed to remove § 23.75(h) because the introductory paragraph of § 23.75 contains commuter category requirements and § 23.1587 requires landing distance correction factors.

No comments were received on the proposals for this section, and they are adopted as proposed.

Section 23.77 Balked Landing

The FAA proposed to revise this section to include additional WAT requirements and to make editorial changes.

The proposed revisions to § 23.77 (a) and (b) differentiate between WAT and non-WAT. (See § 23.45.) Section 23.77(a)(4) adds a new climb speed requirement to ensure that acceleration is not necessary during the transition from landing to balked landing. The climb gradient of § 23.77(b) was selected to be slightly less than the non-WAT airplane sea level requirement in exchange for a balked landing climb capability at all altitudes and temperatures.

The commuter category climb gradient of 3.3 percent specified in § 23.77(c) changes to 3.2 percent for consistency with part 25. Additional editorial changes and deletions are made in § 23.77(c) because the general requirements are covered in final § 23.45.

No comments were received on the proposals for this section, and they are adopted as proposed.

Section 23.143 General

The FAA proposed to revise § 23.143(a) to add the phrase "during all flight phases" to the introductory paragraph and to add "Go-around" to the list of flight phases.

The JAA and FAA decided, during FAA/JAA Harmonization meetings, that the term "go-around" included the all engine balked landings of § 23.77, various all engine and one-engine-inoperative aborted landings specified in the AFM, and the commuter category discontinued approach of § 23.67(c)(4). Balked landing refers only to the all engine balked landing of § 23.77.

The FAA proposed to revise the two-hand roll force in the table of paragraph (c) from 60 to 50 pounds, to be consistent with JAR 25. The FAA also proposed to revise the table to show a one-hand on the rim roll force of 25 pounds. This is an FAA/JAA harmonized value.

Comment: Raytheon Aircraft Company comments that the control force limits table is specifically tied to the flight phases of paragraph (a) and that this "could be interpreted as providing an upper limit of maneuvering force (stick force per g) such that all normal operational

maneuvers would have to be performed within a pitch force limit of 75 lbs (wheel, two hands), for unspecified normal acceleration limits."

Raytheon states that this has not been previous policy and could become a costly requirement for larger part 23 aircraft with large cg ranges, "if substantial normal acceleration excursions are considered 'normal' maneuvering." Raytheon recommends "that either the normal acceleration excursions be defined for normal, utility, acrobatic, and commuter categories or the explicit tie to the flight phases in this rule be deleted."

FAA Response: Raytheon's concern is whether "normal acceleration excursions are considered 'normal' maneuvering." They are not.

Section 23.143 has historically been titled "General" and has always been considered broad enough to cover controllability and maneuverability in general. The inclusion of "all flight phases" is considered clarifying, and Raytheon's concern that the concept of normal being expanded is unwarranted. Adopting this proposal would not change current certification practice.

The proposals are adopted as proposed.

Section 23.145 Longitudinal Control

The FAA proposed to revise § 23.145 to change the speed ranges applicable to the takeoff, enroute, and landing configurations.

Editorial changes were also proposed for the introductory text of paragraph (b) with no substantive change.

The FAA proposed in paragraph (b)(2) to change the requirement from "attaining and maintaining, as a minimum, the speed used to show compliance with § 23.77" to "allow the airspeed to transition from 1.3 V_{S0} to 1.3 V_{S1}."

The FAA also proposed to redesignate paragraphs (b)(2) (i) and (ii) as (b)(2) and (b)(3), respectively, and in paragraph (b)(3) to add more specific requirements if gated flap positions are used.

The FAA proposed to change the speed reference from 1.4 V_{S0} to V_{REF} for landing configuration in paragraph (b)(5). The FAA also proposed in paragraph (b)(5) to allow a two-handed control force since use of two hands is considered appropriate for a power off condition because the pilot does not need to change power settings.

Proposed paragraph (b)(6) is the same as former paragraph (b)(3).

In paragraph (c), the FAA proposed to change the speed range for maneuvering capability from "above V_{MO}/M_{MO} and up to V_D/M_D" to "above V_{MO}/M_{MO} and up to the maximum speed shown under § 23.251." This change is considered necessary because a range of speeds can be chosen as V_D/M_D, and reference to § 23.251 ensures a flight demonstrated speed instead of a design speed.

The FAA proposed in paragraph (d) to change the speed that must be maintained for power-off glide from 1.3 V_{S0} to V_{REF}.

No comments were received on the proposals for this section, and they are adopted as proposed.

Section 23.147 Directional and Lateral Control

The FAA proposed to make minor revisions to § 23.147(a) and to add two new requirements in proposed paragraphs (b) and (c). The flaps retracted configuration for § 23.147(a)(4) are consistent with proposed § 23.67.

In proposed § 23.147(b), the FAA proposed to add requirements for multiengine airplanes that, during an enroute climb, when an engine fails the airplane maintains a minimum standard of controllability after allowing for a pilot action delay of two seconds. This proposed change tests for a likely operational scenario and is intended to ensure satisfactory controllability.

In § 23.147(c), the FAA proposed to test for the failure or disconnection of the primary lateral control. This paragraph requires that the airplane exhibit adequate dihedral effect throughout the airplane's operational envelope to ensure continued safe flight and landings if a lateral control disconnects. In addition, this requirement complements the relaxed requirements of proposed § 23.177(b) (see proposal for § 23.177).

Comment: Raytheon comments that there is no basis provided for the new rules proposed in § 23.147 (b) and (c). Raytheon states that the "two second delay and the 45 degree bank appear to be arbitrary choices" and that there "is no comparable FAR requirement."

FAA Response: The values of 2 seconds and 45 degrees in proposed paragraph (b) were determined from § 23.367, "Unsymmetrical loads due to engine failure," which contains a 2 second delay for pilot corrective action. Historically, the 2 second delay and the 45 degree bank angle correlate to a similar requirement used for years by the United Kingdom CAA.

Proposed paragraph (c), failure of the lateral control, is part of a reduction in the overall lateral stability requirements. In Amendment 23–45, the FAA reduced the power requirements for § 23.177(a) in the landing configuration from 75 percent maximum continuous power to the power required to maintain a three degree angle of descent. The § 23.177 requirement essentially demonstrated that the airplane had the wing dihedral effect and rudder control power to raise a low (banked) wing using rudder only. Prior to this amendment, many manufacturers had to install an aileron/rudder interconnect to meet this requirement because of the high power setting. An aileron/rudder interconnect is a mechanism that ties the two controls together such that when one control surface deflects, the other will also deflect. In the case of § 23.177, the pilot uses the rudder, which also deflects the aileron and raises the wing to level. The underlying intent of this rule is to demonstrate that the airplane is controllable after an aileron control failure, similar to the elevator control failure demonstration currently in the requirements. This change, in conjunction with Amendment 23–45, will allow manufacturers to eliminate the need for the aileron/rudder interconnect.

The proposals are adopted as proposed.

Section 23.149 Minimum Control Speed

The FAA proposed to clarify § 23.149, to add a V_{MC} in the landing configuration, and to provide the procedure for determining a ground V_{MC}.

The FAA proposed to clarify § 23.149(a), with no requirement change. The FAA also proposed to clarify § 23.149(b) and to remove the reference to lesser weights in paragraph (b)(4) because the range of weights is covered in § 23.21.

The FAA proposed to revise § 23.149(c) to specify the requirements for a V_{MC} in the landing configuration for all WAT airplanes. This requirement is necessary for WAT airplanes to provide a V_{REF} margin above the V_{MC} determined in the landing configuration. (See proposal for § 23.73.)

The FAA proposed a new § 23.149(f) to contain requirements to determine a V_{MCG} for commuter category airplanes that could, at the option of the applicant, be used to comply with § 23.51. (See § 23.51.)

The only comment came from the JAA, which addressed a known disharmony, V_{SSE}, from a previous rule change.

The proposals are adopted as proposed.

Section 23.153 Control During Landings

The FAA proposed to revise § 23.153 to reference landing speeds to V_{REF} and to reorganize the section.

No comments were received on the proposal for this section, and it is adopted as proposed.

Section 23.155 Elevator Control Forces in Maneuvers

The FAA proposed to revise § 23.155 to make changes to the power requirements and gradient of the stick force curve.

The FAA proposed to revise § 23.155(b) to specify the maximum continuous power for the test required by this section instead of allowing a power selected by the applicant as an operating limitation. This revision eliminates an unnecessary power specification and simplifies normal operations for the pilot.

The FAA proposed to revise § 23.155(c) to address stick force gradient to ensure that stick force lightening is not excessive. As stated in the preamble to Notice 94–22, the FAA will issue advisory material on acceptable methods of compliance.

Comment: Raytheon states that proposed paragraph (c) adds a new requirement that there must not be an "excessive decrease" in the gradient of the stick force per g with increasing load factor. Raytheon's concern is that this is a very loosely defined requirement and that the allowable decrease in maneuvering stability may be a function of aircraft size and mission.

FAA Response: The FAA agrees that every airplane is different and that, therefore, each must be considered separately. The FAA does not agree that paragraph (c) is loosely defined. For many of the flight requirements, including "excessive decrease," the FAA must evaluate the individual airplanes to determine if the handling qualities are safe.

This proposal are adopted as proposed.

Section 23.157 Rate of Roll

The FAA proposed to revise § 23.157(d) power and trim requirements and to clarify the flap position. In § 23.157(d)(1), the FAA proposed to clarify that the flaps should be in the landing position and § 23.157(d)(3) makes the power consistent with the approach configuration, which is the configuration being tested. The FAA proposed in § 23.157(d)(4) to relate the trim speed to V_{REF}. (See amendment for § 23.73.)

No comments were received on the proposals for this section, and they are adopted as proposed.

Section 23.161 Trim

The FAA proposed to revise § 23.161 power, configurations, and speeds.

The FAA proposed to revise § 23.161(a) to state the safety principles underlying the trim requirements and to provide a regulatory requirement for considering conditions that might be encountered outside the requirements addressed in paragraphs (b) through (d).

The FAA proposed to revise § 23.161(b)(1) to add a requirement to trim at M_{MO} in addition to V_{MO} to clarify that the airplane must trim in the Mach limited speed range.

The FAA proposed to revise § 23.161(b)(2) to require lateral and directional trim over a range of 1.4 V_{S1} to V_H or V_{MO}/M_{MO} for commuter category airplanes instead of only the high speed requirement in the present rules.

The FAA proposed, in the introductory paragraph of § 23.161(c), to remove the reference to V_{MO}/M_{MO} because it is covered in the applicable individual sections. In § 23.161(c)(1), the FAA proposed to require trim at takeoff power, as this is a likely operational scenario for most airplanes and the condition should be tested. In addition, the change relates the maximum continuous power climb speeds and configuration to § 23.69, the enroute climb requirement. The FAA proposed to redesignate § 23.161(c)(2) as § 23.161(c)(4), to change the reference V_{REF} for a landing speed, and to add a requirement for the airplane to trim at the steepest landing approach gradient the applicant chooses under § 23.75. The FAA proposed to redesignate § 23.161(c)(3) as § 23.161(c)(2) with editorial changes and to redesignate § 23.161(c)(4) as § 23.161(c)(3) with an increase in the trim speed from 0.9 V_{NO} or V_{MO} to V_{NO} or V_{MO}/M_{MO}. The increase in trim speed is appropriate because descent is permitted and is common at V_{MO}.

In § 23.161(d), the FAA proposed to make editorial changes in the introductory paragraph, to reference the appropriate § 23.67 requirements, and to remove commuter category speed ranges, which are moved to the new § 23.161(e). The FAA proposed to revise § 23.161(d)(4) to specify flaps retracted instead of referencing the § 23.67 configurations. Flaps retracted is the likely sustained configuration where a pilot would need to trim. Also, the flaps retracted configuration for § 23.161(d)(4) is consistent with § 23.67.

The FAA proposed a new § 23.161(e) to ensure that excessive forces are not encountered in commuter category airplanes during extended climbs at V_2 in the takeoff configuration, when climb above 400 feet is required.

No comments were received on the proposals for this section, and they are adopted as proposed.

Section 23.175 Demonstration of Static Longitudinal Stability

The FAA proposed to revise § 23.175(a)(1) to change the flap position from the climb position to the flaps retracted position. This is a clarifying change since virtually all part 23 airplanes use the flaps retracted position for climb. Also, this change aligns the part 23 and part 25 climb static longitudinal stability requirements.

The FAA proposed, in § 23.175(a)(3), to remove the option for the applicant to select some power other than maximum continuous power as an operating limitation. As noted in the discussion of § 23.155, this eliminates a power specification that is unnecessary and simplifies normal operations for the pilot. In § 23.175(a)(4), the FAA proposed to make the trim speed consistent with the enroute all-engine climb speed.

The FAA proposed in § 23.175(b) to rearrange the paragraph with no change in requirements. The definition of V_{FC}/M_{MC} contained in § 23.175(b)(2) is moved to part 1, to harmonize with JAR 1. (See the change to § 1.1.)

The FAA proposed to remove § 23.175(c). The test for gear down cruise static longitudinal stability required under paragraph (c) is considered superfluous to the landing configuration static longitudinal stability test and does not represent a likely operating scenario.

The FAA proposed to redesignate § 23.175(d) as § 23.175(c) with a change to V_{REF} as the trim speed.

No comments were received on the proposals for this section, and they are adopted as proposed.

Section 23.177 Static Directional and Lateral Stability

The FAA proposed to revise § 23.177 to remove the requirements for two-control airplanes, to make minor clarifying changes, and to specify an exclusion for acrobatic category airplanes.

The FAA proposed in § 23.177 to remove the introductory phrase concerning three-control airplanes, which is consistent with the removal of the requirements for two-control airplanes in paragraph (b). The two-control airplane regulations were introduced in 1945 but no two-control airplanes have been certificated for several decades and no need is foreseen for these regulations. If an applicant

proposes a two-control airplane, the FAA would issue special conditions.

The FAA proposed that, after removing the introductory portion of § 23.177(a), paragraph (a)(1) would be redesignated as (a). In the first sentence, "skid" is replaced with "wings level sideslip" to clarify the intended maneuver. Also, this change increases the power requirement for demonstration of directional stability in the landing configuration. The requirement specifies power necessary to maintain a three degree angle of descent. Maximum continuous power is considered appropriate since directional stability should be maintained during a balked landing, particularly since directional instability is an undesirable characteristic at any point in the flight envelope. Also, the FAA proposed to replace V_A with V_O to be consistent with § 23.1507.

The FAA proposed, in § 23.177(b), to replace "any" with "all" in the first sentence to clarify that all landing gear and flap positions must be addressed. Also, the FAA proposed that the paragraph specify a minimum speed at which static lateral stability may not be negative, as 1.3 V_S, for all configurations except takeoff. This is consistent with the other speeds specified in § 23.177(b) and relieves the requirement for other than takeoff speeds.

The FAA proposed new § 23.177(c) to provide an exclusion for the dihedral effect for acrobatic category airplanes approved for inverted flight. This change recognizes that, in full acrobatic airplanes, the dihedral effect is not a desired characteristic

The addition of § 23.147(c), which ensures lateral control capability without the use of the primary lateral control system, compensates for the relieving nature of proposed § 23.177(b) and the exception from the requirements of § 23.177(b) for acrobatic category airplanes.

The FAA proposes to redesignate § 23.177(a)(3) as § 23.177(d) and to remove the next to the last sentence of § 23.177(d), concerning bank angle and heading. The requirement is not a necessary test condition and a constant heading during the sideslip may be impossible in some airplanes.

Comment: Raytheon commented on the requirements for stability in steady heading slips, which were changed in a previous amendment (Amendment 23–21; 43 FR 2318; January 16, 1978), and recommended clarifying language.

FAA Response: As Raytheon noted, the rule language they believe needs clarification was not addressed in Notice 94–22, and, therefore, is beyond the scope of this rulemaking.

The proposals are adopted as proposed.

Section 23.201 Wings Level Stall

The FAA proposed to remove the two-control airplane requirements, altitude loss requirements, and to make clarifying changes in § 23.201.

The FAA proposed to revise § 23.201(a) to remove the applicability reference for an airplane with independently controlled roll and directional controls and to replace the last word "pitches" with "stalls" since stalls may be defined by other than nose-down pitching.

The FAA proposed to remove § 23.201(b) since it applies to two-control airplanes. (See § 23.177 for discussion of two-control airplane requirements.)

The FAA proposed to divide § 23.201(c) into § 23.201(b), stall recognition, and § 23.201(c), stall recovery. The FAA proposed, in § 23.201(b), to clarify that the test should start from a speed at least 10 knots above the stall speed, with no change in requirements. The FAA proposed to add § 23.201(c) to specify how long the control must be held against the stop. This change ensures that the procedure for determining stall speed is the same procedure used to test stall characteristics. The FAA proposed to remove the last sentence of paragraph (c) on the increase of power because it only applies to altitude loss.

The FAA proposed to remove § 23.201(d), as suggested by the JAA, since the determination of altitude loss, and its subsequent furnishing in the AFM, is not considered information useful to the pilot for safe operation of the airplane.

The FAA proposed new § 23.201(d) based on present § 23.201(e), to clarify that the roll and yaw limits apply during both entry and recovery.

The FAA proposed new § 23.201(e) based on former paragraph (f) with some revisions. During FAA/JAA harmonization meetings, the JAA pointed out to the FAA that, in high power-to-weight ratio airplanes, extreme nose-up attitudes were the principal criteria for use of reduced power, not the presence of undesirable stall characteristics. The FAA concurs, and, therefore, proposed to remove the phrase concerning stall characteristics.

No comments were received on the proposals for this section, and they are adopted as proposed.

Section 23.203 Turning Flight and Accelerated Turning Stalls

The FAA proposed to revise § 23.203 to add the word "turning" before "stalls" and after "accelerated" in the heading, the introductory text, and in paragraphs (a)(2) and (b)(5). This change clarifies that accelerated stalls are performed in turning flight. This clarification reflects current practice.

In § 23.203 (a) and (b), the FAA proposed to reference the stall definition in current § 23.201(b), which is more specific than the present general words "when the stall has fully developed or the elevator has reached its stop."

For clarification, the FAA proposed that paragraph (b)(4) be separated into paragraphs (b)(4) and (b)(5) without substantive change, and that former paragraph (b)(5) be redesignated as paragraph (b)(6).

The FAA proposed in § 23.203(c)(1) to clarify the wing flap positions by changing "each intermediate position" to "each intermediate normal operating position," and in § 23.203(c)(4) to clarify the use of reduced power. (See the final change to § 23.201(f).)

The FAA proposed new paragraph (c)(6) to be consistent with new § 23.207(c)(6) configurations (Amendment No. 23–45).

No comments were received on the proposals for this section, and they are adopted as proposed.

Section 23.205 Critical Engine-Inoperative Stalls

The FAA proposed to remove § 23.205. The stall demonstration conditions are not realistic because the engine operation and power asymmetry do not represent conditions likely to accompany an inadvertent stall in service. Service history shows, however, that stalls with significant power asymmetry can result in a spin, even on airplanes that are certificated to the present requirement. Based on this service history, the FAA determined that the requirement for demonstrating one-engine-inoperative stalls is not effective in ensuring that inadvertent stalls with one engine inoperative will have satisfactory characteristics and be recoverable. Sufficient protection against the hazard of stalling with one engine inoperative is provided by the one-engine-inoperative performance requirements and operating speed margins, coupled with the requirements for determination of V_{MC}, and the addition of a directional and lateral control test under § 23.147(b).

No comments were received on the proposal for this section, and the section is removed as proposed.

Section 23.207 Stall Warning

The FAA proposed, in § 23.207(c), to reference the stall tests required by

§ 23.201(b) and § 23.203(a)(1) and to specify that during such tests for one knot per second deceleration stalls, both wings level and turning, the stall warning must begin at a speed exceeding the stalling speed by a margin of not less than 5 knots. The FAA proposed to remove the quantified upper limit in the rule of 10 knots or 15 percent of the stalling speed. The upper limit has created problems for manufacturers because of the complex design features required to show compliance. The upper limit requirement is, in effect, replaced by the nuisance stall warning provision in § 23.207(d).

The FAA proposed to divide § 23.207(d) into § 23.207 (d) and (e), with § 23.207(d) on nuisance stall warnings having no change in requirements. In § 23.207(e), the FAA proposed to remove the bottom limit of five knots for decelerations greater than one knot per second and to specify that the stall warning must begin sufficiently before the stall so that the pilot can take corrective action. This is considered appropriate because, at the higher deceleration rates of three to five knots per second, a specified five knots may not be enough stall warning.

The FAA proposed new § 23.207(f) to allow for a mutable stall warning system in acrobatic category airplanes, with automatic arming for takeoff and rearming for landing. This feature allows the pilot to disengage the warning during acrobatics while retaining the safety feature during takeoff and landing.

No comments were received on the proposals for this section, and they are adopted as proposed.

Section 23.221 Spinning

The FAA proposed to change the point to start the one-turn-spin recovery count, to delete the "characteristically incapable of spinning" option, and to make minor changes in acrobatic category spins in § 23.221.

The FAA proposed, in § 23.221(a), to replace the exception for airplanes characteristically incapable of spinning with an exception for airplanes that demonstrate compliance with the optional spin resistant requirements of paragraph (a)(2) of this section. Criteria for an airplane incapable of spinning are unnecessary since criteria for spin resistant airplanes are provided. As proposed, § 23.221(a) changed the point at which the count for the one-turn-spin recovery begins. The change provides a specific point to begin the count by replacing the phrase "after the controls have been applied" with "after initiation of the first control action for recovery." Under the former rules, if an applicant proposed a multiple step recovery procedure that starts with the rudder, then the airplane may be effectively recovered before the start of the recovery count.

The FAA proposed, in § 23.221(a)(1)(ii), to specify that no control force or characteristic can adversely affect prompt recovery. This would be an improvement over the present requirement because it includes yaw and roll as well as pitch control.

The FAA proposed to recodify § 23.221(a)(1) into § 23.221 (a)(1)(i) through (a)(1)(iv) with no changes in the requirements, and to restate § 23.221(a)(2) on spin resistant airplanes with minor editorial changes but with no change in requirements.

The FAA proposed to specify, in § 23,221(b), the emergency egress requirements of § 23.807(b)(5) for those utility category airplanes approved for spinning, thereby cross-referencing the requirements of § 23.807 to the flight requirements.

The FAA proposed, in the introductory paragraph of § 23.221(c), to require acrobatic category airplanes to meet the one-turn-spin requirements of § 23.221(a). This change is needed because acrobatic category airplanes should have sufficient controllability to recover from the developing one-turn-spin under the same conditions as normal category airplanes. The introductory paragraph also cross-references § 23.807 for emergency egress requirements.

The FAA proposed, in § 23.221(c)(1), pertaining to acrobatic category airplanes, to add a requirement for spin recovery after six turns or any greater number of turns for which certification is requested. This rule requires recovery within 1.5 turns after initiation of the first control action for recovery. This requirement ensures recovery within 1.5 turns if the spin mode changes beyond six turns. As an alternative, the applicant may stop at six turns and provide a limitation of six turns.

The FAA proposed, in § 23.221(c)(2), to remove the option to retract flaps during recovery and to provide the applicant with a choice of flaps up or flaps deployed for spin approval. The paragraph continues to prohibit exceeding applicable airspeed limits and limit maneuvering load factors.

The FAA proposed new § 23.221(c)(4) to ensure that the acrobatic spins do not cause pilot incapacitation.

The FAA proposed to remove § 23.221(d), relating to airplanes that are "characteristically incapable of spinning," which has been in the regulation since at least 1937. In 1942, the present weight, center of gravity, and control mis-rig criteria were introduced into Civil Air Regulation (CAR) 03. Since then, the National Aeronautics and Space Administration (NASA) spin resistant requirements, which are based on research, have been developed and incorporated in the regulations by Amendment No. 23–42 (56 FR 344, January 3, 1991). If an applicant proposes a non-spinable airplane, it would be appropriate to apply the requirements of § 23.221(a)(2) as proposed in Notice 90–22.

The only comment on this section was a JAA statement recognizing this as an existing disharmony.

The proposals are adopted as proposed.

Section 23.233 Directional Stability and Control

The FAA proposed to make minor word changes to § 23.233(a) to harmonize this section with the corresponding JAR section.

No comments were received on the proposal for this section, and it is adopted as proposed.

Section 23.235 Operation on Unpaved Surfaces

The FAA proposed to revise the heading of § 23.235 and to remove water operating requirements, which are moved to new § 23.237.

No comments were received on the proposals for this section, and it is adopted as proposed.

Section 23.237 Operation on Water

New § 23.237, for operation on water, is the same as the former § 23.235(b).

The only comment on this section is a JAA statement acknowledging an existing disharmony.

The proposal is adopted as proposed.

Section 23.253 High Speed Characteristics

The FAA proposed to remove paragraph (b)(1), since the requirement for piloting strength and skill is covered in § 23.141.

No comments were received on the proposal for this section, and it is adopted as proposed.

Section 23.562 Emergency Landing Dynamic Conditions

The FAA proposed to change the one engine inoperative climb to remove the reference in § 23.562(d) and to add it to § 23.67(a)(1).

The only comment on this section is a JAA statement acknowledging existing disharmony.

The proposal is adopted as proposed.

Section 23.1325 Static Pressure System

The FAA proposed to revise § 23.1325(e) to clarify that the static pressure calibration must be conducted in flight, which is standard practice, and to remove and reserve § 23.1325(f).

No comments were received on the proposals for this section, and they are adopted as proposed.

Section 23.1511 Flap Extended Speed

The FAA proposed to remove from § 23.1511(a) references to § 23.457. Section 23.457 is proposed to be removed in a related NPRM, Notice No. 94–20 (59 FR 35196, July 8, 1994), on the airframe.

No comments were received on the proposal for this section, and it is adopted as proposed.

Section 23.1521 Powerplant Limitations

The FAA proposed to amend § 23.1521 to require maximum temperature be established for takeoff operation and to require an ambient temperature limit for reciprocating engines in airplanes of more than 6,000 pounds.

The FAA proposed in § 23.1521(b)(5) to require the establishment of maximum cylinder head, liquid coolant, and oil temperature limits for takeoff operation without regard to the allowable time. Previously, temperature limits were required only if the takeoff power operation is permitted for more than two minutes. It is appropriate to require operating temperature limitations because most takeoff operations will exceed two minutes.

The FAA proposed in § 23.1521(e) to require an ambient temperature limit for turbine engine-powered airplanes and reciprocating engine-powered airplanes over 6,000 pounds. These airplanes are subject to WAT limits and the revision will ensure that airplane engines will cool at the ambient temperature limit.

No comments were received on the proposals for this section, and they are adopted as proposed.

Section 23.1543 Instrument Markings: General

The FAA proposed new § 23.1543(c) to require that all related instruments be calibrated in compatible units. This is considered essential for safe operation.

No comments were received on the proposal for this section, and it is adopted as proposed.

Section 23.1545 Airspeed Indicator

The FAA proposed in § 23.1545(b)(5) to delete any one-engine-inoperative best rate of climb speed marking requirements for WAT limited airplanes. These airplanes already have scheduled speeds in case of an engine failure. The FAA proposed that paragraph (b)(5) apply only to non-WAT airplanes for which the one-engine-operative best rate of climb speed marking has been simplified to reflect performance for sea level at maximum weight. Since the blue arc rule was promulgated in Amendment No. 23–23 (43 FR 50593, October 30, 1978), certification experience has shown that the marking of an arc is unnecessarily complicated. For many airplanes, the approved arc was so narrow that the arc was a line; therefore, final paragraph (b)(5) requires a blue radial line instead of an arc.

The FAA proposed to revise § 23.1545(b)(6) to retain the existing V_{MC} requirement for non-WAT airplanes and to remove the requirement for V_{MC} markings for WAT airplanes since WAT airplanes already have scheduled speeds in case of engine failure.

No comments were received on the proposals for this section, and they are adopted as proposed.

Section 23.1553 Fuel Quantity Indicator

The FAA proposed to remove, from § 23.1553, the use of an arc to show a quantity of unusable fuel. The FAA proposed that the rule reference the unusable fuel determination and require only a red radial line, which provides a clearer indication of fuel quantity for pilots.

No comments were received on the proposal for this section, and it is adopted as proposed.

Section 23.1555 Control Markings

The FAA proposed to add to § 23.1555(e)(2) a requirement that no controls except emergency controls be red.

Comment: Transport Canada states that certain cockpit controls serve a dual purpose in that they serve normal aircraft operation functions as well as emergency functions. Examples are fuel selector valves and door handles. Transport Canada recommends rule language that recognizes dual usage.

FAA Response: Transport Canada's statement about the existence of dual usage controls is correct. The FAA originally intended to address the dual usage issue in an AC. On further evaluation of the proposed rule language, dual usage controls would be prohibited, if it were adopted as proposed. Therefore, an AC could not be used to allow controls such as the mixture (which is usually red) to continue to be red without violating the rule. The FAA has incorporated the dual usage language in the final rule to avoid confusion between the intent of the rule and the current practice.

The proposal is adopted with the changes mentioned above.

Section 23.1559 Operating Limitations Placard

The FAA proposed to simplify § 23.1559 and to remove duplicate material while requiring essentially the same information. Most airplanes currently operate with an AFM and the new rule places emphasis on using the AFM to define required operating limitations.

No comments were received on the proposal for this section, and it is adopted as proposed.

Section 23.1563 Airspeed Placards

The FAA proposed to add a new paragraph (c) to § 23.1563. The new paragraph is applicable to WAT limited airplanes and requires providing the maximum V_{MC} in the takeoff configuration determined under § 23.149(b). This is desirable since the V_{MC} is not marked on the airspeed indicator for these airplanes.

No comments were received on the proposal for this section, and it is adopted as proposed.

Section 23.1567 Flight Maneuver Placard

The FAA proposed to add new § 23.1567(d) to apply to acrobatic and utility airplanes approved for intentional spinning, which requires a placard listing control actions for recovery. New paragraph (d) proposed to require a statement on the placard that the airplane be recovered when spiral characteristics occur, or after six turns, or at any greater number of turns for which certification tests have been conducted. This paragraph replaces the similar placard requirement in current § 23.1583(e)(3) for acrobatic category airplanes.

No comments were received on the proposal for this section, and it is adopted as proposed.

Section 23.1581 General

The FAA proposed to make editorial changes in § 23.1581 that recognize WAT limited and non-WAT limited airplanes.

In new § 23.1581(a)(3), the FAA proposed to require information necessary to comply with relevant operating rules. This is a FAR and JAR harmonization item and is considered necessary because some operational rules, such as § 135.391, require flight

planning with one-engine-inoperative cruise speed and/or driftdown data. For airplanes operated under part 135 in the United States, it represents no change in requirements.

The FAA proposed § 23.1581(b)(2) to require that only WAT limited airplane AFM's provide data necessary for determining WAT limits.

The FAA proposed new § 23.1581(c) to require the AFM units to be the same as on the instruments.

The FAA proposed new § 23.1581(d) to remove the requirement for a table of contents. This is considered a format requirement and is not appropriate for this section, which specifies AFM content. Section 23.1581(d) is replaced by a requirement to present all operational airspeeds as indicated airspeeds. This adopts current practice.

No comments were received on the proposals for this section, and they are adopted as proposed.

Section 23.1583 Operating Limitations

The FAA proposed to revise § 23.1583 operating limitations information for the AFM. The FAA proposed to revise airspeed limitations for commuter category airplanes, to require AFM limitations for WAT limited airplanes, to furnish ambient temperature limitations and smoking restriction information, and to specify types of runway surfaces.

The FAA proposed, in § 23.1583(a)(3), to make V_{MO}/M_{MO} airspeed operating limitations applicable only to turbine powered commuter category airplanes. This is consistent with current practice since no reciprocating engine-powered commuter category airplanes have been proposed.

In § 23.1583(c)(3), the FAA proposed to add takeoff and landing weight limitations for WAT limited airplanes. (See § 23.45.)

The FAA proposed to revise § 23.1583(c)(4) and (c)(5), to renumber § 23.1583(c)(3) and (c)(4), and to make editorial and cross-reference changes. In paragraph (c)(4)(ii), the FAA proposed a new requirement that the AFM include the maximum takeoff weight for each airport altitude and ambient temperature within the range selected by the applicant at which the accelerate-stop distance determined under § 23.55 is equal to the available runway length plus the length of any stopway, if available. This is currently required for transport category airplanes and is necessary for harmonization with JAR 23.

In § 23.1583(c)(6), the FAA proposed to establish the zero wing fuel weight of § 23.343 as a limitation. This provides the pilot with information necessary to prevent exceeding airplane structural limits.

The FAA proposed editorial changes to § 23.1583(d) and, in paragraphs (e)(1) and (e)(2), to remove references to "characteristically incapable of spinning." As discussed under § 23.221, requirements for "characteristically incapable of spinning" are removed.

In § 23.1583(e)(4), the FAA proposed to add a requirement to specify limitations associated with spirals, six turn spins, or more than six turn spins. The requirement for a placard is removed since the requirement is covered in § 23.1567.

The FAA proposed to revise § 23.1583(e)(5) based on former paragraph (e)(4) for commuter category airplanes. This restates the maneuvers as those proposed for commuter category airplanes in § 23.3.

The FAA proposed to revise the heading of § 23.1583(f) and to add a limit negative load factor for acrobatic category airplanes.

The FAA proposed to revise § 23.1583(g) to make editorial changes with no change in requirements and to reference the flight crews' requirements in § 23.1523. As proposed, § 23.1583(k), (l), and (m) are redesignated as § 23.1583(i), (j), and (k).

The FAA proposed new § 23.1583(l) to require baggage and cargo loading limits in the AFM.

The FAA proposed a new § 23.1583(m) to require any special limitations on systems and equipment in the AFM. This provides the pilot with information necessary for safe operation of the airplane systems and equipment.

The FAA proposed a new § 23.1583(n) to require a statement on ambient temperature limitations. Maximum cooling temperature limits have been required for turbine powered airplanes by § 23.1521(e); however, the requirement for the limitation has never been specified in § 23.1583. Proposed § 23.1583(n) requires both maximum and minimum temperature limits if appropriate. A minimum temperature limit provides the pilot with information necessary to avoid airplane damage during low temperature operations.

The FAA proposed a new § 23.1583(o) to state any occupant smoking limitations on the airplane in the AFM.

The FAA proposed a new § 23.1583(p) to require the applicant to state what runway surfaces have been approved.

No comments were received on the proposals for this section, and it is adopted as proposed.

Section 23.1585 Operating Procedures

The FAA proposed to rearrange the material in § 23.1585(a). Also, the FAA proposed to add, for all airplanes, a requirement to paragraph (a) that information in the following areas be included: Unusual flight or ground handling characteristics; maximum demonstrated values of crosswinds; recommended speed for flight in rough air; restarting an engine in flight; and making a normal approach and landing in accordance with §§ 23.73 and 23.75. All of these requirements are in former § 23.1585(a) except for restarting a turbine engine in flight, which is in former paragraph (c)(5) pertaining only to multiengine airplanes. The FAA decided that a restart capability is not required for single reciprocating engine airplanes for the reasons given in the preamble discussion of proposal 3 in Amendment No. 23–43 (58 FR 18958, April 9, 1993). The requirement to provide restart information should apply to single turbine engines, however, since turbine engine designs incorporate a restart capability and inadvertent shutdowns may occur. The requirement for normal approach and landing information, in accordance with the landing requirement in §§ 23.73 and 23.75, is new. This information is necessary to enable pilots to achieve the published landing distances and, if necessary, to safely transition to a balked landing.

The FAA proposed to revise § 23.1585(b) by adding new requirements, which cover gliding after an engine failure for single-engine airplanes, to reference the new requirements proposed in § 23.71.

The FAA proposed to revise § 23.1585(c) to require compliance with paragraph (a) plus the following requirements from former paragraph (c): Approach and landing with an engine inoperative; balked landing with an engine inoperative; and V_{SSE} as determined in § 23.149. The FAA also proposed to redesignate paragraph (c) requirements, information on procedures for continuing a takeoff following an engine failure and continuing a climb following an engine failure, as proposed (e) for normal, utility, and acrobatic multiengines.

The FAA proposed to revise § 23.1585(d) to apply to normal, utility, and acrobatic airplanes, which would have to comply with paragraph (a) and either (b) or (c). These airplanes must also comply with the normal takeoff, climb, and abandoning a takeoff procedures, which were contained in paragraph (a).

The FAA proposed to revise § 23.1585(c), for normal, utility and acrobatic multiengine airplanes, to require compliance with proposed (a), (c), and (d), plus requirements for continuing a takeoff or climb with one engine inoperative that were in former paragraph (c) (1) and (2).

The FAA proposed to revise § 23.1585(f) to amend normal takeoff requirements in former paragraph (a)(2); to add accelerate-stop requirements; and to continue takeoff after engine failure, which was in former paragraph (c)(1).

The FAA proposed no substantial changes in § 23.1585 (g) and (h), which are based on paragraphs (d) and (e), respectively.

The FAA proposed to revise § 23.1585(i) based on former paragraph (g) on the total quantity of usable fuel and to add information on the effect of pump failure on unusable fuel.

The FAA proposed a new § 23.1585(j) to require procedures for safe operation of the airplanes' systems and equipment that, although not previously required, are current industry practice.

In the proposed revision of § 23.1585(h), the commuter category airplane procedures for restarting turbine engines in flight would no longer be necessary because the requirement is covered under paragraph (a)(4).

Comment: The JAA comments that the JAA does not agree with limiting the inflight engine restart requirements of proposed paragraph (a)(4) to turbine engines only.

FAA Response: The JAA comment addresses a known disharmony between the regulations.

No substantive comment was received, and the proposals are adopted as proposed.

Section 23.1587 Performance Information

The FAA proposed to revise § 23.1587 to rearrange existing material, to remove ski plane performance exceptions, to remove the option of calculating approximate performance, to remove staff altitude loss data, and to require overweight landing performance in § 23.1587. Stalling speed requirements of paragraph (c)(2) and (3) are combined and moved to final paragraph (a)(1) and reference and stalling speed requirement of § 23.49. Information on the steady rate and gradient of climb with all engines operating is required by paragraph (a)(2). This is revised from paragraph (a)(2). The climb section referenced in existing § 23.1587(a)(2) is removed and replaced with § 23.69(a).

The FAA proposed to revise paragraph (a)(3) to add that landing distance determined under § 23.75 must be provided for each airport altitude, standard temperature, and type of surface for which it is valid. The FAA proposed to revise paragraph (a)(4) to require information on the effect on landing distance when landing on other than hard surface, as determined under § 23.45(g). The FAA proposed to revise paragraph (a)(5) to cover information on the effects on landing distance of runway slope and wind. This provides the pilot with data with which to account for these factors in his or her takeoff calculations.

The FAA proposed to remove requirements on ski planes from § 23.1587(b) and to add a requirement for a steady angle of climb/descent, as determined under § 23.77(a), in its place. This requirement applies to all non-WAT airplanes.

The FAA proposed to revise paragraph (c) to apply normal, utility, and acrobatic category airplanes, rather than all airplanes. The FAA proposed to remove the stall altitude loss requirements from paragraph (c)(1). As mentioned, the FAA proposed to remove the stalling speed requirements from paragraphs (c)(2) and (c)(3) and to place them in paragraph (a)(1). The FAA also proposed to remove paragraph (c)(4) on cooling climb speed data since most airplanes cool at scheduled speeds.

The FAA proposes to revise paragraph (c)(1) to pertain to the takeoff distance determined under § 23.53 and to the type of surface. Proposed paragraphs (c)(2) and (c)(3) pertain to the effect on takeoff distance of the runway surface, slope, and headwind and tailwind component.

The FAA proposed to revise paragraph (c)(4) to add a new requirement pertaining to the one-engine inoperative takeoff climb/descent performance for WAT-limited airplanes. This pertains only to reciprocating engine-powered airplanes. It provides the pilot with the information determined under final § 23.66.

The FAA proposed a new paragraph (c)(5), which pertains to enroute rate and gradient and climb/descent determined under § 23.69(b), for multiengine airplanes.

The FAA proposed to revised § 23.1587(d) to incorporate into commuter category airplanes the present data and accelerate-stop data, overweight landing performance, and the effect of operation on other than smooth hard surfaces. In addition, in order to consolidate all of the requirements for what must appear in the AFM in subpart G, the FAA proposed that § 23.1587(d)(10) contain the requirement, found in former § 23.1323(d), to show the relationship between IAS and CAS in the AFM.

No comments were received on the proposals for this section, and they are adopted as proposed.

Section 23.1589 Loading Information

The FAA proposed to make editorial changes in § 23.1589(b) to simplify the text, with no change in requirements.

No comments were received on the proposal for this section, and it is adopted as proposed.

Appendix E

The FAA proposed to remove Appendix E and to reserve it for the reasons given in the change to § 23.25.

No comments were received on the proposal, and Appendix E is removed and reserved as proposed.

Regulatory Evaluation, Regulatory Flexibility Determination, and Trade Impact Assessment

Changes to Federal regulations must undergo several economic analyses. First, Executive Order 12866 directs Federal agencies to promulgate new regulations only if the potential benefits to society justify its costs. Second, the Regulatory Flexibility Act of 1980 requires agencies to analyze the economic impact of regulatory changes on small entities. Finally, the Office of Management and Budget directs agencies to assess the effects of regulatory changes on international trade. In conducting these assessments, the FAA has determined that this rule: (1) Will generate benefits exceeding its costs and is "significant" as defined in the Executive Order; (2) is "significant" as defined in DOT's Policies and Procedures; (3) will not have a significant impact on a substantial number of small entities; and (4) will not constitute a barrier to international trade. These analyses, available in the docket, are summarized below.

Comments Related to the Economics of the Proposed Rule

One comment was received regarding the economics, § 23.143 Controllability and Maneuverability. This comment, as well as the FAA's response, are included in the section "Discussion of Amendments."

Regulatory Evaluation Summary

The FAA has identified 15 sections that will result in additional compliance costs to one or more airplane categories. Amendments to five sections will result in cost savings. The greatest costs will be incurred by manufacturers of WAT

limited airplanes (e.g., multiengine airplanes with maximum weights of more than 6,000 pounds). When amortized over a production run, the incremental costs will have a negligible impact on airplane prices, less than $100 per airplane.

The primary benefit of the rule will be the cost efficiencies of harmonization with the JAR for those manufacturers that choose to market airplanes in JAA countries as well as to manufacturers in JAA countries that market airplanes in the United States. Other benefits of the rule will be decreased reliance on special conditions, simplification of the certification process through clarification of existing requirements, and increased flexibility through optional designs.

Regulatory Flexibility Determination

The Regulatory Flexibility Act of 1980 (RFA) was enacted by Congress to ensure that small entities are not unnecessarily and disproportionately burdened by Federal regulations. The RFA requires a Regulatory Flexibility Analysis if a rule will have a significant economic impact, either detrimental or beneficial, on a substantial number of small entities. Based on FAA Order 2100.14A, Regulatory Flexibility Criteria and Guidance, the FAA has determined that the rule will not have a significant economic impact on a substantial number of small entities.

International Trade Impact Assessment

The rule will not constitute a barrier to international trade, including the export of American airplanes to foreign countries and the impact of foreign airplanes into the United States. Instead, the flight certification procedures have been harmonized with those of the JAA and will lessen restraints on trade.

Federalism Implications

The regulations herein will not have substantial direct effects 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, in accordance with Executive Order 12612, it is determined that this rule does not have sufficient federalism implications to warrant the preparation of a Federalism Assessment.

Conclusion

The FAA is revising the flight airworthiness standards for normal, utility, acrobatic, and commuter category airplanes to harmonize them with the standards of the Joint Aviation Authorities in Europe for the same category airplanes. The revisions will reduce the regulatory burden on the United States and European airplane manufacturers by relieving them of the need to show compliance with different standards each time they seek certification approval of an airplane in the United States or in a country that is a member of the JAA.

For the reasons discussed in the preamble, and based on the findings in the Regulatory Evaluation, the FAA has determined that this rule is significant under Executive Order 12866. In addition, the FAA certifies that this rule will not have a significant economic impact, positive or negative, on a substantial number of small entities under the criteria of the Regulatory Flexibility Act. This rule is considered significant under DOT Regulatory Policies and Procedures (44 FR 11034, February 26, 1979). A regulatory evaluation of the rule has been placed in the docket. A copy may be obtained by contracting the person identified under **FOR FURTHER INFORMATION CONTACT.**

List of Subjects

14 CFR Part 1

Air transportation.

14 CFR Part 23

Aircraft, Aviation safety, Signs and symbols.

The Amendments

In consideration of the foregoing, the Federal Aviation Administration amends 14 CFR parts 1 and 23 to read 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, 44702, 44704.

2. A new definition is added in alphabetical order to § 1.1 to read as follows:

§ 1.1 General definitions.

* * * * * * *

Maximum speed for stability characteristics, V_{FC}/M_{FC} means a speed that may not be less than a speed midway between maximum operating limit speed (V_{MO}/M_{MO}) and demonstrated flight diving speed (V_{DF}/M_{DF}), except that, for altitudes where the Mach number is the limiting factor, M_{FC} need not exceed the Mach number at which effective speed warning occurs.

* * * * *

PART 23—AIRWORTHINESS STANDARDS: NORMAL, UTILITY, ACROBATIC, AND COMMUTER CATEGORY AIRPLANES

3. The authority citation for part 23 continues to read as follows:

Authority: 49 U.S.C. 106(g), 40113, 44701, 44702, 44704.

4. Section 23.3 is amended by revising paragraphs (b)(2), (d), and (e) to read as follows:

§ 23.3 Airplane categories.

* * * * *

(b) * * *

(2) Lazy eights, chandelles, and steep turns, or similar maneuvers, in which the angle of bank is more than 60 degrees but not more than 90 degrees.

* * * * *

(d) The commuter category is limited to propeller-driven, multiengine airplanes that have a seating configuration, excluding pilot seats, of 19 or less, and a maximum certificated takeoff weight of 19,000 pounds or less. The commuter category operation is limited to any maneuver incident to normal flying, stalls (except whip stalls), and steep turns, in which the angle of bank is not more than 60 degrees.

(e) Except for commuter category, airplanes may be type certificated in more than one category if the requirements of each requested category are met.

5. Section 23.25 is amended by revising paragraphs (a) introductory text and (a)(1) introductory text, and paragraphs (a)(1)(i) and (a)(1)(iii) to read as follows:

§ 23.25 Weight limits.

(a) *Maximum weight.* The maximum weight is the highest weight at which compliance with each applicable requirement of this part (other than those complied with at the design landing weight) is shown. The maximum weight must be established so that it is—

(1) Not more than the least of—

(i) The highest weight selected by the applicant; or

* * * * *

(iii) The highest weight at which compliance with each applicable flight requirement is shown, and

* * * * *

6. Section 23.33 is amended by revising paragraphs (b) (1) and (2) to read as follows:

§ 23.33 Propeller speed and pitch limits.

(b) * * *

(1) During takeoff and initial climb at the all engine(s) operating climb speed

specified in § 23.65, the propeller must limit the engine r.p.m., at full throttle or at maximum allowable takeoff manifold pressure, to a speed not greater than the maximum allowable takeoff r.p.m.; and

(2) During a closed throttle glide, at V_{NE}, the propeller may not cause an engine speed above 110 percent of maximum continuous speed.

* * * * *

7. Section 23.45 is revised to read as follows:

§ 23.45 General.

(a) Unless otherwise prescribed, the performance requirements of this part must be met for—

(1) Still air and standard atmosphere; and

(2) Ambient atmospheric conditions, for commuter category airplanes, for reciprocating engine-powered airplanes of more than 6,000 pounds maximum weight, and for turbine engine-powered airplanes.

(b) Performance data must be determined over not less than the following ranges of conditions—

(1) Airport altitudes from sea level to 10,000 feet; and

(2) For reciprocating engine-powered airplanes of 6,000 pounds, or less, maximum weight, temperature from standard to 30 °C above standard; or

(3) For reciprocating engine-powered airplanes of more than 6,000 pounds maximum weight and turbine engine-powered airplanes, temperature from standard to 30 °C above standard, or the maximum ambient atmospheric temperature at which compliance with the cooling provisions of § 23.1041 to § 23.1047 is shown, if lower.

(c) Performance data must be determined with the cowl flaps or other means for controlling the engine cooling air supply in the position used in the cooling tests required by § 23.1041 to § 23.1047.

(d) The available propulsive thrust must correspond to engine power, not exceeding the approved power, less—

(1) Installation losses; and

(2) The power absorbed by the accessories and services appropriate to the particular ambient atmospheric conditions and the particular flight condition.

(e) The performance, as affected by engine power or thrust, must be based on a relative humidity:

(1) Of 80 percent at and below standard temperature; and

(2) From 80 percent, at the standard temperature, varying linearly down to 34 percent at the standard temperature plus 50 °F.

(f) Unless otherwise prescribed, in determining the takeoff and landing distances, changes in the airplane's configuration, speed, and power must be made in accordance with procedures established by the applicant for operation in service. These procedures must be able to be executed consistently by pilots of average skill in atmospheric conditions reasonably expected to be encountered in service.

(g) The following, as applicable, must be determined on a smooth, dry, hard-surfaced runway—

(1) Takeoff distance of § 23.53(b);

(2) Accelerate-stop distance of § 23.55;

(3) Takeoff distance and takeoff run of § 23.59; and

(4) Landing distance of § 23.75.

Note: The effect on these distances of operation on other types of surfaces (for example, grass, gravel) when dry, may be determined or derived and these surfaces listed in the Airplane Flight Manual in accordance with § 23.1583(p).

(h) For commuter category airplanes, the following also apply:

(1) Unless otherwise prescribed, the applicant must select the takeoff, enroute, approach, and landing configurations for the airplane.

(2) The airplane configuration may vary with weight, altitude, and temperature, to the extent that they are compatible with the operating procedures required by paragraph (h)(3) of this section.

(3) Unless otherwise prescribed, in determining the critical-engine-inoperative takeoff performance, takeoff flight path, and accelerate-stop distance, changes in the airplane's configuration, speed, and power must be made in accordance with procedures established by the applicant for operation in service.

(4) Procedures for the execution of discontinued approaches and balked landings associated with the conditions prescribed in § 23.67(c)(4) and § 23.77(c) must be established.

(5) The procedures established under paragraphs (h)(3) and (h)(4) of this section must—

(i) Be able to be consistently executed by a crew of average skill in atmospheric conditions reasonably expected to be encountered in service;

(ii) Use methods or devices that are safe and reliable; and

(iii) Include allowance for any reasonably expected time delays in the execution of the procedures.

8. Section 23.49 is revised to read as follows:

§ 23.49 Stalling period.

(a) V_{SO} and V_{S1} are the stalling speeds or the minimum steady flight speeds, in knots (CAS), at which the airplane is controllable with—

(1) For reciprocating engine-powered airplanes, the engine(s) idling, the throttle(s) closed or at not more than the power necessary for zero thrust at a speed not more than 110 percent of the stalling speed;

(2) For turbine engine-powered airplanes, the propulsive thrust not greater than zero at the stalling speed, or, if the resultant thrust has no appreciable effect on the stalling speed, with engine(s) idling and throttle(s) closed;

(3) The propeller(s) in the takeoff position;

(4) The airplane in the condition existing in the test, in which V_{SO} and V_{S1} are being used;

(5) The center of gravity in the position that results in the highest value of V_{SO} and V_{S1}; and

(6) The weight used when V_{SO} and V_{S1} are being used as a factor to determine compliance with a required performance standard.

(b) V_{SO} and V_{S1} must be determined by flight tests, using the procedure and meeting the flight characteristics specified in § 23.201.

(c) Except as provided in paragraph (d) of this section, V_{SO} and V_{S1} at maximum weight must not exceed 61 knots for—

(1) Single-engine airplanes; and

(2) Multiengine airplanes of 6,000 pounds or less maximum weight that cannot meet the minimum rate of climb specified in § 23.67(a) (1) with the critical engine inoperative.

(d) All single-engine airplanes, and those multiengine airplanes of 6,000 pounds or less maximum weight with a V_{SO} of more than 61 knots that do not meet the requirements of § 23.67(a)(1), must comply with § 23.562(d).

9. Section 23.51 is revised to read as follows:

§ 23.51 Takeoff speeds.

(a) For normal, utility, and acrobatic category airplanes, rotation speed, V_R, is the speed at which the pilot makes a control input, with the intention of lifting the airplane out of contact with the runway or water surface.

(1) For multiengine landplanes, V_R, must not be less than the greater of 1.05 V_{MC}; or 1.10 V_{S1};

(2) For single-engine landplanes, V_R, must not be less than V_{S1}; and

(3) For seaplanes and amphibians taking off from water, V_R, may be any speed that is shown to be safe under all reasonably expected conditions, including turbulence and complete failure of the critical engine.

(b) For normal, utility, and acrobatic category airplanes, the speed at 50 feet above the takeoff surface level must not be less than:

(1) or multiengine airplanes, the highest of—

(i) A speed that is shown to be safe for continued flight (or emergency landing, if applicable) under all reasonably expected conditions, including turbulence and complete failure of the critical engine;

(ii) 1.10 V_{MC}; or

(iii) 1.20 V_{S1}.

(2) For single-engine airplanes, the higher of—

(i) A speed that is shown to be safe under all reasonably expected conditions, including turbulence and complete engine failure; or

(ii) 1.20 V_{S1}.

(c) For commuter category airplanes, the following apply:

(1) V_1 must be established in relation to V_{EF} as follows:

(i) V_{EF} is the calibrated airspeed at which the critical engine is assumed to fail. V_{EF} must be selected by the applicant but must not be less than 1.05 V_{MC} determined under § 23.149(b) or, at the option of the applicant, not less than V_{MCG} determined under § 23.149(f).

(ii) The takeoff decision speed, V_1, is the calibrated airspeed on the ground at which, as a result of engine failure or other reasons, the pilot is assumed to have made a decision to continue or discontinue the takeoff. The takeoff decision speed, V_1, must be selected by the applicant but must not be less than V_{EF} plus the speed gained with the critical engine inoperative during the time interval between the instant at which the critical engine is failed and the instant at which the pilot recognizes and reacts to the engine failure, as indicated by the pilot's application of the first retarding means during the accelerate-stop determination of § 23.55.

(2) The rotation speed, V_R, in terms of calibrated airspeed, must be selected by the applicant and must not be less than the greatest of the following:

(i) V_1;

(ii) 1.05 V_{MC} determined under § 23.149(b);

(iii) 1.10 V_{S1}; or

(iv) The speed that allows attaining the initial climb-out speed, V_2, before reaching a height of 35 feet above the takeoff surface in accordance with § 23.57(c)(2).

(3) For any given set of conditions, such as weight, altitude, temperature, and configuration, a single value of V_R must be used to show compliance with both the one-engine-inoperative takeoff and all-engines-operating takeoff requirements.

(4) The takeoff safety speed, V_2, in terms of calibrated airspeed, must be selected by the applicant so as to allow the gradient of climb required in § 23.67 (c)(1) and (c)(2) but mut not be less than 1.10 V_{MC} or less than 1.20 V_{S1}.

(5) The one-engine-inoperative takeoff distance, using a normal rotation rate at a speed 5 knots less than V_R, established in accordance with paragraph (c)(2) of this section, must be shown not to exceed the corresponding one-engine-inoperative takeoff distance, determined in accordance with § 23.57 and § 23.59(a)(1), using the established V_R. The takeoff, otherwise performed in accordance with § 23.57, must be continued safely from the point at which the airplane is 35 feet above the takeoff surface and at a speed not less than the established V_2 minus 5 knots.

(6) The applicant must show, with all engines operating, that marked increases in the scheduled takeoff distances, determined in accordance with § 23.59(a)(2), do not result from over-rotation of the airplane or out-of-trim conditions.

10. Section 23.53 is revised to read as follows:

§ 23.53 Takeoff performance.

(a) For normal, utility, and acrobatic category airplanes, the takeoff distance must be determined in accordance with paragraph (b) of this section, using speeds determined in accordance with § 23.51 (a) and (b).

(b) For normal, utility, and acrobatic category airplanes, the distance required to takeoff and climb to a height of 50 feet above the takeoff surface must be determined for each weight, altitude, and temperature within the operational limits established for takeoff with—

(1) Takeoff power on each engine;

(2) Wing flaps in the takeoff position(s); and

(3) Landing gear extended.

(c) For commuter category airplanes, takeoff performance, as required by §§ 23.55 through 23.59, must be determined with the operating engine(s) within approved operating limitations.

11. Section 23.55 is amended by revising paragraph (a) and the introductory text of paragraph (b) to read as follows:

§ 23.55 Accelerate-stop distance.

* * * * *

(a) The accelerate-stop distance is the sum of the distances necessary to—

(1) Accelerate the airplane from a standing start to V_{EF} with all engines operating;

(2) Accelerate the airplane from V_{EF} to V_1, assuming the critical engine fails at V_{EF}; and

(3) Come to a full stop from the point at which V_1 is reached.

(b) Means other than wheel brakes may be used to determine the accelerate-stop distances if that means—

* * * * *

12. Section 23.57 is amended by revising paragraphs (a) introductory text, (b), (c)(1), (c)(3) introductory text, (c)(4), and (d); and by adding a new paragraph (e) to read as follows:

§ 23.57 Takeoff path.

* * * * *

(a) The takeoff path extends from a standing start to a point in the takeoff at which the airplane is 1500 feet above the takeoff surface at or below which height the transition from the takeoff to the enroute configuration must be completed; and

* * * * *

(b) During the acceleration to speed V_2, the nose gear may be raised off the ground at a speed not less than V_R. However, landing gear retraction must not be initiated until the airplane is airborne.

(c) * * *

(1) The slope of the airborne part of the takeoff path must not be negative at any point;

* * * * *

(3) At each point along the takeoff path, starting at the point at which the airplane reaches 400 feet above the takeoff surface, the available gradient of climb must not be less than—

* * * * *

(4) Except for gear retraction and automatic propeller feathering, the airplane configuration must not be changed, and no change in power that requires action by the pilot may be made, until the airplane is 400 feet above the takeoff surface.

(d) The takeoff path to 35 feet above the takeoff surface must be determined by a continuous demonstrated takeoff.

(e) The takeoff path to 35 feet above the takeoff surface must be determined by synthesis from segments; and

(1) The segments must be clearly defined and must be related to distinct changes in configuration, power, and speed;

(2) The weight of the airplane, the configuration, and the power must be assumed constant throughout each segment and must correspond to the most critical condition prevailing in the segment; and

(3) The takeoff flight path must be based on the airplane's performance without utilizing ground effect.

13. Section 23.59 is amended by revising the introductory text, paragraph (a)(2), and paragraph (b) to read as follows:

§ 23.59 Takeoff distance and takeoff run.

For each commuter category airplane, the takeoff distance and, at the option of the applicant, the takeoff run, must be determined.

(a) * * *

(2) With all engines operating, 115 percent of the horizontal distance from the start of the takeoff to the point at which the airplane is 35 feet above the takeoff surface, determined by a procedure consistent with § 23.57.

(b) If the takeoff distance includes a clearway, the takeoff run is the greater of—

(1) The horizontal distance along the takeoff path from the start of the takeoff to a point equidistant between the liftoff point and the point at which the airplane is 35 feet above the takeoff surface as determined under § 23.57; or

(2) With all engines operating, 115 percent of the horizontal distance from the start of the takeoff to a point equidistant between the liftoff point and the point at which the airplane is 35 feet above the takeoff surface, determined by a procedure consistent with § 23.57.

14. A new § 23.63 is added to read as follows:

§ 23.63 Climb: general.

(a) Compliance with the requirements of §§ 23.65, 23.66, 23.67, 23.69, and 23.77 must be shown—

(1) Out of ground effect; and

(2) At speeds that are not less than those at which compliance with the powerplant cooling requirements of §§ 23.1041 to 23.1047 has been demonstrated; and

(3) Unless otherwise specified, with one engine inoperative, at a bank angle not exceeding 5 degrees.

(b) For normal, utility, and acrobatic category reciprocating engine-powered airplanes of 6,000 pounds or less maximum weight, compliance must be shown with § 23.65(a), § 23.67(a), where appropriate, and § 23.77(a) at maximum takeoff or landing weight, as appropriate, in a standard atmosphere.

(c) For normal, utility, and acrobatic category reciprocating engine-powered airplanes of more than 6,000 pounds maximum weight, and turbine engine-powered airplanes in the normal, utility, and acrobatic category, compliance must be shown at weights as a function of airport altitude and ambient temperature, within the operational limits established for takeoff and landing, respectively, with—

(1) Sections 23.65(b) and 23.67(b) (1) and (2), where appropriate, for takeoff, and

(2) Section 23.67(b)(2), where appropriate, and § 23.77(b), for landing.

(d) For commuter category airplanes, compliance must be shown at weights as a function of airport altitude and ambient temperature within the operational limits established for takeoff and landing, respectively, with—

(1) Sections 23.67(c)(1), 23.67(c)(2), and 23.67(c)(3) for takeoff; and

(2) Sections 23.67(c)(3), 23.67(c)(4), and 23.77(c) for landing.

15. Section 23.65 is revised to read as follows:

§ 23.65 Climb: all engines operating.

(a) Each normal, utility, and acrobatic category reciprocating engine-powered airplane of 6,000 pounds or less maximum weight must have a steady climb gradient at sea level of at least 8.3 percent for landplanes or 6.7 percet for seaplanes and amphibians with—

(1) Not more than maximum continuous power on each engine;

(2) The landing gear retracted;

(3) The wing flaps in the takeoff position(s); and

(4) A climb speed not less than the greater of 1.1 V_{MC} and 1.2 V_{S1} for multiengine airplanes and not less than 1.2 V_{S1} for single—engine airplanes.

(b) Each normal, utility, and acrobatic category reciprocating engine-powered airplane of more than 6,000 pounds maximum weight and turbine engine-powered airplanes in the normal, utility, and acrobatic category must have a steady gradient of climb after takeoff of at least 4 percent with

(1) Take off power on each engine;

(2) The landing gear extended, except that if the landing gear can be retracted in not more than sven seconds, the test may be conducted with the gear retracted;

(3) The wing flaps in the takeoff position(s); and

(4) A climb speed as specified in § 23.65(a)(4).

16. A new § 23.66 is added to read as follows:

§ 23.66 Takeoff climb: One-engine inoperative.

For normal, utility, and acrobatic category reciprocating engine-powered airplanes of more than 6,000 pounds maximum weight, and turbine engine-powered airplanes in the normal, utility, and acrobatic category, the steady gradient of climb or descent must be determined at each weight, altitude, and ambient temperature within the operational limits established by the applicant with—

(a) The critical engine inoperative and its propeller in the position it rapidly and automatically assumes;

(b) The remaining engine(s) at takeoff power;

(c) The landing gear extended, except that if the landing gear can be retracted in not more than seven seconds, the test may be conducted with the gear retracted;

(d) The wing flaps in the takeoff position(s):

(e) The wings level; and

(f) A climb speed equal to that achieved at 50 feet in the demonstration of § 23.53.

17. Section 23.67 is revised to read as follows:

§ 23.67 Climb: One engine inoperative.

(a) For normal, utility, and acrobatic category reciprocating engine-powered airplanes of 6,000 pounds or less maximum weight, the following apply:

(1) Except for those airplanes that meet the requirements prescribed in § 23.562(d), each airplane with a V_{SO} of more than 61 knots must be able to maintain a steady climb gradient of at least 1.5 percent at a pressure altitude of 5,000 feet with the—

(i) Critical engine inoperative and its propeller in the minimum drag position;

(ii) Remaining engine(s) at not more than maximum continuous power;

(iii) Landing gear retracted;

(iv) Wing flaps retracted; and

(v) Climb speed not less than 1.2 V_{S1}.

(2) For each airplane that meets the requirements prescribed in § 23.562(d), or that has a V_{SO} of 61 knots or less, the steady gradient of climb or descent at a pressure altitude of 5,000 feet must be determined with the—

(i) Critical engine inoperative and its propeller in the minimum drag position;

(ii) Remaining engine(s) at not more than maximum continuous power;

(iii) Landing gear retracted;

(iv) Wing flaps retracted; and

(v) Climb speed not less than 1.2V_{S1}.

(b) For normal, utility, and acrobatic category reciprocating engine-powered airplanes of more than 6,000 pounds maximum weight, and turbine engine-powered airplanes in the normal, utility, and acrobatic category—

(1) The steady gradient of climb at an altitude of 400 feet above the takeoff must be measurably positive with the—

(i) Critical engine inoperative and its propeller in the minimum drag position;

(ii) Remaining engine(s) at takeoff power;

(iii) Landing gear retracted;

(iv) Wing flaps in the takeoff position(s); and

(v) Climb speed equal to that achieved at 50 feet in the demonstration of § 23.53.

(2) The steady gradient of climb must not be less than 0.75 percent at an altitude of 1,500 feet above the takeoff surface, or landing surface, as appropriate, with the—

(i) Critical engine inoperative and its propeller in the minimum drag position;

(ii) Remaining engine(s) at not more than maximum continuous power;

(iii) Landing gear retracted;

(iv) Wing flaps retracted; and

(v) Climb speed not less than 1.2 V_{S1}.

(c) For commuter category airplanes, the following apply:

(1) *Takeoff; landing gear extended.* The steady gradient of climb at the altitude of the takeoff surface must be measurably positive for two-engine airplanes, not less than 0.3 percent for three-engine airplanes, or 0.5 percent for four-engine airplanes with—

(i) The critical engine inoperative and its propeller in the position it rapidly and automatically assumes;

(ii) The remaining engine(s) at takeoff power;

(iii) The landing gear extended, and all landing gear doors open;

(iv) The wing flaps in the takeoff position(s);

(v) The wings level; and

(vi) A climb speed equal to V_2.

(2) *Takeoff; landing gear retracted.* The steady gradient of climb at an altitude of 400 feet above the takeoff surface must be not less than 2.0 percent of two-engine airplanes, 2.3 percent for three-engine airplanes, and 2.6 percent for four-engine airplanes with—

(i) The critical engine inoperative and its propeller in the position it rapidly and automatically assumes;

(ii) The remaining engine(s) at takeoff power;

(iii) The landing gear retracted;

(iv) The wing flaps in the takeoff position(s);

(v) A climb speed equal to V_2.

(3) *Enroute.* The steady gradient of climb at an altitude of 1,500 feet above the takeoff or landing surface, as appropriate, must be not less than 1.2 percent for two-engine airplanes, 1.5 percent for three-engine airplanes, and 1.7 percent for four-engine airplanes with—

(i) The critical engine inoperative and its propeller in the minimum drag position;

(ii) The remaining engine(s) at not more than maximum continuous power;

(iii) The landing gear retracted;

(iv) The wing flaps retracted; and

(v) A climb speed not less than 1.2 V_{S1}.

(4) *Discontinued approach.* The steady gradient of climb at an altitude of 400 feet above the landing surface must be not less than 2.1 percent for two-engine airplanes, 2.4 percent for three-engine airplanes; and 2.7 percent for four-engine airplanes, with—

(i) The critical engine inoperative and its propeller in the minimum drag position;

(ii) The remaining engine(s) at takeoff power;

(iii) Landing gear retracted;

(iv) Wing flaps in the approach position(s) in which V_{S1} for these position(s) does not exceed 110 percent of the V_{S1} for the related all-engines-operated landing position(s); and

(v) A climb speed established in connection with normal landing procedures but not exceeding 1.5 V_{S1}.

18. A new § 23.69 is added to read as follows:

§ 23.69 Enroute climb/descent.

(a) *All engines operating.* The steady gradient and rate of climb must be determined at each weight, altitude, and ambient temperature within the operational limits established by the applicant with—

(1) Not more than maximum continuous power on each engine;

(2) The landing gear retracted;

(3) The wing flaps retracted; and

(4) A climb speed not less than 1.3 V_{S1}.

(b) *One engine inoperative.* The steady gradient and rate of climb/descent must be determined at each weight, altitude, and ambient temperature within the operational limits established by the applicant with—

(1) The critical engine inoperative and its propeller in the minimum drag position;

(2) The remaining engine(s) at not more than maximum continuous power;

(3) The landing gear retracted;

(4) The wing flaps retracted; and

(5) A climb speed not less than 1.2 V_{S1}.

19. A new § 23.71 is added to read as follows:

§ 23.71 Glide: Single-engine airplanes.

The maximum horizontal distance traveled in still air, in nautical miles, per 1,000 feet of altitude lost in a glide, and the speed necessary to achieve this must be determined with the engine inoperative, its propeller in the minimum drag position, and landing gear and wing flaps in the most favorable available position.

20. A new § 23.73 is added to read as follows:

§ 23.73 Reference landing approach speed.

(a) For normal, utility, and acrobatic category reciprocating engine-powered airplanes of 6,000 pounds or less maximum weight, the reference landing approach speed, V_{REF}, must not be less than the greater of V_{MC}, determined in § 23.149(b) with the wing flaps in the most extended takeoff position, and 1.3 V_{SO}.

(b) For normal, utility, and acrobatic category reciprocating engine-powered airplanes of more than 6,000 pounds maximum weight, and turbine engine-powered airplanes in the normal, utility, and acrobatic category, the reference landing approach speed, V_{REF}, must not be less than the greater of V_{MC}, determined in § 23.149(c), and 1.3 V_{SO}.

(c) For commuter category airplanes, the reference landing approach speed, V_{REF}, must not be less than the greater of 1.05 V_{MC}, determined in § 23.149(c), and 1.3 V_{SO}.

21. Section 23.75 is amended by revising the section heading, introductory text, the introductory text of paragraph (a), and paragraphs (b), (d), (e), and (f); and by removing paragraph (h), to read as follows:

§ 23.75 Landing distance.

The horizontal distance necessary to land and come to a complete stop from a point 50 feet above the landing surface must be determined, for standard temperatures at each weight and altitude within the operational limits established for landing, as follows:

(a) A steady approach at not less than V_{REF}, determined in accordance with § 23.73 (a), (b), or (c), as appropriate, must be maintained down to the 50 foot height and—

* * * * *

(b) A constant configuration must be maintained throughout the maneuver.

* * * * *

(d) It must be shown that a safe transition to the balked landing conditions of § 23.77 can be made from the conditions that exist at the 50 foot height, at maximum landing weight, or at the maximum landing weight for altitude and temperature of § 23.63 (c)(2) or (d)(2), as appropriate.

(e) The brakes must be used so as to not cause excessive wear of brakes or tires.

(f) Retardation means other than wheel brakes may be used if that means—

(1) Is safe and reliable; and

(2) Is used so that consistent results can be expected in service.

* * * * *

22. Section 23.77 is revised to read as follows:

§ 23.77 Balked landing.

(a) Each normal, utility, and acrobatic category reciprocating engine-powered airplane at 6,000 pounds or less maximum weight must be able to maintain a steady gradient of climb at sea level of at least 3.3 percent with—

(1) Takeoff power on each engine;

(2) The landing gear extended;

(3) The wing flaps in the landing position, except that if the flaps may safely be retracted in two seconds or less without loss of altitude and without sudden changes of angle of attack, they may be retracted; and

(4) A climb speed equal to V_{REF}, as defined in § 23.73(a).

(b) Each normal, utility, and acrobatic category reciprocating engine-powered airplane of more than 6,000 pounds maximum weight and each normal, utility, and acrobatic category turbine engine-powered airplane must be able to maintain a steady gradient of climb of at least 2.5 percent with—

(1) Not more than the power that is available on each engine eight seconds after initiation of movement of the power controls from minimum flight-idle position;

(2) The landing gear extended;

(3) The wing flaps in the landing position; and

(4) A climb speed equal to V_{REF}, as defined in § 23.73(b).

(c) Each commuter category airplane must be able to maintain a steady gradient of climb of at least 3.2 percent with—

(1) Not more than the power that is available on each engine eight seconds after initiation of movement of the power controls from the minimum flight idle position;

(2) Landing gear extended;

(3) Wing flaps in the landing position; and

(4) A climb speed equal to V_{REF}, as defined in § 23.73(c).

23. Section 23.143 is amended by revising paragraphs (a) and (c) to read as follows:

§ 23.143 General.

(a) The airplane must be safely controllable and maneuverable during all flight phases including—

(1) Takeoff;

(2) Climb;

(3) Level flight;

(4) Descent;

(5) Go-around; and

(6) Landing (power on and power off) with the wing flaps extended and retracted.

* * * * *

(c) If marginal conditions exist with regard to required pilot strength, the control forces necessary must be determined by quantitative tests. In no case may the control forces under the conditions specified in paragraphs (a) and (b) of this section exceed those prescribed in the following table:

Values in pounds force applied to the relevant control	Pitch	Roll	Yaw
(a) For temporary application:			
Stick	60	30	
Wheel (Two hands on rim)	75	50	
Wheel (One hand on rim)	50	25	
Rudder Pedal			150
(b) For prolonged application	10	5	20

24. Section 23.145 is amended by revising paragraph (b) introductory text, paragraphs (b)(2) through (b)(5); adding a new paragraph (b)(6); and revising paragraphs (c) and (d) to read as follows:

§ 23.145 Longitudinal control.

* * * * *

(b) Unless otherwise required, it must be possible to carry out the following maneuvers without requiring the application of single-handed control forces exceeding those specified in § 23.143(c). The trimming controls must not be adjusted during the maneuvers:

* * * * *

(2) With landing gear and flaps extended, power off, and the airplane as nearly as possible in trim at 1.3 V_{SO}, quickly apply takeoff power and retract the flaps as rapidly as possible to the recommended go around setting and allow the airspeed to transition from 1.3 V_{SO} to 1.3 V_{S1}. Retract the gear when a positive rate of climb is established.

(3) With landing gear and flaps extended, in level flight, power necessary to attain level flight at 1.1 V_{SO}, and the airplane as nearly as possible in trim, it must be possible to maintain approximately level flight while retracting the flaps as rapidly as possible with simultaneous application of not more than maximum continuous power. If gated flat positions are provided, the flap retraction may be demonstrated in stages with power and trim reset for level flight at 1.1 V_{S1}, in the initial configuration for each stage—

(i) From the fully extended position to the most extended gated position;

(ii) Between intermediate gated positions, if applicable; and

(iii) From the least extended gated position to the fully retracted position.

(4) With power off, flaps and landing gear retracted and the airplane as nearly as possible in trim at 1.4 V_{S1}, apply takeoff power rapidly while maintaining the same airspeed.

(5) With power off, landing gear and flaps extended, and the airplane as nearly as possible in trim at V_{REF}, obtain and maintain airspeeds between 1.1 V_{SO}, and either 1.7 V_{SO} or V_{FE}, whichever is lower without requiring the application of two-handed control forces exceeding those specified in § 23.143(c).

(6) With maximum takeoff power, landing gear retracted, flaps in the takeoff position, and the airplane as nearly as possible in trim at V_{FE} appropriate to the takeoff flap position, retract the flaps as rapidly as possible while maintaining constant speed.

(c) At speeds above V_{MO}/M_{MO}, and up to the maximum speed shown under § 23.251, a maneuvering capability of 1.5 g must be demonstrated to provide a margin to recover from upset or inadvertent speed increase.

(d) It must be possible, with a pilot control force of not more than 10 pounds, to maintain a speed of not more than V_{REF} during a power-off glide with landing gear and wing flaps extended, for any weight of the airplane, up to and including the maximum weight.

* * * * *

25. Section 23.147 is revised to read as follows:

§ 23.147 Directional and lateral control.

(a) For each multiengine airplane, it must be possible, while holding the wings level within five degrees, to make sudden changes in heading safely in both directions. This ability must be shown at 1.4 V_{S1} with heading changes up to 15 degrees, except that the heading change at which the rudder force corresponds to the limits specified in § 23.143 need not be exceeded, with the—

(1) Critical engine inoperative and its propeller in the minimum drag position;

(2) Remaining engines at maximum continuous power;

(3) Landing gear—

(i) Retracted; and

(ii) Extended; and

(4) Flaps retracted.

(b) For each multiengine airplane, it must be possible to regain full control of the airplane without exceeding a bank angle of 45 degrees, reaching a dangerous attitude or encountering dangerous characteristics, in the event of a sudden and complete failure of the critical engine, making allowance for a delay of two seconds in the initiation of recovery action appropriate to the situation, with the airplane initially in trim, in the following condition:

(1) Maximum continuous power on each engine;

(2) The wing flaps retracted;

(3) The landing gear retracted;

(4) A speed equal to that at which compliance with § 23.69(a) has been shown; and

(5) All propeller controls in the position at which compliance with § 23.69(a) has been shown.

(c) For all airplanes, it must be shown that the airplane is safely controllable without the use of the primary lateral control system in any all-engine configuration(s) and at any speed or altitude within the approved operating envelope. It must also be shown that the airplane's flight characteristics are not impaired below a level needed to permit continued safe flight and the ability to maintain attitudes suitable for a controlled landing without exceeding the operational and structural limitations of the airplane. If a single failure of any one connecting or transmitting link in the lateral control system would also cause the loss of additional control system(s), compliance with the above requirement must be shown with those additional systems also assumed to be inoperative.

26. Section 23.149 is revised to read as follows:

§ 23.149 Minimum control speed.

(a) V_{MC} is the calibrated airspeed at which, when the critical engine is suddenly made inoperative, it is possible to maintain control of the airplane with that engine still inoperative, and thereafter maintain straight flight at the same speed with an angle of bank of not more than 5 degrees. The method used to simulate critical engine failure must represent the most critical mode of powerplant failure expected in service with respect to controllability.

(b) V_{MC} for takeoff must not exceed 1.2 V_{S1}, where V_{S1} is determined at the maximum takeoff weight. V_{MC} must be determined with the most unfavorable weight and center of gravity position and with the airplane airborne and the ground effect negligible, for the takeoff configuration(s) with—

(1) Maximum available takeoff power initially on each engine;

(2) The airplane trimmed for takeoff;

(3) Flaps in the takeoff position(s);

(4) Landing gear retracted; and

(5) All propeller controls in the recommended takeoff position throughout.

(c) For all airplanes except reciprocating engine-powered airplanes of 6,000 pounds or less maximum weight, the conditions of paragraph (a) of this section must also be met for the landing configuration with—

(1) Maximum available takeoff power initially on each engine;

(2) The airplane trimmed for an approach, with all engines operating, at V_{REF}, at an approach gradient equal to the steepest used in the landing distance demonstration of § 23.75;

(3) Flaps in the landing position;

(4) Landing gear extended; and

(5) All propeller controls in the position recommended for approach with all engines operating.

(d) A minimum speed to intentionally render the critical engine inoperative must be established and designated as the safe, intentional, one-engine-inoperative speed, V_{SSE}.

(e) At V_{MC}, the rudder pedal force required to maintain control must not exceed 150 pounds and it must not be necessary to reduce power of the operative engine(s). During the maneuver, the airplane must not assume any dangerous attitude and it must be possible to prevent a heading change of more than 20 degrees.

(f) At the option of the applicant, to comply with the requirements of § 23.51(c)(1), V_{MCG} may be determined. V_{MCG} is the minimum control speed on the ground, and is the calibrated airspeed during the takeoff run at which, when the critical engine is suddenly made inoperative, it is possible to maintain control of the airplane using the rudder control alone (without the use of nosewheel steering), as limited by 150 pounds of force, and using the lateral control to the extent of keeping the wings level to enable the takeoff to be safely continued. In the determination of V_{MCG}, assuming that the path of the airplane accelerating with all engines operating is along the centerline of the runway, its path from the point at which the critical engine is made inoperative to the point at which recovery to a direction parallel to the centerline is completed may not deviate more than 30 feet laterally from the centerline at any point. V_{MCG} must be established with—

(1) The airplane in each takeoff configuration or, at the option of the applicant, in the most critical takeoff configuration;

(2) Maximum available takeoff power on the operating engines;

(3) The most unfavorable center of gravity;

(4) The airplane trimmed for takeoff; and

(5) The most unfavorable weight in the range of takeoff weights.

27. Section 23.153 is revised to read as follows:

§ 23.153 Control during landings.

It must be possible, while in the landing configuration, to safely complete a landing without exceeding the one-hand control force limits specified in § 23.143(c) following an approach to land—

(a) At a speed of V_{REF} minus 5 knots;

(b) With the airplane in trim, or as nearly as possible in trim and without the trimming control being moved throughout the maneuver;

(c) At an approach gradient equal to the steepest used in the landing distance demonstration of § 23.75; and

(d) With only those power changes, if any, that would be made when landing normally from an approach at V_{REF}.

28. Section 23.155 is amended by revising the introductory text of paragraph (b) and paragraph (b)(1), and by adding a new paragraph (c) to read as follows:

§ 23.155 Elevator control force in maneuvers.

* * * * *

(b) The requirement of paragraph (a) of this section must be met at 75 percent of maximum continuous power for reciprocating engines, or the maximum continuous power for turbine engines, and with the wing flaps and landing gear retracted—

(1) In a turn, with the trim setting used for wings level flight at V_O; and

* * * * *

(c) There must be no excessive decrease in the gradient of the curve of stick force versus maneuvering load factor with increasing load factor.

29. Section 23.157 is amended by revising paragraph (d) to read as follows:

§ 23.157 Rate of roll.

* * * * *

(d) The requirement of paragraph (c) of this section must be met when rolling the airplane in each direction in the following conditions—

(1) Flaps in the landing position(s);

(2) Landing gear extended;

(3) All engines operating at the power for a 3 degree approach; and

(4) The airplane trimmed at V_{REF}.

30. Section 23.161 is amended by revising paragraphs (a), (b)(1), (b)(2), (c), the introductory text of paragraph (d), and (d)(4), and by adding a new paragraph (e) to read as follows:

§ 23.161 Trim.

(a) *General.* Each airplane must meet the trim requirements of this section after being trimmed and without further pressure upon, or movement of, the primary controls or their corresponding trim controls by the pilot or the automatic pilot. In addition, it must be possible, in other conditions of loading, configuration, speed and power to ensure that the pilot will not be unduly fatigued or distracted by the need to apply residual control forces exceeding those for prolonged application of

§ 23.143(c). This applies in normal operation of the airplane and, if applicable, to those conditions associated with the failure of one engine for which performance characteristics are established.

(b) * * *

(1) For normal, utility, and acrobatic category airplanes, at a speed of 0.9 V_H, V_C, or V_{MO}/M_O, whichever is lowest; and

(2) For commuter category airplanes, at all speeds from 1.4 V_{S1} to the lesser of V_H or V_{MO}/M_{MO}.

(c) *Longitudinal trim.* The airplane must maintain longitudinal trim under each of the following conditions:

(1) A climb with—

(i) Takeoff power, landing gear retracted, wing flaps in the takeoff position(s), at the speeds used in determining the climb performance required by § 23.65; and

(ii) Maximum continuous power at the speeds and in the configuration used in determining the climb performance required by § 23.69(a).

(2) Level flight at all speeds from the lesser of V_H and either V_{NO} or V_{MO}/M_{MO} (as appropriate), to 1.4 V_{S1}, with the landing gear and flaps retracted.

(3) A descent at V_{NO} or V_{MO}/M_{MO}, whichever is applicable, with power off and with the landing gear and flaps retracted.

(4) Approach with landing gear extended and with—

(i) A 3 degree angle of descent, with flaps retracted and at a speed of 1.4 V_{S1};

(ii) A 3 degree angle of descent, flaps in the landing position(s) at V_{REF}; and

(iii) An approach gradient equal to the steepest used in the landing distance demonstrations of § 23.75, flaps in the landing position(s) at V_{REF}.

(d) In addition, each multiple airplane must maintain longitudinal and directional trim, and the lateral control force must not exceed 5 pounds at the speed used in complying with § 23.67(a), (b)(2), or (c)(3), as appropriate, with—

* * * * *

(4) Wing flaps retracted; and

* * * * * *

(e) In addition, each commuter category airplane for which, in the determination of the takeoff path in accordance with § 23.57, the climb in the takeoff configuration at V_2 extends beyond 400 feet above the takeoff surface, it must be possible to reduce the longitudinal and lateral control forces to 10 pounds and 5 pounds, respectively, and the directional control force must not exceed 50 pounds at V_2 with—

(1) The critical engine inoperative and its propeller in the minimum drag position;

(2) The remaining engine(s) at takeoff power;

(3) Landing gear retracted;

(4) Wing flaps in the takeoff position(s); and

(5) An angle of bank not exceeding 5 degrees.

31. Section 23.175 is revised to read as follows:

§ 23.175 Demonstration of static longitudinal stability.

Static longitudinal stability must be shown as follows:

(a) *Climb.* The stick force curve must have a stable slope at speeds between 85 and 115 percent of the trim speed, with—

(1) Flaps retracted;

(2) Landing gear retracted;

(3) Maximum continuous power; and

(4) The airplane trimmed at the speed used in determining the climb performance required by § 23.69(a).

(b) *Cruise.* With flaps and landing gear retracted and the airplane in trim with power for level flight at representative cruising speeds at high and low altitudes, including speeds up to V_{NO} or V_{MO}/M_{MO}, as appropriate, except that the speed need not exceed V_H—

(1) For normal, utility, and acrobatic category airplanes, the stick force curve must have a stable slope at all speeds within a range that is the greater of 15 percent of the trim speed plus the resulting free return speed range, or 40 knots plus the resulting free return speed range, above and below the trim speed, except that the slope need not be stable—

(i) At speeds less than 1.3 V_{S1}; or

(ii) For airplanes with V_{NE} established under § 23.1505(a), at speeds greater than V_{NE}; or

(iii) For airplanes with V_{MO}/M_{MO} established under § 23.1505(c), at speeds greater than V_{FC}/M_{FC}.

(2) For commuter category airplanes, the stick force curve must have a stable slope at all speeds within a range of 50 knots plus the resulting free return speed range, above and below the trim speed, except that the slope need not be stable—

(i) At speeds less than 1.4 V_{S1}; or

(ii) At speeds greater than V_{FC}/M_{FC}; or

(iii) At speeds that require a stick force greater than 50 pounds.

(c) *Landing.* The stick force curve must have a stable slope at speeds between 1.1 V_{S1} and 1.8 V_{S1} with—

(1) Flaps in the landing position;

(2) Landing gear extended; and

(3) The airplane trimmed at—

(i) V_{REF}, or the minimum trim speed if higher, with power off; and

(ii) V_{REF} with enough power to maintain a 3 degree angle of descent.

32. Section 23.177 is revised to read as follows:

§ 23.177 Static directional and lateral stability.

(a) The static directional stability, as shown by the tendency to recover from a wings level sideslip with the rudder free, must be positive for any landing gear and flap position appropriate to the takeoff, climb, cruise, approach, and landing configurations. This must be shown with symmetrical power up to maximum continuous power, and at speeds from 1.2 V_{S1} up to the maximum allowable speed for the condition being investigated. The angel of sideslip for these tests must be appropriate to the type of airplane. At larger angles of sideslip, up to that at which full rudder is used or a control force limit in § 23.143 is reached, whichever occurs first, and at speeds from 1.2 V_{S1} to V_O, the rudder pedal force must not reverse.

(b) The static lateral stability, as shown by the tendency to raise the low wing in a sideslip, must be positive for all landing gear and flap positions. This must be shown with symmetrical power up to 75 percent of maximum continuous power at speeds above 1.2 V_{S1} in the take off configuration(s) and at speeds above 1.3 V_{S1} in other configurations, up to the maximum allowable speed for the configuration being investigated, in the takeoff, climb, cruise, and approach configurations. For the landing configuration, the power must be that necessary to maintain a 3 degree angle of descent in coordinated flight. The static lateral stability must not be negative at 1.2 V_{S1} in the takeoff configuration, or at 1.3 V_{S1} in other configurations. The angle of sideslip for these tests must be appropriate to the type of airplane, but in no case may the constant heading sideslip angle be less than that obtainable with a 10 degree bank, or if less, the maximum bank angle obtainable with full rudder deflection or 150 pound rudder force.

(c) Paragraph (b) of this section does not apply to acrobatic category airplanes certificated for inverted flight.

(d) In straight, steady slips at 1.2 V_{S1} for any landing gear and flap positions, and for any symmetrical power conditions up to 50 percent of maximum continuous power, the aileron and rudder control movements and forces must increase steadily, but not necessarily in constant proportion, as the angle of sideslip is increased up to the maximum appropriate to the type of airplane. At larger slip angles, up to the angle at which full rudder or aileron control is used or a control force limit

contained in § 23.143 is reached, the aileron and rudder control movements and forces must not reverse as the angle of sideslip is increased. Rapid entry into, and recovery from, a maximum sideslip considered appropriate for the airplane must not result in uncontrollable flight characteristics.

33. Section 23.201 is revised to read as follows:

§ 23.201 Wings level stall.

(a) It must be possible to produce and to correct roll by unreversed use of the rolling control and to produce and to correct yaw by unreversed use of the directional control, up to the time the airplane stalls.

(b) The wings level stall characteristics must be demonstrated in flight as follows. Starting from a speed at least 10 knots above the stall speed, the elevator control must be pulled back so that the rate of speed reduction will not exceed one knot per second until a stall is produced, as shown by either:

(1) An uncontrollable downward pitching motion of the airplane;

(2) A downward pitching motion of the airplane that results from the activation of a stall avoidance device (for example, stick pusher); or

(3) The control reaching the stop.

(c) Normal use of elevator control for recovery is allowed after the downward pitching motion of paragraphs (b)(1) or (b)(2) of this section has unmistakably been produced, or after the control has been held against the stop for not less than the longer of two seconds or the time employed in the minimum steady slight speed determination of § 23.49.

(d) During the entry into and the recovery from the maneuver, it must be possible to prevent more than 15 degrees of roll or yaw by the normal use of controls.

(e) Compliance with the requirements of this section must be shown under the following conditions:

(1) *Wing flaps.* Retracted, fully extended, and each intermediate normal operating position.

(2) *Landing gear.* Retracted and extended.

(3) *Cowl flaps.* Appropriate to configuration.

(4) *Power:*

(i) Power off; and

(ii) 75 percent of maximum continuous power. However, if the power-to-weight ratio at 75 percent of maximum continuous power result in extreme nose-up attitudes, the test may be carried out with the power required for level flight in the landing configuration at maximum landing weight and a speed of 1.4 V_{SO}, except that the power may not be less than 50 percent of maximum continuous power.

(5) *Trim.* The airplane trimmed at a speed as near 1.5 V_{S1} as practicable.

(6) *Propeller.* Full increase r.p.m. position for the power off condition.

34. Section 23.203 is amended by revising the section heading and introductory text, paragraph (a), the introductory text of paragraph (b), paragraphs (b)(4) and (b)(5), the introductory text of paragraph (c), and paragraphs (c)(1) and (c)(4), and by adding new paragraphs (b)(6) and (c)(6) to read as follows:

§ 23.203 Turning flight and accelerated turning stalls.

Turning flight and accelerated turning stalls must be demonstrated in tests as follows:

(a) Establish and maintain a coordinated turn in a 30 degree bank. Reduce speed by steadily and progressively tightening the turn with the elevator until the airplane is stalled, as defined in § 23.201(b). The rate of speed reduction must be constant, and—

(1) For a turning flight stall, may not exceed one knot per second; and

(2) For an accelerated turning stall, be 3 to 5 knots per second with steadily increasing normal acceleration.

(b) After the airplane has stalled, as defined in § 23.201(b), it must be possible to regain wings level flight by normal use of the flight controls, but without increasing power and without—

* * * * *

(4) Exceeding a bank angle of 60 degrees in the original direction of the turn or 30 degrees in the opposite direction in the case of turning flight stalls;

(5) Exceeding a bank angle of 90 degrees in the original direction of the turn or 60 degrees in the opposite direction in the case of accelerated turning stalls; and

(6) Exceeding the maximum permissible speed or allowable limit load factor.

(c) Compliance with the requirements of this section must be shown under the following conditions:

(1) *Wing flaps:* Retracted, fully extended, and each intermediate normal operating position;

* * * * *

(4) *Power:*

(i) Power off; and

(ii) 75 percent of maximum continuous power. However, if the power-to-weight ratio at 75 percent of maximum continuous power results in extreme nose-up attitudes, the test may be carried out with the power required for level flight in the landing configuration at maximum landing weight and a speed of 1.4 V_{SO}, except that the power may not be less than 50 percent of maximum continuous power.

* * * * * *

(6) *Propeller.* Full increase rpm position for the power off condition.

§ 23.205 [Removed]

35. Section 23.205 is removed.

36. Section 23.207 is amended by revising paragraphs (c) and (d), and by adding new paragraphs (e) and (f) to read as follows:

§ 23.207 Stall warning.

* * * * *

(c) During the stall tests required by § 23.201(b) and § 23.203(a)(1), the stall warning must begin at a speed exceeding the stalling speed by a margin of not less than 5 knots and must continue until the stall occurs.

(d) When following procedures furnished in accordance with § 23.1585, the stall warning must not occur during a takeoff with all engines operating, a takeoff continued with one engine inoperative, or during an approach to landing.

(e) During the stall tests required by § 23.203(a)(2), the stall warning must begin sufficiently in advance of the stall for the stall to be averted by pilot action taken after the stall warning first occurs.

(f) For acrobatic category airplanes, an artificial stall warning may be mutable, provided that it is armed automatically during takeoff and rearmed automatically in the approach configuration.

37. Section 23.221 is revised to read as follows:

§ 23.221 Spinning.

(a) *Normal category airplanes.* A single-engine, normal category airplane must be able to recover from a one-turn spin or a three-second spin, whichever takes longer, in not more than one additional turn after initiation of the first control action for recovery, or demonstrate compliance with the optional spin resistant requirements of this section.

(1) The following apply to one turn or three second spins:

(i) For both the flaps-retracted and flaps-extended conditions, the applicable airspeed limit and positive limit maneuvering load factor must not be exceeded;

(ii) No control forces or characteristic encountered during the spin or recovery may adversely affect prompt recovery;

(iii) It must be impossible to obtain unrecoverable spins with any use of the flight or engine power controls either at the entry into or during the spin; and

(iv) For the flaps-extended condition, the flaps may be retracted during the

recovery but not before rotation has ceased.

(2) At the applicant's option, the airplane may be demonstrated to be spin resistant by the following:

(i) During the stall maneuver contained in § 23.201, the pitch control must be pulled back and held against the stop. Then, using ailerons and rudders in the proper direction, it must be possible to maintain wings-level flight within 15 degrees of bank and to roll the airplane from a 30 degree bank in one direction to a 30 degree bank in the other direction;

(ii) Reduce the airplane speed using pitch control at a rate of approximately one knot per second until the pitch control reaches the stop; then, with the pitch control pulled back and held against the stop, apply full rudder control in a manner to promote spin entry for a period of seven seconds or through a 360 degree heading change, whichever occurs first. If the 360 degree heading change is reached first, it must have taken no fewer than four seconds. This maneuver must be performed first with the ailerons in the neutral position, and then with the ailerons deflected opposite the direction of turn in the most adverse manner. Power and airplane configuration must be set in accordance with § 23.201(e) without change during the maneuver. At the end of seven seconds or a 360 degree heading change, the airplane must respond immediately and normally to primary flight controls applied to regain coordinated, unstalled flight without reversal of control effect and without exceeding the temporary control forces specified by § 23.143(c); and

(iii) Compliance with §§ 23.201 and 23.203 must be demonstrated with the airplane in uncoordinated flight, corresponding to one ball width displacement on a slip-skid indicator, unless one ball width displacement cannot be obtained with full rudder, in which case the demonstration must be with full rudder applied.

(b) *Utility category airplanes.* A utility category airplane must meet the requirements of paragraph (a) of this section. In addition, the requirements of paragraph (c) of this section and § 23.807(b)(7) must be met if approval for spinning is requested.

(c) *Acrobatic category airplanes.* An acrobatic category airplane must meet the spin requirements of paragraph (a) of this section and § 23.807(b)(6). In addition, the following requirements must be met in each configuration for which approval for spinning is requested:

(1) The airplane must recover from any point in a spin up to and including six turns, or any greater number of turns for which certification is requested, in not more than one and one-half additional turns after initiation of the first control action for recovery. However, beyond three turns, the spin may be discontinued if spiral characteristics appear.

(2) The applicable airspeed limits and limit maneuvering load factors must not be exceeded. For flaps-extended configurations for which approval is requested, the flaps must not be retracted during the recovery.

(3) It must be impossible to obtain unrecoverable spins with any use of the flight or engine power controls either at the entry into or during the spin.

(4) There must be no characteristics during the spin (such as excessive rates of rotation or extreme oscillatory motion) that might prevent a successful recovery due to disorientation or incapacitation of the pilot.

38. Section 23.233(a) is revised to read as follows:

§ 23.233 Directional stability and control.

(a) A 90 degree cross-component of wind velocity, demonstrated to be safe for taxiing, takeoff, and landing must be established and must be not less than 0.2 V_{SO}.

* * * * *

39. Section 23.235 is revised to read as follows:

§ 23.235 Operation on unpaved surfaces.

The airplane must be demonstrated to have satisfactory characteristics and the shock-absorbing mechanism must not damage the structure of the airplane when the airplane is taxied on the roughest ground that may reasonably be expected in normal operation and when takeoffs and landings are performed on unpaved runways having the roughest surface that may reasonably be expected in normal operation.

40. A new § 23.237 is added to read as follows:

§ 23.237 Operation on water.

A wave height, demonstrated to be safe for operation, and any necessary water handling procedures for seaplanes and amphibians must be established.

§ 23.253 [Amended]

41. Section 23.253 is amended by removing paragraph (b)(1) and by redesignating paragraphs (b)(2) and (b)(3) as paragraphs (b)(1) and (b)(2), respectively.

42. Section 23.562(d) introductory text is revised to read as follows:

§ 23.562 Emergency landing dynamic conditions.

* * * * *

(d) For all single-engine airplanes with a V_{SO} of more than 61 knots at maximum weight, and those multiengine airplanes of 6,000 pounds or less maximum weight with a V_{SO} of more than 61 knots at maximum weight that do not comply with § 23.67(a)(1);

* * * * *

43. Section 23.1325 is amended by revising paragraph (e), by removing and reserving paragraph (f) to read as follows:

§ 23.1325 Static pressure system.

* * * * *

(e) Each static pressure system must be calibrated in flight to determine the system error. The system error, in indicated pressure altitude, at sea-level, with a standard atmosphere, excluding instrument calibration error, may not exceed ±30 feet per 100 knot speed for the appropriate configuration in the speed range between 1.3 V_{SO} with flaps extended, and 1.8 V_{S1} with flaps retracted. However, the error need not be less than 30 feet.

(f) [Reserved]

* * * * *

44. Section 23.1511 is amended by revising paragraphs (a)(1) and (a)(2) to read as follows:

§ 23.1511 Flap extended speed.

(a) * * *

(1) Not less than the minimum value of V_F allowed in § 23.345(b); and

(2) Not more than V_F established under § 23.345(a), (c), and (d).

* * * * *

45. Section 23.1521 is amended by revising paragraphs (b)(5) and (e) to read as follows:

§ 23.1521 Powerplant limitations.

* * * * *

(b) * * *

(5) The maximum allowable cylinder head (as applicable), liquid coolant and oil temperatures.

* * * * *

(e) *Ambient temperature.* For all airplanes except reciprocating engine-powered airplanes of 6,000 pounds or less maximum weight, ambient temperature limitations (including limitations for winterization installations if applicable) must be established as the maximum ambient atmospheric temperature at which compliance with the cooling provisions of §§ 23.1041 through 23.1047 is shown.

46. Section 23.1543(c) is added to read as follows:

§ 23.1543 Instrument markings: General.

* * * * *

(c) All related instruments must be calibrated in compatible units.

47. Section 23.1545 is amended by revising paragraphs (b)(5) and (b)(6) to read as follows:

§ 23.1545 Airspeed indicator.

* * * * *

(b) * * *

(5) For reciprocating multiengine-powered airplanes of 6,000 pounds or less maximum weight, for the speed at which compliance has been shown with § 23.69(b) relating to rate of climb at maximum weight and at sea level, a blue radial line.

(6) For reciprocating multiengine-powered airplanes of 6,000 pounds or less maximum weight, for the maximum value of minimum control speed, V_{MC}, (one-engine-inoperative) determined under § 23.149(b), a red radial line.

* * * * *

48. Section 23.1553 is revised to read as follows:

§ 23.1553 Fuel quantity indicator.

A red radial line must be marked on each indicator at the calibrated zero reading, as specified in § 23.1337(b)(1).

49. Section 23.1555(e)(2) is revised to read as follows:

§ 23.1555 Control markings.

* * * * *

(e) * * *

(2) Each emergency control must be red and must be marked as to method of operation. No control other than an emergency control, or a control that serves an emergency function in addition to its other functions, shall be this color.

50. Section 23.1559 is revised to read as follows:

§ 23.1559 Operating limitations placard.

(a) There must be a placard in clear view of the pilot stating—

(1) That the airplane must be operated in accordance with the Airplane Flight Manual; and

(2) The certification category of the airplane to which the placards apply.

(b) For airplanes certificated in more than one category, there must be a placard in clear view of the pilot stating that other limitations are contained in the Airplane Flight Manual.

(c) There must be a placard in clear view of the pilot that specifies the kind of operations to which the operation of the airplane is limited or from which it is prohibited under § 23.1525.

51. Section 23.1563(c) is added to read as follows:

§ 23.1563 Airspeed placards.

* * * * *

(c) For reciprocating multiengine-powered airplanes of more than 6,000 pounds maximum weight, and turbine engine-powered airplanes, the maximum value of the minimum control speed, V_{MC} (one-engine-inoperative) determined under § 23.149(b).

52. Section 23.1567(d) is added to read as follows:

§ 23.1567 Flight maneuver placard.

* * * * *

(d) For acrobatic category airplanes and utility category airplanes approved for spinning, there must be a placard in clear view of the pilot—

(1) Listing the control actions for recovery from spinning maneuvers; and

(2) Stating that recovery must be initiated when spiral characteristics appear, or after not more than six turns or not more than any greater number of turns for which the airplane has been certificated.

53. Section 23.1581 is amended by adding new paragraphs (a)(3) and (c), and by revising the introductory text of paragraph (b)(2) and paragraph (d) to read as follows:

§ 23.1581 General.

(a) * * *

(3) Further information necessary to comply with the relevant operating rules.

(b) * * *

(2) The requirements of paragraph (b)(1) of this section do not apply to reciprocating engine-powered airplanes of 6,000 pounds or less maximum weight, if the following is met:

* * * * *

(c) The units used in the Airplane Flight Manual must be the same as those marked on the appropriate instruments and placards.

(d) All Airplane Flight Manual operational airspeeds, unless otherwise specified, must be presented as indicated airspeeds.

* * * * *

54. Section 23.1583 is amended by revising the introductory text, and paragraphs (a)(3) introductory text, (a)(3)(i), (c)(3), (c)(4), (d), (e), (f), and (g); by redesignating paragraphs (k), (l), and (m) as paragraphs (i), (j), and (k), respectively, and revising them; and by adding new paragraphs (c)(5), (c)(6), (l), (m), (n), (o), and (p) to read as follows:

§ 23.1583 Operating limitations.

The Airplane Flight Manual must contain operating limitations determined under this part 23, including the following—

(a) * * *

(3) In addition, for turbine powered commuter category airplanes—

(i) The maximum operating limit speed, V_{MO}/M_{MO} and a statement that this speed must not be deliberately exceeded in any regime of flight (climb, cruise or descent) unless a higher speed is authorized for flight test or pilot training;

* * * * *

(c) * * *

(3) For normal, utility, and acrobatic category reciprocating engine-powered airplanes of more than 6,000 pounds maximum weight and for turbine engine-powered airplanes in the normal, utility, and acrobatic category, performance operating limitations as follows—

(i) The maximum takeoff weight for each airport altitude and ambient temperature within the range selected by the applicant at which the airplane complies with the climb requirements of § 23.63(c)(1).

(ii) The maximum landing weight for each airport altitude and ambient temperature within the range selected by the applicant at which the airplane complies with the climb requirements of § 23.63(c)(2).

(4) For commuter category airplanes, the maximum takeoff weight for each airport altitude and ambient temperature within the range selected by the applicant at which—

(i) The airplane complies with the climb requirements of § 23.63(d)(1); and

(ii) The accelerate-stop distance determined under § 23.55 is equal to the available runway length plus the length of any stopway, if utilized; and either:

(iii) The takeoff distance determined under § 23.59(a) is equal to the available runway length; or

(iv) At the option of the applicant, the takeoff distance determined under § 23.59(a) is equal to the available runway length plus the length of any clearway and the takeoff run determined under § 23.59(b) is equal to the available runway length.

(5) For commuter category airplanes, the maximum landing weight for each airport altitude within the range selected by the applicant at which—

(i) The airplane complies with the climb requirements of § 23.63(d)(2) for ambient temperatures within the range selected by the applicant; and

(ii) The landing distance determined under § 23.75 for standard temperatures is equal to the available runway length.

(6) The maximum zero wing fuel weight, where relevant, as established in accordance with § 23.343.

(d) *Center of gravity.* The established center of gravity limits.

(e) *Maneuvers.* The following authorized maneuvers, appropriate airspeed limitations, and unauthorized maneuvers, as prescribed in this section.

(1) *Normal category airplanes.* No acrobatic maneuvers, including spins, are authorized.

(2) *Utility category airplanes.* A list of authorized maneuvers demonstrated in the type flight tests, together with recommended entry speeds and any other associated limitations. No other maneuver is authorized.

(3) *Acrobatic category airplanes.* A list of approved flight maneuvers demonstrated in the type flight tests, together with recommended entry speeds and any other associated limitations.

(4) *Acrobatic category airplanes and utility category airplanes approved for spinning.* Spin recovery procedure established to show compliance with § 23.221(c).

(5) *Commuter category airplanes.* Maneuvers are limited to any maneuver incident to normal flying, stalls, (except whip stalls) and steep turns in which the angle of bank is not more than 60 degrees.

(f) *Maneuver load factor.* The positive limit load factors in g's, and, in addition, the negative limit load factor for acrobatic category airplanes.

(g) *Minimum flight crew.* The number and functions of the minimum flight crew determined under § 23.1523.

* * * * *

(i) *Maximum operating altitude.* The maximum altitude established under § 23.1527.

(j) *Maximum passenger seating configuration.* The maximum passenger seating configuration.

(k) *Allowable lateral fuel loading.* The maximum allowable lateral fuel loading differential, if less than the maximum possible.

(l) *Baggage and cargo loading.* The following information for each baggage and cargo compartment or zone—

(1) The maximum allowable load; and

(2) The maximum intensity of loading.

(m) *Systems.* Any limitations on the use of airplane systems and equipment.

(n) *Ambient temperatures.* Where appropriate, maximum and minimum ambient air temperatures for operation.

(o) *Smoking.* Any restrictions on smoking in the airplane.

(p) *Types of surface.* A statement of the types of surface on which operations may be conducted. (See § 23.45(g) and § 23.1587 (a)(4), (c)(2), and (d)(4)).

55. Section 23.1585 is revised to read as follows:

§ 23.1585 Operating procedures.

(a) For all airplanes, information concerning normal, abnormal (if applicable), and emergency procedures and other pertinent information necessary for safe operation and the achievement of the scheduled performance must be furnished, including—

(1) An explanation of significant or unusual flight or ground handling characteristics;

(2) The maximum demonstrated values of crosswind for takeoff and landing, and procedures and information pertinent to operations in crosswinds;

(3) A recommended speed for flight in rough air. This speed must be chosen to protect against the occurrence, as a result of gusts, of structural damage to the airplane and loss of control (for example, stalling);

(4) Procedures for restarting any turbine engine in flight, including the effects of altitude; and

(5) Procedures, speeds, and configuration(s) for making a normal approach and landing, in accordance with §§ 23.73 and 23.75, and a transition to the balked landing condition.

(6) For seaplanes and amphibians, water handling procedures and the demonstrated wave height.

(b) In addition to paragraph (a) of this section, for all single-engine airplanes, the procedures, speeds, and configuration(s) for a glide following engine failure, in accordance with § 23.71 and the subsequent forced landing, must be furnished.

(c) In addition to paragraph (a) of this section, for all multiengine airplanes, the following information must be furnished:

(1) Procedures, speeds, and configuration(s) for making an approach and landing with one engine inoperative;

(2) Procedures, speeds, and configuration(s) for making a balked landing with one engine inoperative and the conditions under which a balked landing can be performed safely, or a warning against attempting a balked landing;

(3) The V_{SSE} determined in § 23.149; and

(4) Procedures for restarting any engine in flight including the effects of altitude.

(d) In addition to paragraphs (a) and either (b) or (c) of this section, as appropriate, for all normal, utility, and acrobatic category airplanes, the following information must be furnished:

(1) Procedures, speeds, and configuration(s) for making a normal takeoff, in accordance with § 23.51 (a) and (b), and § 23.53 (a) and (b), and the subsequent climb, in accordance with § 23.65 and § 23.69(a).

(2) Procedures for abandoning a takeoff due to engine failure or other cause.

(e) In addition to paragraphs (a), (c), and (d) of this section, for all normal, utility, and acrobatic category multiengine airplanes, the information must include the following:

(1) Procedures and speeds for continuing a takeoff following engine failure and the conditions under which takeoff can safely be continued, or a warning against attempting to continue the takeoff.

(2) Procedures, speeds, and configurations for continuing a climb following engine failure, after takeoff, in accordance with § 23.67, or enroute, in accordance with § 23.69(b).

(f) In addition to paragraphs (a) and (c) of this section, for commuter category airplanes, the information must include the following:

(1) Procedures, speeds, and configuration(s) for making a normal takeoff.

(2) Procedures and speeds for carrying out an accelerate-stop in accordance with § 23.55.

(3) Procedures and speeds for continuing a takeoff following engine failure in accordance with § 23.59(a)(1) and for following the flight path determined under § 23.57 and § 23.61(a).

(g) For multiengine airplanes, information identifying each operating condition in which the fuel system independence prescribed in § 23.953 is necessary for safety must be furnished, together with instructions for placing the fuel system in a configuration used to show compliance with that section.

(h) For each airplane showing compliance with § 23.1353 (g)(2) or (g)(3), the operating procedures for disconnecting the battery from its charging source must be furnished.

(i) Information on the total quantity of usable fuel for each fuel tank, and the effect on the usable fuel quantity, as a result of a failure of any pump, must be furnished.

(j) Procedures for the safe operation of the airplane's systems and equipment, both in normal use and in the event of malfunction, must be furnished.

56. Section 23.1587 is revised to read as follows:

§ 23.1587 Performance information.

Unless otherwise prescribed, performance information must be provided over the altitude and temperature ranges required by § 23.45(b).

(a) For all airplanes, the following information must be furnished—

(1) The stalling speeds V_{SO} and V_{S1} with the landing gear and wing flaps

retracted, determined at maximum weight under § 23.49, and the effect on these stalling speeds of angles of bank up to 60 degrees;

(2) The steady rate and gradient of climb with all engines operating, determined under § 23.69(a);

(3) The landing distance, determined under § 23.75 for each airport altitude and standard temperature, and the type of surface for which it is valid;

(4) The effect on landing distances of operation on other than smooth hard surfaces, when dry, determined under § 23.45(g); and

(5) The effect on landing distances of runway slope and 50 percent of the headwind component and 150 percent of the tailwind component.

(b) In addition to paragraph (a) of this section, for all normal, utility, and acrobatic category reciprocating engine-powered airplanes of 6,000 pounds or less maximum weight, the steady angle of climb/descent, determined under § 23.77(a), must be furnished.

(c) In addition to paragraphs (a) and (b) of this section, if appropriate, for normal, utility, and acrobatic category airplanes, the following information must be furnished—

(1) The takeoff distance, determined under § 23.53 and the type of surface for which it is valid.

(2) The effect on takeoff distance of operation on other than smooth hard surfaces, when dry, determined under § 23.45(g);

(3) The effect on takeoff distance of runway slope and 50 percent of the headwind component and 150 percent of the tailwind component;

(4) For multiengine reciprocating engine-powered airplanes of more than 6,000 pounds maximum weight and multiengine turbine powered airplanes, the one-engine-inoperative takeoff climb/descent gradient, determined under § 23.66;

(5) For multiengine airplanes, the enroute rate and gradient of climb/descent with one engine inoperative, determined under § 23.69(b); and

(6) For single-engine airplanes, the glide performance determined under § 23.71.

(d) In addition to paragraph (a) of this section, for commuter category airplanes, the following information must be furnished—

(1) The accelerate-stop distance determined under § 23.55;

(2) The takeoff distance determined under § 23.59(a);

(3) At the option of the applicant, the takeoff run determined under § 23.59(b);

(4) The effect on accelerate-stop distance, takeoff distance and, if determined, takeoff run, of operation on other than smooth hard surfaces, when dry, determined under § 23.45(g);

(5) The effect on accelerate-stop distance, takeoff distance, and if determined, takeoff run, of runway slope and 50 percent of the headwind component and 150 percent of the tailwind component;

(6) The net takeoff flight path determined under § 23.61(b);

(7) The enroute gradient of climb/descent with one engine inoperative, determined under § 23.69(b);

(8) The effect, on the net takeoff flight path and on the enroute gradient of climb/descent with one engine inoperative, of 50 percent of the headwind component and 150 percent of the tailwind component;

(9) Overweight landing performance information (determined by extrapolation and computed for the range of weights between the maximum landing and maximum takeoff weights) as follows—

(i) The maximum weight for each airport altitude and ambient temperature at which the airplane complies with the climb requirements of § 23.63(d)(2); and

(ii) The landing distance determined under § 23.75 for each airport altitude and standard temperature.

(10) The relationship between IAS and CAS determined in accordance with § 23.1323 (b) and (c).

(11) The altimeter system calibration required by § 23.1325(e).

57. Section 23.1589(b) is revised to read as follows:

§ 23.1589 Loading information.

* * * * *

(b) Appropriate loading instructions for each possible loading condition between the maximum and minimum weights established under § 23.25, to facilitate the center of gravity remaining within the limits established under § 23.23.

Appendix E to Part 23 [Removed and Reserved]

58. Appendix E to Part 23 is removed and reserved.

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David R. Hinson,

Administrator.

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