



U.S. Department
of Transportation

**Federal Aviation
Administration**

NSP GB

National Simulator Program
FSTD Qualification Guidance Bulletin

NSP GB 11-04
DATE: 02/22/2018

Flight Standards Service
Washington, DC

National Simulator Program Guidance Bulletin

An NSP GB contains valuable information for FSTD sponsors that should help them meet certain administrative, regulatory, or operational requirements with relatively low urgency or impact on safety.

Subject: FSTD Evaluation and Qualification for Engine and Airframe Icing Training Tasks

Purpose: To provide sponsors of level C and D FSTDs guidance on the evaluation and qualification of engine and air frame icing effects as necessary to accomplish training objectives.

Background: Historically, the effects of icing have been simulated, in some instances, by adding weight to the simulated aircraft without incorporating abnormal aerodynamic characteristics (such as changes in aerodynamic lift as a result of ice accretion) or altered engine performance. Studies of airplane accidents where loss of control (LOC) was attributed to icing have suggested that existing FSTD icing models that do not capture additional effects may be inadequate for training.

On August 1, 2010, H.R. 5900 was passed into law becoming The Airline Safety and Federal Aviation Administration Extension Act of 2010, Public Law #111-216. Section 208(b.) of this act required the FAA to convene a multidisciplinary panel to study methods for improving crewmember familiarity and responsiveness to stick pusher systems, icing conditions, microburst and wind shear weather events.¹ Standards were proposed by a wide range of subject matter experts on FSTD development and evaluation to address training for loss of control in flight. These proposals were considered by the FAA for the purposes of improving FSTD qualification standards. On May 31, 2016, revisions to 14 CFR Part 60² became effective. The rule introduced amended Qualification Performance Standards (QPS) which improved technical standards for full stall and stick pusher maneuvers, upset prevention and recovery maneuvers, maneuvers conducted in airborne icing conditions, takeoff and landing maneuvers in gusting crosswinds, and bounced

¹ The law also requires rulemaking to require Part 121 air carriers to provide flight crewmember training (which may include FSTD training) for stall recognition, avoidance and recovery. Also See NSP Guidance Bulletins for FSTD Qualification for Upset Recovery Training.” and “FSTD Qualification for Enhanced Stall Training” at [NSP Guidance Bulletins](#)

²14 CFR Part 60 effective 2016 is commonly known to industry as Part 60 Change 2.

landing recovery maneuvers. The improved technical standards define FSTD fidelity requirements for conducting new flight training tasks introduced through recent changes to the air carrier training rule³. The changes also address various National Transportation Safety Board (NTSB) and Aviation Rulemaking Committee recommendations. Sponsors are also encouraged to review updated NSP Guidance Bulletins 14-01, FSTD Evaluation and Qualification for Full Stall Training Maneuvers and 11-05, FSTD Evaluation and Qualification for Upset Recognition and Recovery Training Tasks.

³ 14 CFR Part 121.423

Revision	Description of Change	Effective Date
0	Original Draft.	12/19/2011
1	Enhanced for clarity	12/20/2011
2	Updated for Publication of 14 CFR Part 60 Change 2	04/11/2016
3	Revised to include observations, improved practices and clarity.	02/22/2018

General Information

On March 30, 2016, the FAA published changes to the 14 CFR Part 60 Qualification Performance Standard (QPS), which updated technical requirements for the qualification of engine and airframe icing maneuvers. These updated technical standards are applicable to all Level C and Level D FSTDs initially qualified after the effective date of the final rule⁴ and for previously qualified Level C and Level D FSTDs if they are used to conduct engine and airframe icing training tasks. Retroactive requirements for FSTDs initially qualified before the effective date of the final rule are published in FSTD Directive 2. FSTD Directive 2 requires any FSTD, used to conduct engine and airframe icing training tasks, to meet the new technical requirements for engine and airframe icing by March 12, 2019. As explained in FSTD Directive 2, the objective testing demonstration, 2i, is waived for previously qualified devices. FSTD Directive 2, along with other FSTD directives for airplane FSTDs, appear in Appendix A, Attachment 6 of 14 CFR Part 60.

Compliance Dates and Qualification Process

Initial FSTD Qualifications: Level C and Level D FSTDs that are initially qualified after the effective date of the final rule must meet all Part 60 (2016) engine and airframe icing requirements at the time of initial qualification.

Previously Qualified FSTDs: Sponsors may elect not to qualify FSTDs for training tasks involving engine and airframe icing. After March 12, 2019 however, any FSTD being used to conduct training tasks to demonstrate the effects of engine and airframe icing must meet the new general simulator requirements as published in FSTD Directive 2. Where continued qualification for training, testing, or checking credit is requested after the compliance date, each FSTD sponsor is required to perform FSTD modifications under § 60.23 as needed, conduct additional subjective testing, and apply for additional FSTD qualification under § 60.16.

Where sponsors intend to update a significant number of FSTDs for icing, concurrent with other Directive 2 training tasks, they are encouraged to engage the NSP and share their update schedules in advance of official modification notification. Doing so will facilitate the scheduling process.

The qualification process is as follows:

1. Utilizing NSP Form T011-FD2,⁵ submit notification of intent to qualify the FSTD for engine and airframe icing training maneuvers and describe any modifications to the FSTD. Per §60.23, the TPAA must also be notified. Where scheduling of large FSTD fleets create special considerations for notification, sponsors should contact the NSP.

⁴ The final rule became effective on May 31, 2016.

⁵ This form is intended for the notification of intent to use an FSTD for full stall and stick pusher maneuvers, upset recognition and recovery maneuvers, maneuvers conducted in icing conditions, takeoff and landing maneuvers in gusting crosswinds, and bounced landing recovery maneuvers in accordance with FSTD Directive 2.

2. The notification should be accompanied by the required Statement of Compliance (Ice Accretion Model). TPAA may or may not wish to receive the validation materials. Sponsors should consult their TPAA to this end. If the supporting documents are not available at the time of notification, submission will be made at a time that is mutually agreeable to both the sponsor and the NSP.
3. Once FSTD modifications and a sponsor evaluation are completed, submit the confirmation statement that the modified FSTD has been subjectively evaluated by a qualified pilot as described in § 60.16(a)(1)(iii).

The NSP will review each submission, determine if requirements have been met, and respond to the FSTD Sponsor as described in § 60.23(c). This response, along with any noted restrictions, may serve as an interim qualification until a permanent change is made to the Statement of Qualification (SOQ) following the next scheduled NSP conducted FSTD evaluation. Alternatively, the NSP may elect to conduct an update evaluation before the modified FSTD may be used in training.

During an onsite evaluation, the NSP may actively exercise the device or observe the execution of the maneuver by the SME. The NSP may also ask for a demonstration of the training profile and an explanation of how it is evaluated by the instructor.

Technical Requirements:

All Level C and D FSTDs initially qualified after the effective date of May 31, 2016 must meet the revised requirements for engine and airframe icing modeling and evaluation as published in 14 CFR Part 60 Change 2. The technical requirements for these FSTDs are found in Appendix A,

Attachment 1, General Simulator Requirements: Table A1A (2.j.) Engine Airframe and Icing, and

Attachment 2, FFS Objective Tests: Table A2A (2.i.) Engine Airframe and Icing Effects Demonstration, High AOA, and

Attachment 7, Additional Simulator Qualification Requirements for Stall, Upset Prevention and Recovery, and Engine and Airframe Icing Training Tasks: Section C.

All previously qualified Level C and D FSTDs used to obtain training, testing, or checking credits in maneuvers that demonstrate the effects of engine and airframe ice accretion must be evaluated and qualified in accordance with the technical requirements referenced in Section III of FSTD Directive 2. With the exception of the objective demonstration tests, all of the above requirements are also applicable to previously qualified FSTDs.

Sponsors should review the technical requirements for engine and airframe ice accretion as published in applicable sections of the rule. A summary of these requirements follows.

Modeling Requirements: Icing models must simulate the aerodynamic degradation effects of ice accretion on the airplane lifting surfaces including loss of lift, decrease in stall angle of attack, change in pitching moment, decrease in control effectiveness, and changes in control forces in addition to any overall increase in drag. Aircraft systems (such as the stall protection system and auto flight system) must respond properly to ice accretion consistent with the simulated aircraft. Ice accretion models must be developed to account for training the specific skills required for recognition of ice accumulation and execution of the required response. With the exception of aircraft that have specific training requirements for the recognition and avoidance of particular types of icing events, the rule does not mandate a minimum number or specific type of ice accretion models available on the FSTD.

Supporting Data: Aircraft OEM data, aircraft certification data, or other acceptable analytical methods must be utilized to develop ice accretion models. Acceptable analytical methods may include wind tunnel analysis and/or engineering analysis of the aerodynamic effects of icing on the lifting surfaces coupled with tuning and supplemental subjective assessment by a subject matter expert pilot.

Statement of Compliance: The Statement of Compliance should provide a description of the expected effects which provide training in the specific skills required for recognition of icing phenomena and execution of recovery. The description should include those effects specific to the stall warning system. The statement should also describe the source data and any analytical methods used to develop ice accretion models including verification that these effects have been tested. FSTD evaluation should focus on the recognition of ice accretion cues and the procedures/maneuvers necessary to exit icing conditions. A description of the anti-ice system operation will be helpful in interpreting FSTD behavior particularly where the operation state or the presence of ice may automatically alter which surfaces are protected. FSTD sponsors are encouraged to use the procedure in Table A3F (section 2) in subjectively evaluating the effects of engine and airframe icing.

Objective Test Demonstration: (Not required for previously qualified FSTDs) At least one ice accretion model described in the Statement of Compliance must be selected and included in the MQTG for testing. Two tests are needed to demonstrate the performance of the aircraft from a trim position, through approach to stall, full stall, and recovery. The first test shall be a baseline with no icing. The second will demonstrate the aerodynamic effects of ice accretion relative to the baseline test. An existing stall test meeting the requirements of Table A2A (2.i.) may be utilized. The test will be evaluated on the specific icing effects described in the Statement of Compliance. Typically, demonstration will include one case with aircraft anti-ice systems turned off and one case with anti-ice systems turn on. If a different rationale is used it should be presented in the Statement of Compliance.

For question regarding this Guidance Bulletin or 14 CFR Part 60 Change 2, please call the FAA National Simulator Program at 404.474.5620.