DEPARTMENT OF TRANSPORTATION

Federal Aviation Administration

14 CFR Parts 21, 23, 25, 29, 33, 36, 47, 49, 60, 61, 67, 73, 91, 97, 101, 107, 121, 125, 129, 135, 141, 183, and 440

[Docket No. FAA–2022–1355; Amdt. Nos. 21–106, 23–65, 25–146, 29–58, 33–1, 36–32, 47–32, 49–11, 60–7, 61–151, 67–22, 73–1, 91–366, 97–1339, 101–9, 107–10, 121–387, 125–72, 129–54, 135–143, 141–24, 183–18, 440–6]

RIN 2120–AL53

Miscellaneous Amendments

AGENCY: Federal Aviation Administration (FAA), Department of Transportation (DOT).

ACTION: Final rule; technical amendments.

SUMMARY: This technical amendment contains non-substantive corrections to address typographical errors, editorial errors, and outdated or incorrect references in various parts of FAA regulations.

DATES: Effective December 9, 2022.

FOR FURTHER INFORMATION CONTACT: For questions concerning this action, contact Jesse Holston, Office of Rulemaking, ARM–200, Federal Aviation Administration, 800 Independence Ave. SW, Washington, DC 20591; telephone (202) 267–0810; email *jesse.c.holston@faa.gov.*

SUPPLEMENTARY INFORMATION:

I. Good Cause for Immediate Adoption Without Prior Notice

Section 553(b)(3)(B) of the Administrative Procedure Act (APA) (5 U.S.C. 551 *et seq.*) authorizes agencies to dispense with notice and comment procedures for rules when the agency for ''good cause'' finds that those procedures are ''impracticable, unnecessary, or contrary to the public interest.'' Under this section, an agency, upon finding good cause, may issue a final rule without seeking comment prior to the rulemaking.

Additionally, the APA requires agencies to delay the effective date of regulations for 30 days after publication, unless the agency finds good cause to make the regulations effective sooner. *See*, 5 U.S.C. 553(d). This action makes technical amendments that affect the clarity of existing regulations. These amendments will not impose any additional substantive restrictions or requirements on the persons affected by these regulations. Because this action merely makes technical amendments, the FAA finds that notice and public comment under 5 U.S.C. 553(b) is unnecessary. For the same reason, the FAA finds that good cause exists under 5 U.S.C. 553(d) for making this rule effective in less than 30 days.

II. Authority for This Rulemaking

The FAA's authority to issue rules is found in title 49 of the United States Code. Subtitle I, section 106 describes the authority of the FAA Administrator. This rulemaking is promulgated under the authority described in 49 U.S.C. 106(f) and (g), which establish the authority of the Administrator to promulgate and revise regulations and rules related to aviation safety. This regulation is within the scope of that authority because the rule makes non-substantive edits to regulations related to aviation safety promulgated under authorities listed in 49 U.S.C. 106(g).

Portions of this rulemaking are also authorized under 51 U.S.C. 50903(c), which authorizes the promulgation of regulations related to commercial space launches and reentries.

III. Technical Amendments

The FAA is making technical amendments to parts 21, 23, 25, 29, 33, 36, 47, 49, 60, 61, 67, 73, 91, 97, 101, 107, 121, 125, 129, 135, 141, 183, and 440 of those regulations found in Title 14 of the Code of Federal Regulations. All amendments are non-substantive and correct typographical errors, editorial errors, and outdated or incorrect references. The following is a summary of the various amendments to each of the above-listed parts.

Part 21

In § 21.619(a), permits the manufacturer of an article under a Technical Standard Order (TSO) authorization to make a minor design change without FAA approval, so long as the manufacturer forwards to the FAA any revised data necessary for compliance with the application requirements in § 21.603. However, the reference to § 21.603(b) is incorrect, as that section addresses the use of open brackets to identify minor changes. The correct reference is to § 21.603(a), which contains the requirements to include a statement of conformity and required technical data in an application for TSO authorization.

Part 23

In the following sections, the FAA corrects minor typographical and grammatical errors: §§ 23.2115(c), 23.2165(a)(1)(i), 23.2200(d), 23.2315(a), 23.2440(c)(2), 23.2520(a), and 23.2620(b).

In § 23.2120(a), the word ''configuration'' is removed and replaced with the word ''configuration(s)'' to clarify that there could be multiple initial climb configurations.

In § 23.2255(c), the word ''aircraft'' is removed and replaced with the word ''airplane'' for consistency with this section and part 23, which sets forth airworthiness standards for normal category airplanes.

In § 23.2400(b), the word ''FAA'' is removed and replaced with the word ''Administrator'' to align with 49 U.S.C. 44704, which identifies that the Administrator issues type certificates. In § 23.2500(b), the change clarifies that the reference to paragraph (a) refers to paragraph (a) of § 23.2500. Additional updates are made to punctuation for clarity.

In § 23.2600(b), the term ''qualified flightcrew'' is removed and replaced with ''flightcrew members'' to clarify that the term ''qualified flightcrew'' was not intended to have a different meaning than the term ''flightcrew member'' as defined in 14 CFR part 1.[1]

Part 25

In § 25.471(b)(2), the reference to paragraph (c)(1) of § 25.1583 is no longer accurate because § 25.1583 was subsequently revised, and the paragraph numbering changed.[2] Thus, § 25.471(b)(2) is corrected to refer to § 25.1583(c)(2).

In § 25.525(b), the reference to ''§ 25.533(b)'' is incorrect and is replaced with a reference to ''25.533(c)''. Section 25.533(b) provides local pressures rather than distributed pressures, which are the proper pressures to calculate distributed loads as described in § 25.525(b). The distributed pressures are provided in § 25.533(c).

In § 25.535(d), the number ''3.25'' is incorrect and is replaced with the number ''0.25'' as originally stated in the final rule.[3]

In § 25.571, the FAA corrects a minor typographical error.

In § 25.903(a)(3)(ii), the effective date of § 33.68 is corrected to read ''March 26, 1984'' because that is the effective date of Amendment 33–10.

In § 25.903(a)(3)(iii), the effective date of § 33.68 is corrected to read ''October 31, 1974'' because that is the effective date of Amendment 33–6.

In § 25.1517(b), the term ''VMO—35 KTAS'' is removed and replaced with ''VMO minus 35 KTAS'' to clarify that

[1] *See* 81 FR 96572 (Dec. 30, 2016).

[2] *See* 43 FR 4302 (Jan. 16, 1978).

[3] *See* 29 FR 18289 (Dec. 24, 1964).

the ''-'' symbol was logically intended to be a minus sign and not a dash.

Part 29

In § 29.1557(d), the cross reference to § 29.811(h)(2), which does not exist, is replaced with the correct cross reference, § 29.811(f)(2).

Part 33

In § 33.97(a), a comma is added between the words ''endurance'' and ''calibration'' to clarify that both endurance tests and calibration tests are required to evaluate thrust reversers and are separate tests.

Part 36

In § 36.1(a)(4), a spelling error is corrected.

Part 47

Section 47.9(b) differentiates aircraft registered prior to January 1, 1980 and aircraft registered after 1980. As the aircraft registration dates for all aircraft currently on the registry are after January 1, 1980, this differentiation is no longer necessary. The FAA has revised § 47.9(b), (b)(1) and (b)(2) to remove the reference to January 1, 1980 and make conforming changes resulting from the removal of such reference.

In § 47.19, the phrase ''must be mailed to the Registry, Department of Transportation, Post Office Box 25504, Oklahoma City, Oklahoma 73125–0504, or delivered to the Registry at 6425 S. Denning Ave., Oklahoma City, Oklahoma 73169,'' is removed and replaced with, ''must be delivered to the Registry by a means acceptable to the Administrator,'' to conform to the Registry's current practice of accepting digitally signed documents and communications by email as an alternative to delivery of hard copies, as well as submission of documents and communications by other means acceptable to the Administrator.

Part 49

In § 49.1(a)(2), the horsepower threshold for aircraft engines incorrectly references 750 and is corrected to 550 consistent with § 49.41.[4]

Section 49.11 is revised to conform to the Registry's current practice of accepting digitally signed documents by email in addition to accepting delivery of hard copies or acceptance of delivery by other means.

In § 49.13(a), the phrase ''must be in ink'' is removed and replaced with ''must be signed in a manner acceptable to the Administrator,'' to conform to the Registry's continued acceptance of digital signatures.[5]

Part 60

Part 60 has multiple references to the ''National Simulator Program Manager'', ''NSPM'', and ''NSP''. This office and manager position no longer exist by those names due to the reorganization of the Air Transportation Division. Thus, this technical amendment updates all of these references by deleting or replacing them with ''responsible Flight Standards office'', ''Flight Standards Service'', or ''FAA'', as appropriate. Further, references to outdated websites, references to outdated contact information, and incorrect numbering are corrected.

The following table identifies the nomenclature changes in 14 CFR part 60 to account for the reorganization of the Air Transportation Division:

TABLE 1—REVISED NOMENCLATURE AND AFFECTED SECTIONS OF 14 CFR PART 60

Old nomenclature/current CFR	New nomenclature/revision	Affected sections of 14 CFR part 60
National Simulator Program Manager (NSPM)	responsible Flight Standards office	§ 60.5, Attachment 6 to Appendix A to Part 60.
NSPM	responsible Flight Standards office	§ 60.5, § 60.7, § 60.9, § 60.11, § 60.13, § 60.14, § 60.15, § 60.16, § 60.17, § 60.19, § 60.21, § 60.23, § 60.25, § 60.27, § 60.29, § 60.31, § 60.37, Appendix A to Part 60, Attachment 1 to Appendix A to Part 60, Attachment 2 to Appendix A to Part 60, Attachment 3 to Appendix A to Part 60, Attachment 5 to Appendix A to Part 60, Attachment 6 to Appendix A to Part 60, Appendix B to Part 60, Attachment 1 to Appendix B to Part 60, Attachment 2 to Appendix B to Part 60, Appendix C to Part 60, Attachment 1 to Appendix C to Part 60, Attachment 2 to Appendix C to Part 60, Attachment 3 to Appendix C to Part 60, Appendix D to Part 60, Attachment 1 to Appendix D to Part 60, Attachment 2 to Appendix D to Part 60, Attachment 3 to Appendix D to Part 60, Appendix E to Part 60, Appendix F to Part 60.
NSPM	the responsible Flight Standards office	§ 60.19, Attachment 2 to Appendix A to Part 60, Attachment 2 to Appendix C to Part 60.
an NSPM	a responsible Flight Standards office	§ 60.19.
NSPM	Flight Standards Service	Appendix A to Part 60, Attachment 2 to Appendix A to Part 60, Appendix C to Part 60, Appendix D to Part 60.
NSPM, or a person assigned by the NSPM	responsible Flight Standards office	Appendix A to Part 60, Appendix C to Part 60.
an NSP pilot	a pilot from the responsible Flight Standards office.	Appendix A to Part 60, Appendix B to Part 60, Appendix C to Part 60, Appendix D to Part 60.

[4] *See* 70 FR 239 (Jan. 3, 2005).

[5] Notice of Policy Clarification for Acceptance of Documents With Digital Signatures by the Federal Aviation Administration Aircraft Registry, 81 FR 23348, (April 20, 2016).

TABLE 1—REVISED NOMENCLATURE AND AFFECTED SECTIONS OF 14 CFR PART 60—Continued

Old nomenclature/current CFR	New nomenclature/revision	Affected sections of 14 CFR part 60
NSPM or visit the NSPM Web site	responsible Flight Standards office	Appendix A to Part 60, Appendix B to Part 60, Appendix C to Part 60, Appendix D to Part 60.
FAA FSDO	responsible Flight Standards office	Appendix A to Part 60, Appendix B to Part 60, Appendix C to Part 60, Appendix D to Part 60.
NSPM, or a person or persons assigned by the NSPM.	responsible Flight Standards office	Appendix B to Part 60, Appendix D to Part 60.
NSP	FAA	Attachment 2 to Appendix B to Part 60.

In addition to the above nomenclature changes, this technical amendment makes several other minor technical changes to 14 CFR part 60.

In appendices A, B, C, and D to part 60, paragraph 1. Introduction, the following changes are made to reflect the reorganization of the Air Transportation Division:

- Removed paragraph b.;
- Removed the last sentence of paragraph c.;
- Added ''Flightcrew Member'' after ''as amended,'' in appendix A, paragraph d.(12); appendix B, paragraph d.(12); appendix C, paragraph d.(10); and appendix D, paragraph d.(12); and
- Removed the phrase ''FAA Airman Testing Standards for the Airline Transport Pilot Certificate, Type Ratings, Commercial Pilot Certificate, and Instrument Ratings.'' and replaced with ''FAA Airman Certification Standards and Practical Test Standards for Airline Transport Pilot, Type Ratings, Commercial Pilot, and Instrument Ratings.'' in appendix A, paragraph d.(27); appendix B, paragraph d.(26); appendix C, paragraph d.(25); and appendix D, paragraph d.(28).

''NSP'' is removed from the following places to reflect the reorganization of the Air Transportation Division:

- Appendix A;
- Attachment 3 to appendix A;
- Appendix B;
- Attachment 3 to appendix B;
- Appendix C;
- Attachment 3 to appendix C;
- Appendix D; and
- Attachment 3 to appendix D.

In attachment 3 to appendix A, 2. Discussion, the last sentence of paragraph g. is removed to reflect the reorganization of the Air Transportation Division.

In the following Figures, the letter heading addressed to ''Edward D. Cook'' is removed because it is outdated contact information that is no longer accurate:

- Attachment 4 to appendix A, Figure A4A; and
- Attachment 4 to appendix B, Figure B4A.

In the following Figures, ''FAA National Simulator Program'' is removed to reflect the reorganization of the Air Transportation Division:

- Attachment 4 to appendix A, Figure A4C;
- Attachment 4 to appendix B, Figure B4C;
- Attachment 4 to appendix C, Figure C4C; and
- Attachment 4 to appendix D, Figure D4C.

In the following Figures, ''Manager, National Simulator Program'' is removed to reflect the reorganization of the Air Transportation Division:

- Attachment 4 to appendix A, Figure A4D;
- Attachment 4 to appendix B, Figure B4D;
- Attachment 4 to appendix C, Figure C4D; and
- Attachment 4 to appendix D, Figure D4D.

In the following Figures, ''National Simulator Program'' and ''NSPM'' are removed and replaced with ''FAA'' to reflect the reorganization of the Air Transportation Division:

- Attachment 4 to appendix A, Figure A4E;
- Attachment 4 to appendix B, Figure B4E;
- Attachment 4 to appendix C, Figure C4E; and
- Attachment 4 to appendix D, Figure D4E.

''NSP's'' is removed from attachment 6 to appendix A to reflect the reorganization of the Air Transportation Division.

''NSPM'' is removed from the second sentence of appendix B to reflect the reorganization of the Air Transportation Division.

In attachment 3 to appendix C, the last sentence of the first paragraph h. is removed to reflect the reorganization of the Air Transportation Division. Also, the second paragraph h. is redesignated as paragraph i. and paragraph i. is redesignated as paragraph j.

In the following Figures, the letter heading addressed to ''Charles A. Spillner'' is removed because it is outdated contact information that is no longer accurate:

- Attachment 4 to appendix C, figure C4A; and
- Attachment 4 to appendix D, figure D4A.

In appendix D, 17. Modifications to FTDs, an incorrect reference is updated.

In appendix E, paragraph i.(4) is removed and ''NSPM'' is removed from paragraphs h.(1) and h.(2) to reflect the reorganization of the Air Transportation Division.

In appendix F, the definition for ''National Simulator Program Manager (NSPM)'' is removed and the abbreviation ''NSPM'' is removed to reflect the reorganization of the Air Transportation Division.

In the Flight Simulation Training Device Qualification Standards for Extended Envelope and Adverse Weather Event Training Tasks Final Rule, the FAA removed Figure A4H Sample Continuing Qualification Evaluation Requirements Page from attachment 4 to appendix A because the final rule amendment to § 60.19 made the figure obsolete and unnecessary. This same figure should have also been removed from Appendices B–D for the same reason. Thus, the following changes are made:

- In attachment 4 to appendix B, figure B4H is removed and the table of contents is updated accordingly;
- In attachment 4 to appendix C, figure C4H is removed and the table of contents is updated accordingly; and
- In attachment 4 to appendix D, figure D4H is removed and the table of contents is updated accordingly.

In the Flight Simulation Training Device Qualification Standards for Extended Envelope and Adverse Weather Event Training Tasks Final Rule, the FAA added Level 7 FTDs to appendix B. However, the first sentence in this appendix does not include Level 7. Thus, in the first sentence of appendix B, the phrase ''or Level 6'' is replaced with ''Level 6, or Level 7''.

Part 61

In § 61.58, paragraphs (j) and (k) are removed because the October 12, 2012, time limitation has passed and accordingly, those paragraphs are now obsolete.

The FAA also corrects a spelling error in § 61.313(h).

Part 67

A mailing address is updated in §§ 67.4 and 67.409(a). Additionally, in § 67.409(a) a requirement that a duplicate document be submitted is removed because these documents are no longer reviewed in hardcopy.

Part 73

This technical amendment updates office titles in § 73.19(a) and (c) to reflect reorganization within the FAA. It also updates the FAA headquarters address in § 73.19(a) and replaces the word ''shall'' with ''must'' in § 73.19(a), (b) and (c).

Part 91

In § 91.9(c), ''or part 48'' is added to indicate that an aircraft operating under part 91 may also be marked under part 48. This change aligns this provision with § 91.203(a)(2).

In § 91.157(b)(4), aimed to specifically qualify daytime in Alaska because the time between sunrise and sunset is often a longer duration of time than in most of the United States. However, in a 1991 final rule, the FAA stated that daytime in Alaska is ''when the sun is 6° or more above the horizon''. 56 FR 65660 (Dec. 17, 1991). According to the Air Almanac, issued annually by the United States Naval Observatory, civil twilight (daytime) begins and ends when the sun is 6 degrees below the horizon. As such, civil twilight (daytime) is any time when the sun is 6 degrees or less below the horizon. In 1995, the FAA issued a technical amendment to correct the regulatory text to accurately capture daytime in Alaska amending it to state ''when the sun is 6 degrees or more below the horizon''. 60 FR 66874 (Dec. 27, 1995). However, this correction was inaccurate as more than 6 degrees below the horizon is nighttime. This technical amendment is meant to achieve the original intent to refer to daytime in Alaska by amending the language to read ''when the sun is 6 degrees or less below the horizon''.

In § 91.203(a)(1), ''or part 48'' is added to indicate that an aircraft operating under part 91 may also be marked under part 48. This change aligns this provision with § 91.203(a)(2).

In § 91.511(a), the phrase ''operating under this subpart'' is added to clarify who is subject to the prohibition.

In § 91.609(g), ''49 CFR'' is added prior to ''part 830'' everywhere that it appears to clarify which title of the CFR is being referenced.

In § 91.1001(b)(9), the reference to ''paragraph (b)(1)(v)'' is incorrect because no such paragraph exists. The reference to ''paragraph (b)(1)(v)'' is replaced with the correct reference to ''paragraph (b)(5)(vi)'', which addresses multi-year program agreements.

Part 97

In § 97.20(b), the FAA updates a mailing address and email address.

Part 101

In § 101.21(a), the reference to paragraph ''§ 101.25(b)(7)(ii)'' is removed and replaced with the correct reference, ''§ 101.25(g)(2)'', due to a technical amendment to § 101.25.[6]

Part 107

In § 107.9, the word ''accident'' in the title is removed and replaced with the words ''safety event'' to eliminate confusion and to distinguish it from the statutory authority afforded exclusively to the National Transportation Safety Board published in 49 U.S.C. 1101.

Part 121

In §§ 121.310(b)(2)(iii), 121.311(b)(2)(ii)(C), 121.391(d), § 121.523(c), the FAA corrects typographical, grammatical, and spelling errors.

In §§ 121.359(h) and 121.703(f), ''49 CFR'' is added prior to ''part 830'' everywhere that it appears to clarify which title of the CFR is being referenced.

In § 121.909(a) and § 121.923(a)(2), the phrase ''through the FAA office responsible for approval of the certificate holder's operations specifications, to the Manager of the Air Transportation Division'' is removed and replaced with ''to the responsible Flight Standards office'' to reflect the reorganization in the Air Transportation Division.

In § 121.1115(f), Table 2, Bombardier: BD–700, the acronym ''FH'', which stood for flight hours, is removed because it is incorrect and it is replaced with the correct acronym, ''FC'', which stands for flight cycles. Bombardier submitted information to the FAA to establish that the default limit of validity is 15,000 flight cycles rather than flight hours for the Bombardier Model BD–700; however, the FAA inadvertently used the acronym ''FH'' when listing the default LOV for the Bombardier Model BD–700 in Table 2.

[6] *See* 74 FR 38092 (July 31, 2009).

Part 125

In § 125.285(d), the reference to ''(c)(3)'' is removed because it is incorrect and it is replaced with the correct reference, ''(c)(2)'', which prescribes the observation of landings.

Part 129

The FAA corrects a spelling error in § 129.18(b). In § 129.115(f), Table 2, Bombardier: BD–700, the FAA removes the acronym ''FH'', which stood for flight hours because it is incorrect and it is replaced with the correct acronym, ''FC'', which stands for flight cycles. Bombardier submitted information to the FAA to establish that the default limit of validity is 15,000 flight cycles rather than flight hours for the Bombardier Model BD–700; however, the FAA inadvertently used the acronym ''FH'' when listing the default LOV for the Bombardier Model BD–700 in Table 2.

Part 135

In § 135.415(f), ''49 CFR'' is added prior to ''part 830'' to clarify which title of the CFR is being referenced.

Part 141

In a final rule published in the **Federal Register** on August 21, 2009 (74 FR 42499), Pilot, Flight Instructor, and Pilot School Certification, the FAA revised paragraph 4 of appendix I to 14 CFR part 141, to change the presentation of information in response to confusion about what is the amount of ground and flight training required for an add-on category and/or class rating course. In the process of changing the presentation of this information, the FAA inadvertently omitted the existing training requirements for an additional glider category rating for holders of a commercial pilot certificate. By correcting this typographical error, this technical amendment provides these existing requirements by specifying the required contents of such training programs.

In a final rule published in the **Federal Register** on June 27, 2018 (83 FR 30232), Regulatory Relief: Aviation Training Devices; Pilot Certification, Training, and Pilot Schools; and Other Provisions, the FAA inadvertently failed to revise part 141 appendix I, to allow the use of a technically advanced airplane (TAA) to satisfy the experience requirements, for those pilot applicants who would add category and class (specifically, Airplane Single Engine) to an existing Commercial Pilot Certificate. The original proposal was to provide relief to all regulated entities providing flight training for the Commercial Pilot Certificate with single engine land rating under any applicable rule part, including part 141, appendix I. This was an inadvertent omission and has caused some confusion and concern within the flight training community. With that understanding, the FAA is providing a technical amendment to paragraph 4.(a)(3)(ii) of appendix I to part 141 to otherwise permit the use of a complex airplane, turbine-powered airplane, or a technically advanced airplane to meet the experience requirement.

Part 183

The FAA is making updates to part 183 which are necessary to reflect organizational changes within the FAA. The Administrator established the Air Traffic Safety Oversight Service (AOV) within the Aviation Safety Organization (AVS) to provide independent oversight of the Air Traffic Organization in 2004. In 2006, the Administrator gave AOV the authority to manage the Control Tower Operator Certification Program but did not update part 183 to reflect this organizational change. Due to these changes, the FAA is revising §§ 183.11(d) and 183.25(c)(2) to replace ''the Associate Administrator for Air Traffic'' with ''the Associate Administrator for Aviation Safety''. Additionally, §§ 183.11(d) and 183.25(c) will specify that the air traffic control tower operator examiner is ''designated'' to be consistent with the terminology used for other positions involving delegated authority under 49 U.S.C. 44702(d).

Part 440

In § 440.19, this technical amendment restores paragraphs (a)(1) and (a)(2) which were inadvertently deleted from this section in a 2012 technical amendment.[7]

IV. Regulatory Notices and Analyses

Federal agencies consider impacts of regulatory actions under a variety of executive orders and other requirements. First, Executive Order 12866 and Executive Order 13563 direct that each Federal agency shall propose or adopt a regulation only upon a reasoned determination that the benefits of the intended regulation justify the costs. Second, the Regulatory Flexibility Act of 1980 (Pub. L. 96–354) requires agencies to analyze the economic impact of regulatory changes on small entities. Third, the Trade Agreements Act (Pub. L. 96–39) prohibits agencies from setting standards that create unnecessary obstacles to the foreign commerce of the United States. Fourth, the Unfunded Mandates Reform Act of 1995 (Pub. L. 104–4) requires agencies to prepare a written assessment of the costs, benefits, and other effects of proposed or final rules that include a Federal mandate that may result in the expenditure by State, local, and tribal governments, in the aggregate, or by the private sector, of $100,000,000 or more (adjusted annually for inflation) in any one year. The current threshold after adjustment for inflation is $165,000,000, using the most current (2021) Implicit Price Deflator for the Gross Domestic Product. This portion of the preamble summarizes the FAA's analysis of the economic impacts of this rule.

In conducting these analyses, the FAA has determined that this rule: will result in benefits that justify costs; is not a ''significant regulatory action'' as defined in section 3(f) of Executive Order 12866; will not create unnecessary obstacles to the foreign commerce of the United States; and will not impose an unfunded mandate on State, local, or tribal governments, or on the private sector.

A. Regulatory Impact Analysis

This final rule corrects several technical errors that affect the clarity of the regulatory text. As all the amendments in this final rule are non-substantive and intended to correct typographical errors, editorial errors, and outdated or incorrect references, the FAA does not expect that these technical corrections will result in any substantive incremental costs or benefits. These changes include corrections of grammatical and typographical errors, corrections of incorrect cross references, updates to mailing addresses and contact information, and updates to terms and titles following the reorganization or the Air Transportation Division. Since this rule involves non-substantive and clarifying editorial changes only, the impacts of the rule will be minimal.

B. Regulatory Flexibility Act

The Regulatory Flexibility Act (RFA), in 5 U.S.C. 603, requires an agency to prepare an initial regulatory flexibility analysis describing impacts on small entities whenever 5 U.S.C. 553 or any other law requires an agency to publish a general notice of proposed rulemaking for any proposed rule. Similarly, 5 U.S.C. 604 requires an agency to prepare a final regulatory flexibility analysis when an agency issues a final rule under 5 U.S.C. 553, after that section or any other law requires publication of a general notice of proposed rulemaking. The FAA concludes good cause exists to forgo notice and comment and to not delay the effective date for this rule. As 5 U.S.C. 553 does not require notice and comment in this situation, 5 U.S.C. 603 and 604 similarly do not require regulatory flexibility analyses.

C. International Trade Impact Assessment

The Trade Agreements Act of 1979 (Pub. L. 96–39), as amended, prohibits Federal agencies from establishing standards or engaging in related activities that create unnecessary obstacles to the foreign commerce of the United States. Pursuant to this Act, the establishment of standards is not considered an unnecessary obstacle to the foreign commerce of the United States, so long as the standard has a legitimate domestic objective, such as the protection of safety, and does not operate in a manner that excludes imports that meet this objective. The statute also requires consideration of international standards and, where appropriate, that they be the basis for U.S. standards.

The FAA has assessed the potential effect of this rule and has determined that the rule is in accord with the Trade Agreements Act as the rule applies equally to domestic and foreign persons engaged in aviation activities under 14 CFR. As previously discussion, this action corrects several technical errors that affect the clarity of the regulatory text. These corrections will not impose any additional substantive restrictions or requirements on the persons affected by these regulations.

D. Unfunded Mandates Assessment

The Unfunded Mandates Reform Act of 1995 (2 U.S.C. 1531–1538) governs the issuance of Federal regulations that require unfunded mandates. An unfunded mandate is a regulation that requires a state, local, or tribal government or the private sector to incur direct costs without the Federal government having first provided the funds to pay those costs. The FAA determined that the rule will not result in the expenditure of $165,000,000 or more by State, local, or tribal governments, in the aggregate, or the private sector, in any one year.

E. Paperwork Reduction Act

The Paperwork Reduction Act of 1995 (44 U.S.C. 3507(d)) requires that the FAA consider the impact of paperwork and other information collection burdens imposed on the public. The FAA has determined that there is no new requirement for information collection associated with this immediately adopted final rule.

[7] Correction of Authority Citations for Commercial Space Transportation, 77 FR 20531, April 5, 2012.

F. International Compatibility

In keeping with U.S. obligations under the Convention on International Civil Aviation, it is FAA policy to conform to International Civil Aviation Organization (ICAO) Standards and Recommended Practices to the maximum extent practicable. The FAA has reviewed the corresponding ICAO Standards and Recommended Practices and has identified no differences with these proposed regulations.

G. Environmental Analysis

FAA Order 1050.1F identifies FAA actions that are categorically excluded from preparation of an environmental assessment or environmental impact statement under the National Environmental Policy Act in the absence of extraordinary circumstances. The FAA has determined this rulemaking action qualifies for the categorical exclusion identified in paragraph 5–6.6(f) for regulations and involves no extraordinary circumstances.

V. Executive Order Determinations

A. Executive Order 13132, Federalism

The FAA has analyzed this immediately adopted final rule under the principles and criteria of Executive Order 13132, ''Federalism.'' The agency determined that this action will not have a substantial direct effect on the States, or the relationship between the Federal Government and the States, or on the distribution of power and responsibilities among the various levels of government, and, therefore, does not have Federalism implications.

B. Executive Order 13211, Regulations That Significantly Affect Energy Supply, Distribution, or Use

The FAA analyzed this immediately adopted final rule under Executive Order 13211, ''Actions Concerning Regulations that Significantly Affect Energy Supply, Distribution, or Use'' (May 18, 2001). The agency has determined that it is not a ''significant energy action'' under the executive order and it is not likely to have a significant adverse effect on the supply, distribution, or use of energy.

C. Executive Order 13609, International Cooperation

Executive Order 13609, ''Promoting International Regulatory Cooperation,'' promotes international regulatory cooperation to meet shared challenges involving health, safety, labor, security, environmental, and other issues and to reduce, eliminate, or prevent unnecessary differences in regulatory requirements. The FAA has analyzed this action under the policies and agency responsibilities of Executive Order 13609, and has determined that this action would have no effect on international regulatory cooperation.

VI. How To Obtain Additional Information

A. Rulemaking Documents

An electronic copy of a rulemaking document may be obtained from the internet by—

1. Searching the Federal eRulemaking Portal (*www.regulations.gov*);
2. Visiting the FAA's Regulations and Policies web page at *www.faa.gov/regulations_policies/;* or
3. Accessing the Government Printing Office's web page at *www.GovInfo.gov.*

Copies may also be obtained by sending a request (identified by notice, amendment, or docket number of this rulemaking) to the Federal Aviation Administration, Office of Rulemaking, ARM–1, 800 Independence Avenue SW, Washington, DC 20591, or by calling (202) 267–9680.

B. Small Business Regulatory Enforcement Fairness Act

The Small Business Regulatory Enforcement Fairness Act (SBREFA) of 1996 requires FAA to comply with small entity requests for information or advice about compliance with statutes and regulations within its jurisdiction. A small entity with questions regarding this document, may contact its local FAA official, or the person listed under the **FOR FURTHER INFORMATION CONTACT** heading at the beginning of the preamble. To find out more about SBREFA on the internet, visit *www.faa.gov/regulations_policies/rulemaking/sbre_act/.*

List of Subjects

14 CFR Part 21

Aircraft, Aviation safety, Exports, Imports, Reporting and recordkeeping requirements.

14 CFR Part 23

Aircraft, Aviation safety, Signs and symbols.

14 CFR Part 25

Aircraft, Aviation safety, Reporting and recordkeeping requirements.

14 CFR Part 29

Aircraft, Aviation safety, Reporting and recordkeeping requirements.

14 CFR Part 33

Aircraft, Aviation safety, Reporting and recordkeeping requirements.

14 CFR Part 36

Agriculture, Aircraft, Noise control.

14 CFR Part 47

Aircraft, Reporting and recordkeeping requirements.

14 CFR Part 49

Aircraft, Reporting and recordkeeping requirements.

14 CFR Part 60

Airmen, Aviation safety, Reporting and recordkeeping requirements.

14 CFR Part 61

Aircraft, Airmen, Alcohol abuse, Aviation safety, Drug abuse, Recreation and recreation areas, Reporting and recordkeeping requirements, Security measures, Teachers.

14 CFR Part 67

Airmen, Authority delegations (Government agencies), Health, Reporting and recordkeeping requirements.

14 CFR Part 73

Airspace, Navigation (air), Restricted areas, Security measures.

14 CFR Part 91

Afghanistan, Agriculture, Air carriers, Air taxis, Air traffic control, Aircraft, Airmen, Airports, Alaska, Aviation safety, Canada, Charter flights, Cuba, Drug traffic control, Ethiopia, Freight, Incorporation by reference, Iraq, Libya, Mexico, Noise control, North Korea, Political candidates, Reporting and recordkeeping requirements, Security measures, Somalia, Syria, Transportation, Yugoslavia.

14 CFR Part 97

Air traffic control, Airports, Incorporation by reference, Navigation (air), Weather.

14 CFR Part 101

Aircraft, Aviation safety, Reporting and recordkeeping requirements.

14 CFR Part 107

Aircraft, Airmen, Aviation safety, Recreation and recreation areas, Reporting and recordkeeping requirements, Security measures, Signs and symbols.

14 CFR Part 121

Air carriers, Aircraft, Airmen, Alcohol abuse, Aviation safety, Charter flights, Drug abuse, Drug testing, Reporting and recordkeeping requirements, Safety, Transportation.

14 CFR Part 125

Aircraft, Airmen, Aviation safety, Reporting and recordkeeping requirements.

14 CFR Part 129

Air carriers, Administration, Aircraft, Aviation safety, Reporting and recordkeeping requirements, Security measures, Smoking.

14 CFR Part 135

Air taxis, Aircraft, Airmen, Alcohol abuse, Aviation safety, Drug abuse, Drug testing, Reporting and recordkeeping requirements.

14 CFR Part 141

Airmen, Educational facilities, Reporting and recordkeeping requirements, Schools.

14 CFR Part 183

Aircraft, Airmen, Authority delegations (Government agencies), Health professions, Reporting and recordkeeping requirements.

14 CFR Part 440

Indemnity payments, Insurance, Reporting and recordkeeping requirements, Space transportation and exploration.

The Amendments

In consideration of the foregoing, the Federal Aviation Administration amends chapter I of title 14, Code of Federal Regulations (CFR) parts 21, 23, 25, 29, 33, 36, 47, 49, 60, 61, 67, 73, 91, 97, 101, 107, 121, 125, 129, 135, 141, 183, and 440 as follows:

PART 21—CERTIFICATION PROCEDURES FOR PRODUCTS AND ARTICLES

■ 1. The authority citation for part 21 continues to read as follows:

Authority: 42 U.S.C. 7572; 49 U.S.C. 106(f), 106(g), 40105, 40113, 44701–44702, 44704, 44707, 44709, 44711, 44713, 44715, 45303.

§ 21.619 [Amended]

■ 2. Amend § 21.619 in paragraph (a) by removing the citation ''§ 21.603(b)'' and adding in its place the citation ''21.603(a)''.

PART 23—AIRWORTHINESS STANDARDS: NORMAL CATEGORY AIRPLANES

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

Authority: 49 U.S.C. 106(f), 106(g), 40113, 44701–44702, 44704, Pub. L. 113–53, 127 Stat. 584 (49 U.S.C. 44704) note.

§ 23.2115 [Amended]

■ 4. Amend § 23.2115 in paragraph (c) introductory text by adding the word ''of'' after the word ''determination''.

§ 23.2120 [Amended]

■ 5. Amend § 23.2120 in paragraph (a) introductory text by removing the word ''configuration'' and adding in its place the word ''configuration(s)''.

§ 23.2165 [Amended]

■ 6. Amend § 23.2165 in paragraph (a)(1)(i) by removing the words ''knots CAS'' and adding in their place the word ''KCAS''.

§ 23.2200 [Amended]

■ 7. Amend § 23.2200 in paragraph (d) by removing the words ''high lift'' and adding in their place the words ''high-lift''.

§ 23.2255 [Amended]

■ 8. Amend § 23.2255 in paragraph (c) by removing the word ''aircraft'' and adding in its place the word ''airplane''.

§ 23.2315 [Amended]

■ 9. Amend § 23.2315 as follows:
■ a. In paragraph (a)(1), add a comma after the words ''level 2'';
■ b. In paragraph (a)(1), remove the words ''single engine'' and add in its place ''single-engine''; and
■ c. In paragraph (a)(2), add a comma after the first mention of the word ''exits''.

§ 23.2400 [Amended]

■ 10. Amend § 23.2400 in paragraph (b) by removing both instances of ''FAA'' and adding in their places the word ''Administrator''.

■ 11. Amend § 23.2440 by revising paragraph (c)(2) to read as follows:

§ 23.2440 Powerplant fire protection.

* * * * *

(c) * * *

(2) Be fire-resistant if carrying flammable fluid, gas or air, or is required to operate in the event of a fire; and

* * * * *

§ 23.2500 [Amended]

■ 12. Amend § 23.2500 in paragraph (b) by removing the phrase ''(a), considered separately and in relation to other systems, must'' and adding in its place the phrase ''(a) of this section—considered separately and in relation to other systems—must''.

§ 23.2520 [Amended]

■ 13. Amend § 23.2520 in paragraph (a) introductory text by removing the phrase ''systems that perform'' and adding in its place the phrase ''system that performs''.

§ 23.2600 [Amended]

■ 14. Amend § 23.2600 in paragraph (b) by removing the words ''qualified flightcrew'' and adding in their place the words ''flightcrew members''.

§ 23.2620 [Amended]

■ 15. Amend § 23.2620 in paragraph (b) introductory text by removing the word ''administrator'' and adding in its place the word ''Administrator''.

PART 25—AIRWORTHINESS STANDARDS: TRANSPORT CATEGORY AIRPLANES

■ 16. The authority citation for part 25 continues to read as follows:

Authority: 49 U.S.C. 106(f), 106(g), 40113, 44701, 44702 and 44704.

§ 25.471 [Amended]

■ 17. Amend § 25.471 in paragraph (b)(2) by removing the citation ''§ 25.1583(c)(1)'' and adding in its place the citation ''§ 25.1583(c)(2)''.

§ 25.525 [Amended]

■ 18. Amend § 25.525 in paragraph (b) by removing the citation ''§ 25.533(b)'' and adding in its place the citation ''§ 25.533(c)''.

§ 25.535 [Amended]

■ 19. Amend § 25.535 in paragraph (d) by removing the numbers ''3.25'' and adding in their place the numbers ''0.25''.

■ 20. Amend § 25.571 by revising the section heading to read as follows:

§ 25.571 Damage-tolerance and fatigue evaluation of structure.

* * * * *

§ 25.903 [Amended]

■ 21. Amend § 25.903 as follows:
■ a. In paragraph (a)(3)(ii), remove the date ''February 23, 1984'' and add in its place the date ''March 26, 1984''; and
■ b. In paragraph (a)(3)(iii), remove the date ''October 1, 1974''and add in its place the date ''October 31, 1974''.

§ 25.1517 [Amended]

■ 22. Amend § 25.1517 in paragraph (b) by removing ''V_{MO} - 35 KTAS'' and adding in its place ''V_{MO} minus 35 KTAS''.

PART 29—AIRWORTHINESS STANDARDS: TRANSPORT CATEGORY ROTOCRAFT

■ 23. The authority citation for part 29 continues to read as follows:

Authority: 49 U.S.C. 106(f), 106(g), 40113, 44701–44702, 44704.

§ 29.1557 [Amended]

■ 24. Amend § 29.1557 in paragraph (d) by removing the citation ''§ 29.811(h)(2)'' and adding in its place the citation ''§ 29.811(f)(2)''.

PART 33—AIRWORTHINESS STANDARDS: AIRCRAFT ENGINES

■ 25. The authority citation for part 33 continues to read as follows:

Authority: 49 U.S.C. 106(g), 40113, 44701, 44702, 44704.

§ 33.97 [Amended]

■ 26. Amend § 33.97 in paragraph (a) by adding a comma after the word ''endurance'' in the first sentence.

PART 36—NOISE STANDARDS: AIRCRAFT TYPE AND AIRWORTHINESS CERTIFICATION

■ 27. The authority citation for part 36 continues to read as follows:

Authority: 42 U.S.C. 4321 *et seq.;* 49 U.S.C. 106(g), 40113, 44701–44702, 44704, 44715; sec. 305, Pub. L. 96–193, 94 Stat. 50, 57; E.O. 11514, 35 FR 4247, 3 CFR, 1966–1970 Comp., p. 902.

§ 36.1 [Amended]

■ 28. Amend § 36.1 in paragraph (a)(4) by removing the word ''argicultural'' and adding in its place the word ''agricultural''.

PART 47—AIRCRAFT REGISTRATION

■ 29. The authority citation for part 47 continues to read as follows:

Authority: 4 U.S.T. 1830; Public Law 108–297, 118 Stat. 1095 (49 U.S.C. 40101 note, 49 U.S.C. 44101 note); 49 U.S.C. 106(f), 106(g), 40113–40114, 44101–44108, 44110–44113, 44703–44704, 44713, 45302, 45305, 46104, 46301.

■ 30. Amend § 47.9 by revising paragraph (b) to read as follows:

§ 47.9 Corporations not US citizens.

* * * * *

(b) For the purposes of registration, an aircraft is based and primarily used in the United States if the flight hours accumulated within the United States amount to at least 60 percent of the total flight hours of the aircraft during the period consisting in the remainder of the registration month and the succeeding 6 calendar months and each 6 calendar month period thereafter.

* * * * *

§ 47.19 [Amended]

■ 31. Amend § 47.19 by removing the phrase ''must be mailed to the Registry, Department of Transportation, Post Office Box 25504, Oklahoma City, Oklahoma 73125–0504, or delivered to the Registry at 6425 S. Denning Ave., Oklahoma City, Oklahoma 73169'' and adding in its place the phrase ''must be delivered to the Registry by a means acceptable to the Administrator''.

PART 49—RECORDING OF AIRCRAFT TITLES AND SECURITY DOCUMENTS

■ 32. The authority citation for part 49 continues to read as follows:

Authority: 4 U.S.T. 1830; Pub. L. 108–297, 118 Stat. 1095 (49 U.S.C. 40101 note, 49 U.S.C. 44101 note); 49 U.S.C. 106(g), 40113–40114, 44101–44108, 44110–44113, 44704, 44713, 45302, 46104, 46301.

§ 49.1 [Amended]

■ 33. Amend § 49.1 in paragraph (a)(2) by removing the number ''750'' and adding in their place the number ''550''.

§ 49.11 [Amended]

■ 34. Amend § 49.11 by removing the phrase ''must be mailed to the FAA Aircraft Registry, Department of Transportation, Post Office Box 25504, Oklahoma City, Oklahoma 73125–0504, or delivered to the Registry at 6425 S. Denning Ave., Oklahoma City, Oklahoma 73169'' and adding in its place the phrase ''must be delivered to the Registry by a means acceptable to the Administrator''.

§ 49.13 [Amended]

■ 35. Amend § 49.13 in paragraph (a) by removing the phrase ''must be in ink'' and adding in its place the phrase ''must be signed in a manner acceptable to the Administrator''.

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

■ 36. The authority citation for part 60 continues to read as follows:

Authority: 49 U.S.C. 106(f), 106(g), 40113, and 44701; Public Law 111–216, 124 Stat. 2348 (49 U.S.C. 44701 note).

§ 60.5, § 60.7, § 60.9, § 60.11, § 60.13, § 60.14, § 60.15, § 60.16, § 60.17, § 60.19, § 60.21, § 60.23, § 60.25, § 60.27, § 60.29, § 60.31, § 60.37 [Amended]

■ 37. Remove the word ''NSPM'' and add in its place the words ''responsible Flight Standards office'' wherever it appears in the following places:

■ a. § 60.5(c) and (d);
■ b. § 60.7(a)(2), (b)(3), (4), and (6), and (d)(2);
■ c. § 60.9(a), (b)(2), (c) introductory text, and (c)(3);
■ d. § 60.11(d);
■ e. § 60.13(a) and (c) through (f);
■ f. § 60.14;
■ g. § 60.15(a), (b)(1) through (3), (c)(1) introductory text, (c)(1)(i) and (ii), (f), (g) introductory text, (g)(6), (h), and (i);
■ h. § 60.16(a)(1)(i) through (iii), (a)(2)(i) and (ii), (b), and (c);
■ i. § 60.17(e) and (f);
■ j. § 60.19(b)(2) and (3);
■ k. § 60.21(a) introductory text, (b), and (c);
■ l. § 60.23(c)(1) introductory text and (c)(1)(i) through (iv);
■ m. § 60.25(b);
■ n. § 60.27(b)(1)(i) and (ii), (b)(2), and (c);
■ o. § 60.29(a) introductory text, (a)(1) through (3), (a)(4) introductory text, (a)(4)(i) and (ii), (b) introductory text, (b)(3), (c) introductory text, (c)(1) and (2), (d)(1) and (2), and (e);
■ p. § 60.31(b); and
■ q. § 60.37(a) introductory text.

§ 60.5 [Amended]

■ 38. Amend § 60.5 in paragraph (a) by removing the words ''National Simulator Program Manager (NSPM)'' and adding in their place the words ''responsible Flight Standards office''.

§ 60.19 [Amended]

■ 39. Amend § 60.19 as follows:
■ a. Amend paragraph (b)(4) by removing the first instance of the word ''NSPM'' and adding in its place the words ''the responsible Flight Standards office'';
■ b. Amend paragraph (b)(4) by removing the second instance of the word ''NSPM'' and adding in its place the words ''responsible Flight Standards office''; and
■ c. Amend paragraph (b)(6) by removing the words ''an NSPM'' and adding in its place the words ''a responsible Flight Standards office''.

■ 40. In appendix A to part 60:
■ a. In the introductory ''Begin Information'' text, remove the phrase ''NSPM, or a person assigned by the NSPM,'' and add in its place the words ''responsible Flight Standards office''.
■ b. In section 1:
■ i. Remove and reserve paragraph b;
■ ii. Remove the last sentence of paragraph c;
■ iii. In paragraph d.(12), add the words ''Flightcrew Member'' after ''as amended,''; and
■ iv. Revise paragraph d.(27).
■ c. In section 11:
■ i. In paragraph o. introductory text, remove the words ''an NSP pilot'' and add in its place the words, ''a pilot from the responsible Flight Standards office'' and remove the second instance of the word ''NSP'';

■ ii. In paragraph r.(1), remove the word ''NSP''; and
■ iii. In paragraph v., remove the phrase ''NSPM or visit the NSPM website'' and add in its place the words, ''responsible Flight Standards office''.
■ d. In attachment 1, revise table A1A;
■ e. In attachment 2:
■ i. Revise table A2A;
■ ii. In section 8, in the first instance of paragraph d., remove the word ''NSPM'' and add in its place the words ''the responsible Flight Standards office''; and
■ iii. In table A2E, revise the entries for 1.a.2, 2.a.1.a., 2.a.2.a., and 2.a.3.a.
■ f. In attachment 3:
■ i. In section 2, remove the last sentence of paragraph g; and
■ ii. Revise the table A3C introductory text.
■ g. In attachment 4, revise figures A4A, A4C, A4D, and A4E;
■ h. In attachment 6, FTSD Directive 2:
■ i. In the undesignated paragraph following summary paragraph (e), remove the words ''National Simulator Program Manager (NSPM)'' and add in their place the words ''responsible Flight Standards office''.
■ ii. Remove the phrase ''For Further Information Contact'' paragraph before the heading ''Specific Requirements'';
■ iii. In section I, paragraph 5 introductory text, remove the word ''NSP's'';
■ iv. In section II, paragraph 5 introductory text, remove the word ''NSP's'';
■ v. In section III, paragraph 5 introductory text, remove the word ''NSP's'';
■ vi. In section IV, paragraph 4 introductory text, remove the word ''NSP's''; and
■ vii. In section V, paragraph 4 introductory text, remove the word ''NSP's''.
■ i. Remove the word ''NSPM'' and adding in its place the words ''responsible Flight Standards office'' in the following places:
■ i. Section 1, paragraph c, the first two instances;
■ ii. Section 9, paragraphs d., d.(1), d.(2), g., h., and i.;
■ iii. Section 10, paragraph a.;
■ iv. Section 11, paragraphs b.(2), b.(3), d., f., g.(1), h., j. k., l., m., n., n.(2), o., p. q., r.(2), s., t., and w.;
■ v. Section 13, paragraphs a.(1), a.(3), a.(4), a.(5), d., and i.;
■ vi. Section 14, paragraphs a., d., e., and e.(1);
■ vii. Section 17, paragraphs b.(1) and b.(2);
■ viii. Sections 19 and 20;
■ ix. Attachment 2, section 2, paragraphs a., h., j., k., and l.;
■ x. Attachment 2, section 4, the second instance in paragraph b.(1);
■ xi. Attachment 2, section 5, paragraph b.;
■ xii. Attachment 2, section 8, paragraphs b., c., the second instance of d., f., and g.;
■ xiii. Attachment 2, section 9, paragraphs a., b. introductory text, b.(2), and c.(2)(i);
■ xiv. Attachment 2, section 12, paragraph a.;
■ xv. Attachment 2, section 13, paragraph b.(6);
■ xvi. Attachment 2, section 14, paragraph b.(4)(d);
■ xvii. Attachment 2, section 16, paragraphs a.(2) and b.(2);
■ xviii. Attachment 2, section 17, paragraphs c., d.(2), e., and f.;
■ xix. Attachment 3, section 1, paragraphs f., and g.;
■ xx. Attachment 3, section 2, paragraphs, b., and f.;
■ xxi. Attachment 5, section 7, paragraph a;
■ xxii. Attachment 5, section 8, introductory text and paragraph c.;
■ xxiii. Attachment 6, FSTD Directive 2, section I, paragraphs 5 and 6;
■ xxiv. Attachment 6, FSTD Directive 2, section II, paragraphs 3, 5, and 6;
■ xxv. Attachment 6, FSTD Directive 2, section III, paragraphs 3, 5, and 6;
■ xxvi. Attachment 6, FSTD Directive 2, section IV, paragraphs 4 and 5; and
■ xxii. Attachment 6, FSTD Directive 2, section V, paragraphs 4 and 5;
■ i. Remove the word ''NSPM'', and add in its place the words ''Flight Standards Service'' in the following places:
■ i. The introductory ''Begin Information'' text; and
■ ii. The first instance in attachment 2, section 4, paragraph b.(1).
■ j. Remove the word ''NSP'' from the following places:
■ i. Section 14, paragraph g.; and
■ ii. Attachment 3, paragraph 2.d.

The revisions read as follows:

Appendix A to Part 60—Qualification Performance Standards for Airplane Full Flight Simulators

* * * * *

1. Introduction

(d) * * *

(27) FAA Airman Certification Standards and Practical Test Standards for Airline Transport Pilot, Type Ratings, Commercial Pilot, and Instrument Ratings

* * * * *

Attachment 1 * * *

Table A1A – Minimum Simulator Requirements

QPS REQUIREMENTS						INFORMATION
Entry Number	General Simulator Requirements	Simulator Levels				Notes
		A	B	C	D	
1. General Flight Deck Configuration.						
1.a.	The simulator must have a flight deck that is a replica of the airplane simulated with controls, equipment, observable flight deck indicators, circuit breakers, and bulkheads properly located, functionally accurate and replicating the airplane. The direction of movement of controls and switches must be identical to the airplane. Pilot seats must allow the occupant to achieve the design "eye position" established for the airplane being simulated. Equipment for the operation of the flight deck windows must be included, but the actual windows need not be operable. Additional equipment such as fire axes, extinguishers, and spare light bulbs must be available in the FFS but may be relocated to a suitable location as near as practical to the original position. Fire axes, landing gear pins, and any similar purpose instruments need only be represented in silhouette. The use of electronically displayed images with physical overlay or masking for simulator instruments and/or instrument panels is acceptable provided: (1) All instruments and instrument panel layouts are dimensionally correct with differences, if any, being imperceptible to the pilot; (2) Instruments replicate those of the airplane including full instrument functionality and embedded logic; (3) Instruments displayed are free of quantization (stepping); (4) Instrument display characteristics replicate those of the airplane including: resolution, colors, luminance, brightness, fonts, fill patterns, line styles and symbology; (5) Overlay or masking, including bezels and bugs, as applicable, replicates the airplane panel(s); (6) Instrument controls and switches replicate and operate with the same technique, effort, travel and in the same direction as those in the airplane;	X	X	X	X	For simulator purposes, the flight deck consists of all that space forward of a cross section of the flight deck at the most extreme aft setting of the pilots' seats, including additional required crewmember duty stations and those required bulkheads aft of the pilot seats. For clarification, bulkheads containing only items such as landing gear pin storage compartments, fire axes and extinguishers, spare light bulbs, and aircraft document pouches are not considered essential and may be omitted.

	(7) Instrument lighting replicates that of the airplane and is operated from the FSTD control for that lighting and, if applicable, is at a level commensurate with other lighting operated by that same control; and (8) As applicable, instruments must have faceplates that replicate those in the airplane; and Level C and Level D only; (1) The display image of any three dimensional instrument, such as an electro-mechanical instrument, should appear to have the same three dimensional depth as the replicated instrument. The appearance of the simulated instrument, when viewed from the principle operator's angle, should replicate that of the actual airplane instrument. Any instrument reading inaccuracy due to viewing angle and parallax present in the actual airplane instrument should be duplicated in the simulated instrument display image. Viewing angle error and parallax must be minimized on shared instruments such and engine displays and standby indicators.			X	X	
1.b.	Those circuit breakers that affect procedures or result in observable flight deck indications must be properly located and functionally accurate.	**X**	**X**	**X**	**X**	
2. Programming.						
2.a.	A flight dynamics model that accounts for various combinations of drag and thrust normally encountered in flight must correspond to actual flight conditions, including the effect of change in airplane attitude, thrust, drag, altitude, temperature, gross weight, moments of inertia, center of gravity location, and configuration. An SOC is required. For Level C and Level D simulators, the effects of pitch attitude and of fuel slosh on the aircraft center of gravity must be simulated.	**X**	**X**	**X** **X**	**X** **X**	The SOC should include a range of tabulated target values to enable a demonstration of the mass properties model to be conducted from the instructor's station. The data at a minimum should contain 3 weight conditions including zero fuel weight and maximum taxi weight with a least 2 different combinations of zero fuel weight, fuel weight and payload for each condition.
2.b.	The simulator must have the computer capacity, accuracy, resolution, and dynamic response needed to meet the qualification level sought. An SOC is required.	**X**	**X**	**X**	**X**	

2.c.	Surface operations must be represented to the extent that allows turns within the confines of the runway and adequate controls on the landing and roll-out from a crosswind approach to a landing.	**X**				
2.d.	Ground handling and aerodynamic programming must include the following:					
2.d.1.	Ground effect.		**X**	**X**	**X**	Ground effect includes modeling that accounts for roundout, flare, touchdown, lift, drag, pitching moment, trim, and power while in ground effect.
2.d.2.	Ground reaction. Ground reaction modeling must produce the appropriate effects during bounced or skipped landings, including the effects and indications of ground contact due to landing in an abnormal aircraft attitude (e.g. tailstrike or nosewheel contact). An SOC is required.		**X**	**X**	**X**	Ground reaction includes modeling that accounts for strut deflections, tire friction, and side forces. This is the reaction of the airplane upon contact with the runway during landing, and may differ with changes in factors such as gross weight, airspeed, or rate of descent on touchdown.
2.d.3.	Ground handling characteristics, including aerodynamic and ground reaction modeling including steering inputs, operations with crosswind, braking, thrust reversing, deceleration, and turning radius. Aerodynamic and ground reaction modeling to support training in crosswinds and gusting crosswinds up to the aircraft's maximum demonstrated crosswind component. Realistic gusting crosswind profiles must be available to the instructors that have been tuned in intensity and variation to require pilot intervention to avoid runway departure during takeoff or landing roll. An SOC is required describing source data used to construct gusting crosswind profiles.		**X**	**X** **X**	**X** **X**	In developing gust models for use in training, the FSTD sponsor should coordinate with the data provider to ensure that the gust models do not exceed the capabilities of the aerodynamic and ground models.
2.e.	If the aircraft being simulated is one of the aircraft listed in § 121.358, Low-altitude windshear system equipment requirements, the simulator must employ windshear models that provide training for recognition of windshear			**X**	**X**	If desired, Level A and B simulators may qualify for windshear training by meeting these standards; see

	phenomena and the execution of recovery procedures. Models must be available to the instructor/evaluator for the following critical phases of flight: (1) Prior to takeoff rotation; (2) At liftoff; (3) During initial climb; and (4) On final approach, below 500 ft AGL. The QTG must reference the FAA Windshear Training Aid or present alternate airplane related data, including the implementation method(s) used. If the alternate method is selected, wind models from the Royal Aerospace Establishment (RAE), the Joint Airport Weather Studies (JAWS) Project and other recognized sources may be implemented, but must be supported and properly referenced in the QTG. Only those simulators meeting these requirements may be used to satisfy the training requirements of part 121 pertaining to a certificate holder's approved low-altitude windshear flight training program as described in § 121.409. The addition of realistic levels of turbulence associated with each required windshear profile must be available and selectable to the instructor. In addition to the four basic windshear models required for qualification, at least two additional "complex" windshear models must be available to the instructor which represent the complexity of actual windshear encounters. These models must be available in the takeoff and landing configurations and must consist of independent variable winds in multiple simultaneous components. The Windshear Training Aid provides two such example "complex" windshear models that may be used to satisfy this requirement.					Attachment 5 of this appendix. Windshear models may consist of independent variable winds in multiple simultaneous components. The FAA Windshear Training Aid presents one acceptable means of compliance with simulator wind model requirements. The simulator should employ a method to ensure the required survivable and non-survivable windshear scenarios are repeatable in the training environment.
2.f.	The simulator must provide for manual and automatic testing of simulator hardware and software programming to determine compliance with simulator objective tests as prescribed in Attachment 2 of this appendix. An SOC is required.			**X**	**X**	Automatic "flagging" of out-of-tolerance situations is encouraged.
2.g.	Relative responses of the motion system, visual system, and flight deck instruments, measured by latency tests or transport delay tests. Motion onset should occur before the start of the visual scene change (the start of the scan of the first video field containing different information) but must occur before the end of the scan of that video field. Instrument response may not occur prior to motion onset. Test results must be within the following limits:					The intent is to verify that the simulator provides instrument, motion, and visual cues that are, within the stated time delays, like the airplane responses. For airplane

						response, acceleration in the appropriate, corresponding rotational axis is preferred.
2.g.1.	300 milliseconds of the airplane response.	X	X			
2.g.2.	100 milliseconds of the airplane response (motion and instrument cues) 120 milliseconds of the airplane response (visual system cues)			X	X	
2.h.	The simulator must accurately reproduce the following runway conditions: (1) Dry; (2) Wet; (3) Icy; (4) Patchy Wet; (5) Patchy Icy; and (6) Wet on Rubber Residue in Touchdown Zone. An SOC is required.			X	X	
2.i.	The simulator must simulate: (1) brake and tire failure dynamics, including antiskid failure; and (2) decreased brake efficiency due to high brake temperatures, if applicable. An SOC is required.			X	X	Simulator pitch, side loading, and directional control characteristics should be representative of the airplane.
2.j.	Engine and Airframe Icing Modeling that includes the effects of icing, where appropriate, on the airframe, aerodynamics, and the engine(s). 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 autoflight system) must respond properly to ice accretion consistent with the simulated aircraft. Aircraft OEM 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.			X	X	SOC should be provided describing the effects which provide training in the specific skills required for recognition of icing phenomena and execution of recovery. The SOC should describe the source data and any analytical methods used to develop ice accretion models including verification that these effects have been tested. Icing effects simulation models are only required for those

	SOC and tests required. See objective testing requirements (Attachment 2, test 2.i.).					airplanes authorized for operations in icing conditions. See Attachment 7 of this Appendix for further guidance material.
2.k.	The aerodynamic modeling in the simulator must include: (1) Low-altitude level-flight ground effect; (2) Mach effect at high altitude; (3) Normal and reverse dynamic thrust effect on control surfaces; (4) Aeroelastic representations; and (5) Nonlinearities due to sideslip. An SOC is required and must include references to computations of aeroelastic representations and of nonlinearities due to sideslip.				**X**	See Attachment 2 of this appendix, paragraph 5, for further information on ground effect.
2.l.	The simulator must have aerodynamic and ground reaction modeling for the effects of reverse thrust on directional control, if applicable. An SOC is required.		**X**	**X**	**X**	
2.m.	High Angle of Attack Modeling Aerodynamic stall modeling that includes degradation in static/dynamic lateral-directional stability, degradation in control response (pitch, roll, and yaw), uncommanded roll response or roll-off requiring significant control deflection to counter, apparent randomness or non-repeatability, changes in pitch stability, Mach effects, and stall buffet, as appropriate to the aircraft type. The aerodynamic model must incorporate an angle of attack and sideslip range to support the training tasks. At a minimum, the model must support an angle of attack range to ten degrees beyond the stall identification angle of attack. The stall identification angle of attack is defined as the point where the behavior of the airplane gives the pilot a clear and distinctive indication through the inherent flight characteristics or the characteristics resulting from the operation of a stall identification device (e.g., a stick pusher) that the airplane has stalled.			**X**	**X**	The requirements in this section only apply to those FSTDs that are qualified for full stall training tasks. Sponsors may elect to not qualify an FSTD for full stall training tasks; however, the FSTD's qualification will be restricted to approach to stall training tasks that terminate at the activation of the stall warning system. Specific guidance should be available to the instructor which clearly communicates the flight configurations and stall maneuvers that have been

	The model must be capable of capturing the variations seen in the stall characteristics of the airplane (e.g., the presence or absence of a pitch break, deterrent buffet, or other indications of a stall where present on the aircraft). The aerodynamic modeling must support stall training maneuvers in the following flight conditions: (1) Stall entry at wings level (1g); (2) Stall entry in turning flight of at least 25° bank angle (accelerated stall); (3) Stall entry in a power-on condition (required only for propeller driven aircraft); and (4) Aircraft configurations of second segment climb, high altitude cruise (near performance limited condition), and approach or landing. A Statement of Compliance (SOC) is required which describes the aerodynamic modeling methods, validation, and checkout of the stall characteristics of the FSTD. The SOC must also include verification that the FSTD has been evaluated by a subject matter expert pilot acceptable to the FAA. See Attachment 7 of this Appendix for detailed requirements. Where known limitations exist in the aerodynamic model for particular stall maneuvers (such as aircraft configurations and stall entry methods), these limitations must be declared in the required SOC. FSTDs qualified for full stall training tasks must also meet the instructor operating station (IOS) requirements for upset prevention and recovery training (UPRT) tasks as described in section 2.n. of this table. See Attachment 7 of this Appendix for additional requirements.					evaluated in the FSTD for use in training. See Attachment 7 of this Appendix for additional guidance material.
2.n.	Upset Prevention and Recovery Training (UPRT). Aerodynamics Evaluation: The simulator must be evaluated for specific upset recovery maneuvers for the purpose of determining that the combination of angle of attack and sideslip does not exceed the range of flight test validated data or wind tunnel/analytical data while performing the recovery maneuver. The following minimum set of required upset recovery maneuvers must be evaluated in this manner and made available to the instructor/evaluator. Other upset recovery scenarios as developed by the FSTD sponsor must be evaluated in the same manner:			**X**	**X**	This section generally applies to the qualification of airplane upset recovery training maneuvers or unusual attitude training maneuvers that exceed one or more of the following conditions: ▪ Pitch attitude greater than 25 degrees, nose up

	(1) A nose-high, wings level aircraft upset; (2) A nose-low aircraft upset; and (3) A high bank angle aircraft upset. Upset Scenarios: IOS selectable dynamic airplane upsets must provide guidance to the instructor concerning the method used to drive the FSTD into an upset condition, including any malfunction or degradation in the FSTD's functionality required to initiate the upset. The unrealistic degradation of simulator functionality (such as degrading flight control effectiveness) to drive an airplane upset is generally not acceptable unless used purely as a tool for repositioning the FSTD with the pilot out of the loop. Instructor Operating System (IOS): The simulator must have a feedback mechanism in place to notify the instructor/evaluator when the simulator's validated aerodynamic envelope and aircraft operating limits have been exceeded during an upset recovery training task. This feedback mechanism must include: (1) FSTD validation envelope. This must be in the form of an alpha/beta envelope (or equivalent method) depicting the "confidence level" of the aerodynamic model depending on the degree of flight validation or source of predictive methods The envelopes must provide the instructor real-time feedback on the simulation during a maneuver. There must be a minimum of a flaps up and flaps down envelope available; (2) Flight control inputs. This must enable the instructor to assess the pilot's flight control displacements and forces (including fly-by-wire as appropriate); and (3) Airplane operational limits. This must display the aircraft operating limits during the maneuver as applicable for the configuration of the airplane. Statement of Compliance (SOC): An SOC is required that defines the source data used to construct the FSTD validation envelope. The SOC must also verify that each upset prevention and recovery feature programmed at the instructor station and the associated training maneuver has been evaluated by a suitably qualified pilot using methods described in this section. The statement must confirm that the recovery maneuver can be performed such					▪ Pitch attitude greater than 10 degrees, nose down ▪ Bank angle greater than 45 degrees ▪ Flight at airspeeds inappropriate for conditions. FSTDs used to conduct upset recovery maneuvers at angles of attack above the stall warning system activation must meet the requirements for high angle of attack modeling as described in section 2.m. Special consideration should be given to the motion system response during upset prevention and recovery maneuvers. Notwithstanding the limitations of simulator motion, specific emphasis should be placed on tuning out motion system responses. Consideration should be taken with flight envelope protected airplanes as artificially positioning the airplane to a specified attitude may incorrectly initialize flight control laws. See Attachment 7 of this Appendix for further guidance material.

	that the FSTD does not exceed the FSTD validation envelope, or when exceeded, that it is within the realm of confidence in the simulation accuracy.					
3. Equipment Operation.						
3.a.	All relevant instrument indications involved in the simulation of the airplane must automatically respond to control movement or external disturbances to the simulated airplane; e.g., turbulence or windshear. Numerical values must be presented in the appropriate units. For Level C and Level D simulators, instrument indications must also respond to effects resulting from icing.	**X**	**X**	**X**	**X**	
3.b.	Communications, navigation, caution, and warning equipment must be installed and operate within the tolerances applicable for the airplane. Instructor control of internal and external navigational aids. Navigation aids must be usable within range or line-of-sight without restriction, as applicable to the geographic area.	**X**	**X**	**X**	**X**	See Attachment 3 of this appendix for further information regarding long-range navigation equipment.
3.b.1.	Complete navigation database for at least 3 airports with corresponding precision and non-precision approach procedures, including navigational database updates.			**X**	**X**	
3.b.2.	Complete navigation database for at least 1 airport with corresponding precision and non-precision approach procedures, including navigational database updates.	**X**	**X**			
3.c.	Simulated airplane systems must operate as the airplane systems operate under normal, abnormal, and emergency operating conditions on the ground and in flight. Once activated, proper systems operation must result from system management by the crew member and not require any further input from the instructor's controls.	**X**	**X**	**X**	**X**	Airplane system operation should be predicated on, and traceable to, the system data supplied by the airplane manufacturer, original equipment manufacturer or alternative approved data for the airplane system or component. At a minimum, alternate approved data should validate the operation of all normal, abnormal, and emergency operating procedures and

						training tasks the FSTD is qualified to conduct.
3.d.	The simulator must provide pilot controls with control forces and control travel that correspond to the simulated airplane. The simulator must also react in the same manner as in the airplane under the same flight conditions. Control systems must replicate airplane operation for the normal and any non-normal modes including back-up systems and should reflect failures of associated systems. Appropriate cockpit indications and messages must be replicated.	**X**	**X**	**X**	**X**	
3.e.	Simulator control feel dynamics must replicate the airplane. This must be determined by comparing a recording of the control feel dynamics of the simulator to airplane measurements. For initial and upgrade qualification evaluations, the control dynamic characteristics must be measured and recorded directly from the flight deck controls, and must be accomplished in takeoff, cruise, and landing flight conditions and configurations.			**X**	**X**	
3.f.	For aircraft equipped with a stick pusher system, control forces, displacement, and surface position must correspond to that of the airplane being simulated. A Statement of Compliance (SOC) is required verifying that the stick pusher system has been modeled, programmed, and validated using the aircraft manufacturer's design data or other acceptable data source. The SOC must address, at a minimum, stick pusher activation and cancellation logic as well as system dynamics, control displacement and forces as a result of the stick pusher activation. Tests required.			**X**	**X**	See Appendix A, Table A2A, test 2.a.10 (stick pusher system force calibration) for objective testing requirements. The requirements in this section only apply to those FSTDs that are qualified for full stall training tasks.
4. Instructor or Evaluator Facilities.						
4.a.	In addition to the flight crewmember stations, the simulator must have at least two suitable seats for the instructor/check airman and FAA inspector. These seats must provide adequate vision to the pilot's panel and forward windows. All seats other than flight crew seats need not represent those found in the airplane, but must be adequately secured to the floor and equipped with similar positive restraint devices.	**X**	**X**	**X**	**X**	The responsible Flight Standards office will consider alternatives to this standard for additional seats based on unique flight deck configurations.
4.b.	The simulator must have controls that enable the instructor/evaluator to control all required system variables and insert all abnormal or emergency conditions into the simulated airplane systems as described in the sponsor's	**X**	**X**	**X**	**X**	

	FAA-approved training program; or as described in the relevant operating manual as appropriate.					
4.c.	The simulator must have instructor controls for all environmental effects expected to be available at the IOS; e.g., clouds, visibility, icing, precipitation, temperature, storm cells and microbursts, turbulence, and intermediate and high altitude wind speed and direction.	**X**	**X**	**X**	**X**	
4.d.	The simulator must provide the instructor or evaluator the ability to present ground and air hazards.			**X**	**X**	For example, another airplane crossing the active runway or converging airborne traffic.
5. Motion System.						
5.a.	The simulator must have motion (force) cues perceptible to the pilot that are representative of the motion in an airplane.	**X**	**X**	**X**	**X**	For example, touchdown cues should be a function of the rate of descent (RoD) of the simulated airplane.
5.b.	The simulator must have a motion (force cueing) system with a minimum of three degrees of freedom (at least pitch, roll, and heave). An SOC is required.	**X**	**X**			
5.c.	The simulator must have a motion (force cueing) system that produces cues at least equivalent to those of a six-degrees-of-freedom, synergistic platform motion system (i.e., pitch, roll, yaw, heave, sway, and surge). An SOC is required.			**X**	**X**	
5.d.	The simulator must provide for the recording of the motion system response time. An SOC is required.	**X**	**X**	**X**	**X**	
5.e.	The simulator must provide motion effects programming to include:					
5.e.1.	(1) Thrust effect with brakes set; (2) Runway rumble, oleo deflections, effects of ground speed, uneven runway, centerline lights, and taxiway characteristics; (3) Buffets on the ground due to spoiler/speedbrake extension and thrust reversal; (4) Bumps associated with the landing gear; (5) Buffet during extension and retraction of landing gear; (6) Buffet in the air due to flap and spoiler/speedbrake extension; (7) Approach-to-stall buffet and stall buffet (where applicable);		**X**	**X**	**X**	If there are known flight conditions where buffet is the first indication of the stall, or where no stall buffet occurs, this characteristic should be included in the model.

	(8) Representative touchdown cues for main and nose gear; (9) Nosewheel scuffing, if applicable; (10) Mach and maneuver buffet; (11) Engine failures, malfunctions, and engine damage (12) Tail and pod strike;					
5.e.2.	(13) Taxiing effects such as lateral and directional cues resulting from steering and braking inputs; (14) Buffet due to atmospheric disturbances (e.g. buffets due to turbulence, gusting winds, storm cells, windshear, etc.) in three linear axes (isotropic); (15) Tire failure dynamics; and (16) Other significant vibrations, buffets and bumps that are not mentioned above (e.g. RAT), or checklist items such as motion effects due to pre-flight flight control inputs.			**X**	**X**	
5.f.	The simulator must provide characteristic motion vibrations that result from operation of the airplane if the vibration marks an event or airplane state that can be sensed in the flight deck.				**X**	The simulator should be programmed and instrumented in such a manner that the characteristic buffet modes can be measured and compared to airplane data.
6. Visual System.						
6.a.	The simulator must have a visual system providing an out-of-the-flight deck view.	**X**	**X**	**X**	**X**	
6.b.	The simulator must provide a continuous collimated field-of-view of at least 45° horizontally and 30° vertically per pilot seat or the number of degrees necessary to meet the visual ground segment requirement, whichever is greater. Both pilot seat visual systems must be operable simultaneously. The minimum horizontal field-of-view coverage must be plus and minus one-half (½) of the minimum continuous field-of-view requirement, centered on the zero degree azimuth line relative to the aircraft fuselage. An SOC is required and must explain the system geometry measurements including system linearity and field-of-view.	**X**	**X**			Additional field-of-view capability may be added at the sponsor's discretion provided the minimum fields of view are retained.
6.c.	(Reserved)					
6.d.	The simulator must provide a continuous collimated visual field-of-view of at least176° horizontally and 36° vertically or the number of degrees necessary to meet the visual ground segment requirement, whichever is greater. The minimum horizontal field-of-view coverage must be plus and minus one-half			**X**	**X**	The horizontal field-of-view is traditionally described as a 180° field-of-view. However, the field-of-view is technically

	(½) of the minimum continuous field-of-view requirement, centered on the zero degree azimuth line relative to the aircraft fuselage. An SOC is required and must explain the system geometry measurements including system linearity and field-of-view.					no less than 176°. Additional field-of-view capability may be added at the sponsor's discretion provided the minimum fields of view are retained.
6.e.	The visual system must be free from optical discontinuities and artifacts that create non-realistic cues.	**X**	**X**	**X**	**X**	Non-realistic cues might include image "swimming" and image "roll-off," that may lead a pilot to make incorrect assessments of speed, acceleration, or situational awareness.
6.f.	The simulator must have operational landing lights for night scenes. Where used, dusk (or twilight) scenes require operational landing lights.	**X**	**X**	**X**	**X**	
6.g.	The simulator must have instructor controls for the following: (1) Visibility in statute miles (km) and runway visual range (RVR) in ft.(m); (2) Airport selection; and (3) Airport lighting.	**X**	**X**	**X**	**X**	
6.h.	The simulator must provide visual system compatibility with dynamic response programming.	**X**	**X**	**X**	**X**	
6.i.	The simulator must show that the segment of the ground visible from the simulator flight deck is the same as from the airplane flight deck (within established tolerances) when at the correct airspeed, in the landing configuration, at the appropriate height above the touchdown zone, and with appropriate visibility.	**X**	**X**	**X**	**X**	This will show the modeling accuracy of RVR, glideslope, and localizer for a given weight, configuration, and speed within the airplane's operational envelope for a normal approach and landing.
6.j.	The simulator must provide visual cues necessary to assess sink rates (provide depth perception) during takeoffs and landings, to include: (1) Surface on runways, taxiways, and ramps; and (2) Terrain features.		**X**	**X**	**X**	
6.k.	The simulator must provide for accurate portrayal of the visual environment relating to the simulator attitude.	**X**	**X**	**X**	**X**	Visual attitude vs. simulator attitude is a comparison of pitch and roll of the horizon as displayed in the visual scene

						compared to the display on the attitude indicator.
6.l.	The simulator must provide for quick confirmation of visual system color, RVR, focus, and intensity. An SOC is required.			**X**	**X**	
6.m.	The simulator must be capable of producing at least 10 levels of occulting.			**X**	**X**	
6.n.	Night Visual Scenes. When used in training, testing, or checking activities, the simulator must provide night visual scenes with sufficient scene content to recognize the airport, the terrain, and major landmarks around the airport. The scene content must allow a pilot to successfully accomplish a visual landing. Scenes must include a definable horizon and typical terrain characteristics such as fields, roads and bodies of water and surfaces illuminated by airplane landing lights.	**X**	**X**	**X**	**X**	
6.o.	Dusk (or Twilight) Visual Scenes. When used in training, testing, or checking activities, the simulator must provide dusk (or twilight) visual scenes with sufficient scene content to recognize the airport, the terrain, and major landmarks around the airport. The scene content must allow a pilot to successfully accomplish a visual landing. Dusk (or twilight) scenes, as a minimum, must provide full color presentations of reduced ambient intensity, sufficient surfaces with appropriate textural cues that include self-illuminated objects such as road networks, ramp lighting and airport signage, to conduct a visual approach, landing and airport movement (taxi). Scenes must include a definable horizon and typical terrain characteristics such as fields, roads and bodies of water and surfaces illuminated by airplane landing lights. If provided, directional horizon lighting must have correct orientation and be consistent with surface shading effects. Total night or dusk (twilight) scene content must be comparable in detail to that produced by 10,000 visible textured surfaces and 15,000 visible lights with sufficient system capacity to display 16 simultaneously moving objects. An SOC is required.			**X**	**X**	
6.p.	Daylight Visual Scenes. The simulator must provide daylight visual scenes with sufficient scene content to recognize the airport, the terrain, and major landmarks around the airport. The scene content must allow a pilot to successfully accomplish a visual landing. Any ambient lighting must not "washout" the displayed visual scene. Total daylight scene content must be			**X**	**X**	

	comparable in detail to that produced by 10,000 visible textured surfaces and 6,000 visible lights with sufficient system capacity to display 16 simultaneously moving objects. The visual display must be free of apparent and distracting quantization and other distracting visual effects while the simulator is in motion. An SOC is required.					
6.q.	The simulator must provide operational visual scenes that portray physical relationships known to cause landing illusions to pilots.			**X**	**X**	For example: short runways, landing approaches over water, uphill or downhill runways, rising terrain on the approach path, unique topographic features.
6.r.	The simulator must provide special weather representations of light, medium, and heavy precipitation near a thunderstorm on takeoff and during approach and landing. Representations need only be presented at and below an altitude of 2,000 ft. (610 m) above the airport surface and within 10 miles (16 km) of the airport.			**X**	**X**	
6.s.	The simulator must present visual scenes of wet and snow-covered runways, including runway lighting reflections for wet conditions, partially obscured lights for snow conditions, or suitable alternative effects.			**X**	**X**	
6.t.	The simulator must present realistic color and directionality of all airport lighting.			**X**	**X**	
6.u.	The following weather effects as observed on the visual system must be simulated and respective instructor controls provided. (1) Multiple cloud layers with adjustable bases, tops, sky coverage and scud effect; (2) Storm cells activation and/or deactivation; (3) Visibility and runway visual range (RVR), including fog and patchy fog effect; (4) Effects on ownship external lighting; (5) Effects on airport lighting (including variable intensity and fog effects); (6) Surface contaminants (including wind blowing effect); (7) Variable precipitation effects (rain, hail, snow); (8) In-cloud airspeed effect; and (9) Gradual visibility changes entering and breaking out of cloud.			**X**	**X**	Scud effects are low, detached, and irregular clouds below a defined cloud layer. Atmospheric model should support representative effects of wake turbulence and mountain waves as needed to enhance UPRT training. The mountain wave model should support the atmospheric climb, descent, and roll rates which can be encountered in

						mountain wave and rotor conditions.
6.v.	The simulator must provide visual effects for: (1) Light poles; (2) Raised edge lights as appropriate; and (3) Glow associated with approach lights in low visibility before physical lights are seen,			**X**	**X**	Visual effects for light poles and raised edge lights are for the purpose of providing additional depth perception during takeoff, landing, and taxi training tasks. Three dimensional modeling of the actual poles and stanchions is not required.
7. Sound System.						
7.a.	The simulator must provide flight deck sounds that result from pilot actions that correspond to those that occur in the airplane.	**X**	**X**	**X**	**X**	
7.b.	The volume control must have an indication of sound level setting which meets all qualification requirements.	**X**	**X**	**X**	**X**	For Level D simulators, this indication should be readily available to the instructor on or about the IOS and is the sound level setting required to meet the objective testing requirements as described in Table A2A of this Appendix. For all other simulator levels, this indication is the sound level setting as evaluated during the simulator's initial evaluation.
7.c.	The simulator must accurately simulate the sound of precipitation, windshield wipers, and other significant airplane noises perceptible to the pilot during normal and abnormal operations, and include the sound of a crash (when the simulator is landed in an unusual attitude or in excess of the structural gear limitations); normal engine and thrust reversal sounds; and the sounds of flap, gear, and spoiler extension and retraction. Sounds must be directionally representative.			**X**	**X**	For simulators qualified for full stall training tasks, sounds associated with stall buffet should be replicated if significant in the airplane.

* * * * *

	A SOC is required.					
7.d.	The simulator must provide realistic amplitude and frequency of flight deck noises and sounds. Simulator performance must be recorded, compared to amplitude and frequency of the same sounds recorded in the airplane, and be made a part of the QTG.				**X**	

Attachment 2 * * *

Table A2A - Full Flight Simulator (FFS) Objective Tests

QPS REQUIREMENTS									INFORMATION
Test		Tolerance	Flight Conditions	Test Details	Simulator Level				Notes
Entry Number	Title				A	B	C	D	
1. Performance.									
1.a.	**Taxi.**								
1.a.1	Minimum radius turn.	±0.9 m (3 ft) or ±20% of airplane turn radius.	Ground.	Plot both main and nose gear loci and key engine parameter(s). Data for no brakes and the minimum thrust required to maintain a steady turn except for airplanes requiring asymmetric thrust or braking to achieve the minimum radius turn.		X	X	X	
1.a.2	Rate of turn versus nosewheel steering angle (NWA).	±10% or ±2°/s of turn rate.	Ground.	Record for a minimum of two speeds, greater than minimum turning radius speed with one at a typical taxi speed, and with a spread of at least 5 kt.		X	X	X	
1.b.	**Takeoff.**			*Note.— All airplane manufacturer commonly-used certificated take-off flap settings must be demonstrated at least once either in minimum unstick speed (1.b.3), normal take-off (1.b.4), critical engine failure on take-off (1.b.5) or crosswind take-off (1.b.6).*					
1.b.1	Ground acceleration time and distance.	±1.5 s or ±5% of time; and ±61 m (200 ft) or ±5% of distance.	Takeoff.	Acceleration time and distance must be recorded for a minimum of 80% of the total time from brake release to V_r. Preliminary aircraft certification data may be used.	X	X	X	X	May be combined with normal takeoff (1.b.4.) or rejected takeoff (1.b.7.). Plotted data should be shown using appropriate scales for each portion of the maneuver.
1.b.2	Minimum control speed, ground (V_{mcg}) using aerodynamic controls only per applicable airworthiness requirement or alternative engine inoperative test to demonstrate ground control characteristics.	±25% of maximum airplane lateral deviation reached or ±1.5 m (5 ft). For airplanes with reversible flight control systems: ±2.2 daN (5 lbf) or ±10% of rudder pedal force.	Takeoff.	Engine failure speed must be within ±1 kt of airplane engine failure speed. Engine thrust decay must be that resulting from the mathematical model for the engine applicable to the FSTD under test. If the modeled engine is not the same as the airplane manufacturer's flight test engine, a further test may be run with the same initial conditions using the thrust from the flight test data as the driving parameter.	X	X	X	X	If a V_{mcg} test is not available, an acceptable alternative is a flight test snap engine deceleration to idle at a speed between V_1 and V_1-10 kt, followed by control of heading using aerodynamic control only and recovery should be achieved with the main gear on the ground. To ensure only aerodynamic control, nosewheel steering should be disabled (i.e. castored) or the nosewheel held slightly off the ground.

1.b.3	Minimum unstick speed (V_{mu}) or equivalent test to demonstrate early rotation take-off characteristics.	±3 kt airspeed. ±1.5° pitch angle.	Takeoff.	Record time history data from 10 knots before start of rotation until at least 5 seconds after the occurrence of main gear lift-off.	**X**	**X**	**X**	**X**	V_{mu} is defined as the minimum speed at which the last main landing gear leaves the ground. Main landing gear strut compression or equivalent air/ground signal should be recorded. If a V_{mu} test is not available, alternative acceptable flight tests are a constant high-attitude takeoff run through main gear lift-off or an early rotation takeoff. If either of these alternative solutions is selected, aft body contact/tail strike protection functionality, if present on the airplane, should be active.
1.b.4	Normal take-off.	±3 kt airspeed. ±1.5° pitch angle. ±1.5° AOA. ±6 m (20 ft) height. For airplanes with reversible flight control systems: ±2.2 daN (5 lbf) or ±10% of column force.	Takeoff.	Data required for near maximum certificated takeoff weight at mid center of gravity location and light takeoff weight at an aft center of gravity location. If the airplane has more than one certificated takeoff configuration, a different configuration must be used for each weight. Record takeoff profile from brake release to at least 61 m (200 ft) AGL.	**X**	**X**	**X**	**X**	The test may be used for ground acceleration time and distance (1.b.1). Plotted data should be shown using appropriate scales for each portion of the maneuver.
1.b.5	Critical engine failure on take-off.	±3 kt airspeed. ±1.5° pitch angle. ±1.5° AOA. ±6 m (20 ft) height. ±2° roll angle. ±2° side-slip angle. ±3° heading angle. For airplanes with reversible flight control systems: ±2.2 daN (5 lbf) or ±10% of column force; ±1.3 daN (3 lbf) or ±10% of wheel force; and	Takeoff.	Record takeoff profile to at least 61 m (200 ft) AGL. Engine failure speed must be within ±3 kt of airplane data. Test at near maximum takeoff weight.	**X**	**X**	**X**	**X**	

		±2.2 daN (5 lbf) or ±10% of rudder pedal force.							
1.b.6	Crosswind takeoff.	± 3 kt airspeed. ±1.5° pitch angle. ±1.5° AOA. ±6 m (20 ft) height. ±2° roll angle. ±2° side-slip angle. ±3° heading angle. Correct trends at ground speeds below 40 kt for rudder/pedal and heading angle. For airplanes with reversible flight control systems: ±2.2 daN (5 lbf) or ±10% of column force; ±1.3 daN (3 lbf) or ±10% of wheel force; and ±2.2 daN (5 lbf) or ±10% of rudder pedal force.	Takeoff.	Record takeoff profile from brake release to at least 61 m (200 ft) AGL. This test requires test data, including wind profile, for a crosswind component of at least 60% of the airplane performance data value measured at 10 m (33 ft) above the runway. Wind components must be provided as headwind and crosswind values with respect to the runway.	**X**	**X**	**X**	**X**	In those situations where a maximum crosswind or a maximum demonstrated crosswind is not known, contact the responsible Flight Standards office.
1.b.7.	Rejected Takeoff.	±5% of time or ±1.5 s. ±7.5% of distance or ±76 m (250 ft).	Takeoff.	Record at mass near maximum takeoff weight. Speed for reject must be at least 80% of V_1. Maximum braking effort, auto or manual. Where a maximum braking demonstration is not available, an acceptable alternative is a test using approximately 80% braking and full reverse, if applicable. Time and distance must be recorded from brake release to a full stop.	**X**	**X**	**X**	**X**	Autobrakes will be used where applicable.
1.b.8.	Dynamic Engine Failure After Takeoff.	±2°/s or ±20% of body angular rates.	Takeoff.	Engine failure speed must be within ±3 kt of airplane data. Engine failure may be a snap deceleration to idle.			**X**	**X**	For safety considerations, airplane flight test may be performed out of ground effect at a safe altitude, but with correct airplane configuration and airspeed.

				Record hands-off from 5 s before engine failure to +5 s or 30° roll angle, whichever occurs first. **CCA**: Test in Normal and Non-normal control state.					
1.c.	**Climb.**								
1.c.1.	Normal Climb, all engines operating.	±3 kt airspeed. ±0.5 m/s (100 ft/ min) or ±5% of rate of climb.	Clean.	Flight test data are preferred; however, airplane performance manual data are an acceptable alternative. Record at nominal climb speed and mid initial climb altitude. FSTD performance is to be recorded over an interval of at least 300 m (1 000 ft).	**X**	**X**	**X**	**X**	
1.c.2.	One-engine-inoperative 2nd segment climb.	±3 kt airspeed. ±0.5 m/s (100 ft/ min) or ±5% of rate of climb, but not less than airplane performance data requirements.	2nd segment climb.	Flight test data is preferred; however, airplane performance manual data is an acceptable alternative. Record at nominal climb speed. FSTD performance is to be recorded over an interval of at least 300 m (1,000 ft). Test at WAT (weight, altitude or temperature) limiting condition.	**X**	**X**	**X**	**X**	
1.c.3.	One Engine Inoperative En route Climb.	±10% time, ±10% distance, ±10% fuel used	Clean	Flight test data or airplane performance manual data may be used. Test for at least a 1,550 m (5,000 ft) segment.			**X**	**X**	
1.c.4.	One Engine Inoperative Approach Climb for airplanes with icing accountability if provided in the airplane performance data for this phase of flight.	±3 kt airspeed. ±0.5 m/s (100 ft/ min) or ±5% rate of climb, but not less than airplane performance data.	Approach	Flight test data or airplane performance manual data may be used. FSTD performance to be recorded over an interval of at least 300 m (1,000 ft). Test near maximum certificated landing weight as may be applicable to an approach in icing conditions.	**X**	**X**	**X**	**X**	Airplane should be configured with all anti-ice and de-ice systems operating normally, gear up and go-around flap. All icing accountability considerations, in accordance with the airplane performance data for an approach in icing conditions, should be applied.
1.d.	**Cruise / Descent.**								
1.d.1.	Level flight acceleration	±5% Time	Cruise	Time required to increase airspeed a minimum of 50 kt, using maximum continuous thrust rating or equivalent. For airplanes with a small operating speed range, speed change may be reduced to 80% of operational speed change.	**X**	**X**	**X**	**X**	

1.d.2.	Level flight deceleration.	±5% Time	Cruise	Time required to decrease airspeed a minimum of 50 kt, using idle power. For airplanes with a small operating speed range, speed change may be reduced to 80% of operational speed change.	**X**	**X**	**X**	**X**	
1.d.3.	Cruise performance.	±.05 EPR or ±3% N1 or ±5% of torque. ±5% of fuel flow.	Cruise.	The test may be a single snapshot showing instantaneous fuel flow, or a minimum of two consecutive snapshots with a spread of at least 3 minutes in steady flight.			**X**	**X**	
1.d.4.	Idle descent.	±3 kt airspeed. ±1.0 m/s (200 ft/min) or ±5% of rate of descent.	Clean.	Idle power stabilized descent at normal descent speed at mid altitude. FSTD performance to be recorded over an interval of at least 300 m (1,000 ft).	**X**	**X**	**X**	**X**	
1.d.5.	Emergency descent.	±5 kt airspeed. ±1.5 m/s (300 ft/min) or ±5% of rate of descent.	As per airplane performance data.	FSTD performance to be recorded over an interval of at least 900 m (3,000 ft).	**X**	**X**	**X**	**X**	Stabilized descent to be conducted with speed brakes extended if applicable, at mid altitude and near V_{mo} or according to emergency descent procedure.
1.e.	**Stopping.**								
1.e.1.	Deceleration time and distance, manual wheel brakes, dry runway, no reverse thrust.	±1.5 s or ±5% of time. For distances up to 1,220 m (4, 000 ft), the smaller of ±61 m (200 ft) or ±10% of distance. For distances greater than 1,220 m (4, 000 ft), ±5% of distance.	Landing.	Time and distance must be recorded for at least 80% of the total time from touchdown to a full stop. Position of ground spoilers and brake system pressure must be plotted (if applicable). Data required for medium and near maximum certificated landing mass. Engineering data may be used for the medium mass condition.	**X**	**X**	**X**	**X**	
1.e.2.	Deceleration time and distance, reverse thrust, no wheel brakes, dry runway.	±1.5 s or ±5% of time; and the smaller of ±61 m (200 ft) or ±10% of distance.	Landing	Time and distance must be recorded for at least 80% of the total time from initiation of reverse thrust to full thrust reverser minimum operating speed. Position of ground spoilers must be plotted (if applicable). Data required for medium and near maximum certificated landing mass. Engineering data may be used for the medium mass condition.	**X**	**X**	**X**	**X**	
1.e.3.	Stopping distance, wheel brakes, wet runway.	±61 m (200 ft) or ±10% of distance.	Landing.	Either flight test or manufacturer's performance manual data must be used, where available. Engineering data, based on dry runway flight test stopping distance and the effects of contaminated			**X**	**X**	

				runway braking coefficients, are an acceptable alternative.					
1.e.4.	Stopping distance, wheel brakes, icy runway.	±61 m (200 ft) or ±10% of distance.	Landing.	Either flight test or manufacturer's performance manual data must be used, where available. Engineering data, based on dry runway flight test stopping distance and the effects of contaminated runway braking coefficients, are an acceptable alternative.			**X**	**X**	
1.f.	**Engines.**								
1.f.1.	Acceleration.	±10% Ti or ±0.25 s; and ±10% Tt or ±0.25 s.	Approach or landing	Total response is the incremental change in the critical engine parameter from idle power to go-around power.	**X**	**X**	**X**	**X**	See Appendix F of this part for definitions of T_i, and T_t.
1.f.2.	Deceleration.	±10% Ti or ±0.25 s; and ±10% Tt or ±0.25 s.	Ground	Total response is the incremental change in the critical engine parameter from maximum takeoff power to idle power.	**X**	**X**	**X**	**X**	See Appendix F of this part for definitions of T_i, and T_t.
2. Handling Qualities.									
2.a.	**Static Control Tests.**								
	Note.1 — Testing of position versus force is not applicable if forces are generated solely by use of airplane hardware in the FSTD. *Note 2 — Pitch, roll and yaw controller position versus force or time should be measured at the control. An alternative method in lieu of external test fixtures at the flight controls would be to have recording and measuring instrumentation built into the FSTD. The force and position data from this instrumentation could be directly recorded and matched to the airplane data. Provided the instrumentation was verified by using external measuring equipment while conducting the static control checks, or equivalent means, and that evidence of the satisfactory comparison is included in the MQTG, the instrumentation could be used for both initial and recurrent evaluations for the measurement of all required control checks. Verification of the instrumentation by using external measuring equipment should be repeated if major modifications and/or repairs are made to the control loading system. Such a permanent installation could be used without any time being lost for the installation of external devices. Static and dynamic flight control tests should be accomplished at the same feel or impact pressures as the validation data where applicable.* *Note 3 — FSTD static control testing from the second set of pilot controls is only required if both sets of controls are not mechanically interconnected on the FSTD. A rationale is required from the data provider if a single set of data is applicable to both sides. If controls are mechanically interconnected in the FSTD, a single set of tests is sufficient.*								
2.a.1.a.	Pitch controller position versus force and surface position calibration.	±0.9 daN (2 lbf) breakout. ±2.2 daN (5 lbf) or ±10% of force. ±2° elevator angle.	Ground.	Record results for an uninterrupted control sweep to the stops.	**X**	**X**	**X**	**X**	Test results should be validated with in-flight data from tests such as longitudinal static stability, stalls, etc.
2.a.1.b.	**(Reserved)**								
2.a.2.a.	Roll controller position versus force and surface position calibration.	±0.9 daN (2 lbf) breakout. ±1.3 daN (3 lbf) or ±10% of force. ±2° aileron angle. ±3° spoiler angle.	Ground.	Record results for an uninterrupted control sweep to the stops.	**X**	**X**	**X**	**X**	Test results should be validated with in-flight data from tests such as engine-out trims, steady state side-slips, etc.
2.a.2.b.	**(Reserved)**								
2.a.3.a.	Rudder pedal position versus force and surface position calibration.	±2.2 daN (5 lbf) breakout.	Ground.	Record results for an uninterrupted control sweep to the stops.	**X**	**X**	**X**	**X**	Test results should be validated with in-flight data from tests such as engine-out

		±2.2 daN (5 lbf) or ±10% of force. ±2° rudder angle.							trims, steady state side-slips, etc.
2.a.3.b.	**(Reserved)**								
2.a.4.	Nosewheel Steering Controller Force and Position Calibration.	±0.9 daN (2 lbf) breakout. ±1.3 daN (3 lbf) or ±10% of force. ±2° NWA.	Ground.	Record results of an uninterrupted control sweep to the stops.	**X**	**X**	**X**	**X**	
2.a.5.	Rudder Pedal Steering Calibration.	±2° NWA.	Ground.	Record results of an uninterrupted control sweep to the stops.	**X**	**X**	**X**	**X**	
2.a.6.	Pitch Trim Indicator vs. Surface Position Calibration.	±0.5° trim angle.	Ground.		**X**	**X**	**X**	**X**	The purpose of the test is to compare FSTD surface position and indicator against the flight control model computed value.
2.a.7.	Pitch Trim Rate.	±10% of trim rate (°/s) or ±0.1°/s trim rate.	Ground and approach.	Trim rate to be checked at pilot primary induced trim rate (ground) and autopilot or pilot primary trim rate in-flight at go-around flight conditions. For CCA, representative flight test conditions must be used.	**X**	**X**	**X**	**X**	
2.a.8.	Alignment of cockpit throttle lever versus selected engine parameter.	When matching engine parameters: ±5° of TLA. When matching detents: ±3% N1 or ±.03 EPR or ±3% torque, or equivalent. Where the levers do not have angular travel, a tolerance of ±2 cm (±0.8 in) applies.	Ground.	Simultaneous recording for all engines. The tolerances apply against airplane data. For airplanes with throttle detents, all detents to be presented and at least one position between detents/ endpoints (where practical). For airplanes without detents, end points and at least three other positions are to be presented.	**X**	**X**	**X**	**X**	Data from a test airplane or engineering test bench are acceptable, provided the correct engine controller (both hardware and software) is used. In the case of propeller-driven airplanes, if an additional lever, usually referred to as the propeller lever, is present, it should also be checked. This test may be a series of snapshot tests.
2.a.9.	Brake pedal position versus force and brake system pressure calibration.	±2.2 daN (5 lbf) or ±10% of force. ±1.0 MPa (150 psi) or ±10% of brake system pressure.	Ground.	Relate the hydraulic system pressure to pedal position in a ground static test. Both left and right pedals must be checked.	**X**	**X**	**X**	**X**	FFS computer output results may be used to show compliance.
2.a.10	Stick Pusher System Force Calibration (if applicable)	±10% or ±5 lb (2.2 daN)) Stick/Column force	Ground or Flight	Test is intended to validate the stick/column transient forces as a result of a stick pusher system activation. This test may be conducted in an on-ground condition through stimulation of the stall			**X**	**X**	Aircraft manufacturer design data may be utilized as validation data as determined acceptable by the responsible Flight Standards office.

				protection system in a manner that generates a stick pusher response that is representative of an in-flight condition.					Test requirement may be met through column force validation testing in conjunction with the Stall Characteristics test (2.c.8.a.). This test is required only for FSTDs qualified to conduct full stall training tasks.
2.b.	**Dynamic Control Tests.**								
	Note.— Tests 2.b.1, 2.b.2 and 2.b.3 are not applicable for FSTDs where the control forces are completely generated within the airplane controller unit installed in the FSTD. Power setting may be that required for level flight unless otherwise specified. See paragraph 4 of this attachment.								
2.b.1.	Pitch Control.	**For underdamped systems**: $T(P_0)$ ±10% of P_0 or ±0.05 s. $T(P_1)$ ±20% of P_1 or ±0.05 s. $T(P_2)$ ±30% of P_2 or ±0.05 s. $T(P_n)$ ±10*(n+1)% of P_n or ±0.05 s. $T(A_n)$ ±10% of A_{max}, where A_{max} is the largest amplitude or ±0.5% of the total control travel (stop to stop). $T(A_d)$ ±5% of A_d = residual band or ±0.5% of the maximum control travel = residual band. ±1 significant overshoots (minimum of 1 significant overshoot). Steady state position within residual band. *Note 1.— Tolerances should not be applied on period or amplitude after the last significant overshoot.*	Takeoff, Cruise, and Landing.	Data must be for normal control displacements in both directions (approximately 25% to 50% of full throw or approximately 25% to 50% of maximum allowable pitch controller deflection for flight conditions limited by the maneuvering load envelope). Tolerances apply against the absolute values of each period (considered independently).			X	X	n = the sequential period of a full oscillation. Refer to paragraph 4 of this Attachment. For overdamped and critically damped systems, see Figure A2B of Appendix A for an illustration of the reference measurement.

		Note 2.— Oscillations within the residual band are not considered significant and are not subject to tolerances. **For overdamped and critically damped systems only**, the following tolerance applies: $T(P_0)$ ±10% of P_0 or ±0.05 s.							
2.b.2.	Roll Control.	Same as 2.b.1.	Takeoff, Cruise, and Landing.	Data must be for normal control displacement (approximately 25% to 50% of full throw or approximately 25% to 50% of maximum allowable roll controller deflection for flight conditions limited by the maneuvering load envelope).			**X**	**X**	Refer to paragraph 4 of this Attachment. For overdamped and critically damped systems, see Figure A2B of Appendix A for an illustration of the reference measurement.
2.b.3.	Yaw Control.	Same as 2.b.1.	Takeoff, Cruise, and Landing.	Data must be for normal control displacement (approximately 25% to 50% of full throw).			**X**	**X**	Refer to paragraph 4 of this Attachment. For overdamped and critically damped systems, see Figure A2B of Appendix A for an illustration of the reference measurement.
2.b.4.	Small Control Inputs – Pitch.	±0.15°/s body pitch rate or ±20% of peak body pitch rate applied throughout the time history.	Approach or Landing.	Control inputs must be typical of minor corrections made while established on an ILS approach (approximately 0.5 to 2°/s pitch rate). Test in both directions. Show time history data from 5 s before until at least 5 s after initiation of control input. If a single test is used to demonstrate both directions, there must be a minimum of 5 s before control reversal to the opposite direction. **CCA**: Test in normal and non-normal control state.			**X**	**X**	
2.b.5.	Small Control Inputs – Roll.	±0.15°/s body roll rate or ±20% of peak body roll rate applied throughout the time history.	Approach or landing.	Control inputs must be typical of minor corrections made while established on an ILS approach (approximately 0.5 to 2°/s roll rate). Test in one direction. For airplanes that exhibit non-symmetrical behavior, test in both directions. Show time history data from 5 s before until at least 5 s after initiation of control input.			**X**	**X**	

				If a single test is used to demonstrate both directions, there must be a minimum of 5 s before control reversal to the opposite direction. **CCA**: Test in normal and non-normal control state.					
2.b.6.	Small Control Inputs – Yaw.	±0.15°/s body yaw rate or ±20% of peak body yaw rate applied throughout the time history.	Approach or landing.	Control inputs must be typical of minor corrections made while established on an ILS approach (approximately 0.5 to 2°/s yaw rate). Test in both directions. Show time history data from 5 s before until at least 5 s after initiation of control input. If a single test is used to demonstrate both directions, there must be a minimum of 5 s before control reversal to the opposite direction. **CCA:** Test in normal and non-normal control state.			**X**	**X**	
2.c.	**Longitudinal Control Tests.**								
	Power setting is that required for level flight unless otherwise specified.								
2.c.1.	Power Change Dynamics.	±3 kt airspeed. ±30 m (100 ft) altitude. ±1.5° or ±20% of pitch angle.	Approach.	Power change from thrust for approach or level flight to maximum continuous or go-around power. Time history of uncontrolled free response for a time increment equal to at least 5 s before initiation of the power change to the completion of the power change + 15 s. **CCA:** Test in normal and non-normal control mode	**X**	**X**	**X**	**X**	
2.c.2.	Flap/Slat Change Dynamics.	±3 kt airspeed. ±30 m (100 ft) altitude. ±1.5° or ±20% of pitch angle.	Takeoff through initial flap retraction, and approach to landing.	Time history of uncontrolled free response for a time increment equal to at least 5 s before initiation of the reconfiguration change to the completion of the reconfiguration change + 15 s. **CCA:** Test in normal and non-normal control mode	**X**	**X**	**X**	**X**	
2.c.3.	Spoiler/Speedbrake Change Dynamics.	±3 kt airspeed. ±30 m (100 ft) altitude. ±1.5° or ±20% of pitch angle.	Cruise.	Time history of uncontrolled free response for a time increment equal to at least 5 s before initiation of the configuration change to the completion of the configuration change +15 s. Results required for both extension and retraction.	**X**	**X**	**X**	**X**	

				CCA: Test in normal and non-normal control mode					
2.c.4.	Gear Change Dynamics.	±3 kt airspeed. ±30 m (100 ft) altitude. ±1.5° or ±20% of pitch angle.	Takeoff (retraction), and Approach (extension).	Time history of uncontrolled free response for a time increment equal to at least 5 s before initiation of the configuration change to the completion of the configuration change + 15 s. **CCA:** Test in normal and non-normal control mode	**X**	**X**	**X**	**X**	
2.c.5.	Longitudinal Trim.	±1° elevator angle. ±0.5° stabilizer or trim surface angle. ±1° pitch angle. ±5% of net thrust or equivalent.	Cruise, Approach, and Landing.	Steady-state wings level trim with thrust for level flight. This test may be a series of snapshot tests. **CCA**: Test in normal or non-normal control mode, as applicable.	**X**	**X**	**X**	**X**	
2.c.6.	Longitudinal Maneuvering Stability (Stick Force/g).	±2.2 daN (5 lbf) or ±10% of pitch controller force. Alternative method: ±1° or ±10% of the change of elevator angle.	Cruise, Approach, and Landing.	Continuous time history data or a series of snapshot tests may be used. Test up to approximately 30° of roll angle for approach and landing configurations. Test up to approximately 45° of roll angle for the cruise configuration. Force tolerance not applicable if forces are generated solely by the use of airplane hardware in the FSTD. Alternative method applies to airplanes which do not exhibit stick-force-per-g characteristics. **CCA:** Test in normal or non-normal control mode	**X**	**X**	**X**	**X**	
2.c.7.	Longitudinal Static Stability.	±2.2 daN (5 lbf) or ±10% of pitch controller force. Alternative method: ±1° or ±10% of the change of elevator angle.	Approach.	Data for at least two speeds above and two speeds below trim speed. The speed range must be sufficient to demonstrate stick force versus speed characteristics. This test may be a series of snapshot tests. Force tolerance is not applicable if forces are generated solely by the use of airplane hardware in the FSTD. Alternative method applies to airplanes which do not exhibit speed stability characteristics. **CCA:** Test in normal or non-normal control mode, as applicable.	**X**	**X**	**X**	**X**	

2.c.8.a	Stall Characteristics	±3 kt airspeed for stall warning and stall speeds. ±2.0° angle of attack for buffet threshold of perception and initial buffet based upon Nz component. Control inputs must be plotted and demonstrate correct trend and magnitude. Approach to stall: ±2.0° pitch angle; ±2.0° angle of attack; and ±2.0° bank angle Stall warning up to stall: ±2.0° pitch angle; ±2.0° angle of attack; and Correct trend and magnitude for roll rate and yaw rate. Stall Break and Recovery: SOC Required (see Attachment 7) Additionally, for those simulators with reversible flight control systems or equipped with stick pusher systems: ±10% or ±5 lb (2.2 daN)) Stick/Column force (prior to the stall angle of attack).	Second Segment Climb, High Altitude Cruise (Near Performance Limited Condition), and Approach or Landing	Each of the following stall entries must be demonstrated in at least one of the three flight conditions: ▪ Stall entry at wings level (1g) ▪ Stall entry in turning flight of at least 25° bank angle (accelerated stall) ▪ Stall entry in a power-on condition (required only for propeller driven aircraft) The cruise flight condition must be conducted in a flaps-up (clean) configuration. The second segment climb flight condition must use a different flap setting than the approach or landing flight condition. Record the stall warning signal and initial buffet, if applicable. Time history data must be recorded for full stall through recovery to normal flight. The stall warning signal must occur in the proper relation to buffet/stall. FSTDs of airplanes exhibiting a sudden pitch attitude change or "g break" must demonstrate this characteristic. FSTDs of airplanes exhibiting a roll off or loss of roll control authority must demonstrate this characteristic. Numerical tolerances are not applicable past the stall angle of attack, but must demonstrate correct trend through recovery. See Attachment 7 for additional requirements and information concerning data sources and required angle of attack ranges. **CCA:** Test in normal and non-normal control states. For CCA aircraft with stall envelope protection systems, the normal mode testing is only required to an angle of attack range necessary to demonstrate the correct operation of the system. These tests may be used to satisfy the required (angle of attack) flight maneuver and envelope protection tests (test 2.h.6.). Non-normal control states must be tested through stall identification and recovery.			**X**	**X**	Buffet threshold of perception should be based on 0.03 g peak to peak normal acceleration above the background noise at the pilot seat. Initial buffet to be based on normal acceleration at the pilot seat with a larger peak to peak value relative to buffet threshold of perception (some airframe manufacturers have used 0.1 g peak to peak). Demonstrate correct trend in growth of buffet amplitude from initial buffet to stall speed for normal and lateral acceleration. The FSTD sponsor/FSTD manufacturer may limit maximum buffet based on motion platform capability/limitations or other simulator system limitations. Tests may be conducted at centers of gravity and weights typically required for airplane certification stall testing. This test is required only for FSTDs qualified to conduct full stall training tasks. In instances where flight test validation data is limited due to safety of flight considerations, engineering simulator validation data may be used in lieu of flight test validation data for angles of attack that exceed the activation of a stall protection system or stick pusher system. Where approved engineering simulation validation is used, the reduced engineering tolerances (as defined in paragraph 11 of this appendix) do not apply.
2.c.8.b	Approach to Stall Characteristics	±3 kt airspeed for stall warning speeds. ±2.0° angle of attack for initial buffet.	Second Segment Climb, High Altitude Cruise (Near Performance Limited Condition), and Approach or Landing	Each of the following stall entries must be demonstrated in at least one of the three flight conditions: ▪ Approach to stall entry at wings level (1g)	**X**	**X**			Tests may be conducted at centers of gravity and weights typically required for airplane certification stall testing.

		Control displacements and flight control surfaces must be plotted and demonstrate correct trend and magnitude. ±2.0° pitch angle; ±2.0° angle of attack; and ±2.0° bank angle Additionally, for those simulators with reversible flight control systems: ±10% or ±5 lb (2.2 daN)) Stick/Column force		▪ Approach to stall entry in turning flight of at least 25° bank angle (accelerated stall) ▪ Approach to stall entry in a power-on condition (required only for propeller driven aircraft) The cruise flight condition must be conducted in a flaps-up (clean) configuration. The second segment climb flight condition must use a different flap setting than the approach or landing flight condition. **CCA:** Test in Normal and Non-normal control states. For CCA aircraft with stall envelope protection systems, the normal mode testing is only required to an angle of attack range necessary to demonstrate the correct operation of the system. These tests may be used to satisfy the required (angle of attack) flight maneuver and envelope protection tests (test 2.h.6.).					Tolerances on stall buffet are not applicable where the first indication of the stall is the activation of the stall warning system (i.e. stick shaker).
2.c.9.	Phugoid Dynamics.	±10% of period. ±10% of time to one half or double amplitude or ±0.02 of damping ratio.	Cruise.	Test must include three full cycles or that necessary to determine time to one half or double amplitude, whichever is less. **CCA:** Test in non-normal control mode.	**X**	**X**	**X**	**X**	
2.c.10	Short Period Dynamics.	±1.5° pitch angle or ±2°/s pitch rate. ±0.1 g normal acceleration	Cruise.	**CCA:** Test in normal and non-normal control mode.	**X**	**X**	**X**	**X**	
2.c.11.	**(Reserved)**								
2.d.	**Lateral Directional Tests.**								
	Power setting is that required for level flight unless otherwise specified.								
2.d.1.	Minimum control speed, air (V_{mca}) or landing (V_{mcl}), per applicable airworthiness requirement or low speed engine-inoperative handling characteristics in the air.	±3 kt airspeed.	Takeoff or Landing (whichever is most critical in the airplane).	Takeoff thrust must be set on the operating engine(s). Time history or snapshot data may be used. **CCA**: Test in normal or non-normal control state, as applicable.	**X**	**X**	**X**	**X**	Minimum speed may be defined by a performance or control limit which prevents demonstration of V_{mca} or V_{mcl} in the conventional manner.
2.d.2.	Roll Response (Rate).	±2°/s or ±10% of roll rate. For airplanes with reversible flight control systems: ±1.3 daN (3 lbf) or ±10% of wheel force.	Cruise, and Approach or Landing.	Test with normal roll control displacement (approximately one-third of maximum roll controller travel). This test may be combined with step input of flight deck roll controller test 2.d.3.	**X**	**X**	**X**	**X**	
2.d.3.	Step input of flight deck roll controller.	±2° or ±10% of roll angle.	Approach or Landing.	This test may be combined with roll response (rate) test 2.d.2.	**X**	**X**	**X**	**X**	With wings level, apply a step roll control input using

				CCA: Test in normal and non-normal control mode					approximately one-third of the roll controller travel. When reaching approximately 20° to 30° of bank, abruptly return the roll controller to neutral and allow approximately 10 seconds of airplane free response.
2.d.4.	Spiral Stability.	Correct trend and ±2° or ±10% of roll angle in 20 s. If alternate test is used: correct trend and ±2° aileron angle.	Cruise, and Approach or Landing.	Airplane data averaged from multiple tests may be used. Test for both directions. As an alternative test, show lateral control required to maintain a steady turn with a roll angle of approximately 30°. **CCA:** Test in non-normal control mode.	**X**	**X**	**X**	**X**	
2.d.5.	Engine Inoperative Trim.	±1° rudder angle or ±1° tab angle or equivalent rudder pedal. ±2° side-slip angle.	Second Segment Climb, and Approach or Landing.	This test may consist of snapshot tests.	**X**	**X**	**X**	**X**	Test should be performed in a manner similar to that for which a pilot is trained to trim an engine failure condition. 2nd segment climb test should be at takeoff thrust. Approach or landing test should be at thrust for level flight.
2.d.6.	Rudder Response.	±2°/s or ±10% of yaw rate.	Approach or Landing.	Test with stability augmentation on and off. Test with a step input at approximately 25% of full rudder pedal throw. **CCA:** Test in normal and non-normal control mode	**X**	**X**	**X**	**X**	
2.d.7.	Dutch Roll	±0.5 s or ±10% of period. ±10% of time to one half or double amplitude or ±.02 of damping ratio. ±1 s or ±20% of time difference between peaks of roll angle and side-slip angle.	Cruise, and Approach or Landing.	Test for at least six cycles with stability augmentation off. **CCA:** Test in non-normal control mode.		**X**	**X**	**X**	
2.d.8.	Steady State Sideslip.	For a given rudder position: ±2° roll angle;	Approach or Landing.	This test may be a series of snapshot tests using at least two rudder positions (in each direction for propeller-driven airplanes), one of which must be near maximum allowable rudder.	**X**	**X**	**X**	**X**	

		±1° side-slip angle; ±2° or ±10% of aileron angle; and ±5° or ±10% of spoiler or equivalent roll controller position or force. For airplanes with reversible flight control systems: ±1.3 daN (3 lbf) or ±10% of wheel force. ±2.2 daN (5 lbf) or ±10% of rudder pedal force.							
2.e.	**Landings.**								
2.e.1.	Normal Landing.	±3 kt airspeed. ±1.5° pitch angle. ±1.5° AOA. ±3 m (10 ft) or ±10% of height. For airplanes with reversible flight control systems: ±2.2 daN (5 lbf) or ±10% of column force.	Landing.	Test from a minimum of 61 m (200 ft) AGL to nosewheel touchdown. **CCA:** Test in normal and non-normal control mode, if applicable.		**X**	**X**	**X**	Two tests should be shown, including two normal landing flaps (if applicable) one of which should be near maximum certificated landing mass, the other at light or medium mass.
2.e.2.	Minimum Flap Landing.	±3 kt airspeed. ±1.5° pitch angle. ±1.5° AOA. ±3 m (10 ft) or ±10% of height. For airplanes with reversible flight control systems:	Minimum Certified Landing Flap Configuration.	Test from a minimum of 61 m (200 ft) AGL to nosewheel touchdown. Test at near maximum certificated landing weight.			**X**	**X**	

		±2.2 daN (5 lbf) or ±10% of column force.						
2.e.3.	Crosswind Landing.	±3 kt airspeed. ±1.5° pitch angle. ±1.5° AOA. ±3 m (10 ft) or ±10% of height. ±2° roll angle. ±2° side-slip angle. ±3° heading angle. For airplanes with reversible flight control systems: ±2.2 daN (5 lbf) or ±10% of column force. ±1.3 daN (3 lbf) or ±10% of wheel force. ±2.2 daN (5 lbf) or ±10% of rudder pedal force.	Landing.	Test from a minimum of 61 m (200 ft) AGL to a 50% decrease in main landing gear touchdown speed. Test data is required, including wind profile, for a crosswind component of at least 60% of airplane performance data value measured at 10 m (33 ft) above the runway. Wind components must be provided as headwind and crosswind values with respect to the runway.		**X**	**X**	**X**	In those situations where a maximum crosswind or a maximum demonstrated crosswind is not known, contact the responsible Flight Standards office.
2.e.4.	One Engine Inoperative Landing.	±3 kt airspeed. ±1.5° pitch angle. ±1.5° AOA. ±3 m (10 ft) or ±10% of height. ±2° roll angle. ±2° side-slip angle. ±3° heading angle.	Landing.	Test from a minimum of 61 m (200 ft) AGL to a 50% decrease in main landing gear touchdown speed.		**X**	**X**	**X**	
2.e.5.	Autopilot landing (if applicable).	±1.5 m (5 ft) flare height. ±0.5 s or ± 10% of Tf.	Landing.	If autopilot provides roll-out guidance, record lateral deviation from touchdown to a 50% decrease in main landing gear touchdown speed. Time of autopilot flare mode engage and main gear touchdown must be noted.		**X**	**X**	**X**	See Appendix F of this part for definition of T_f.

		±0.7 m/s (140 ft/min) rate of descent at touchdown. ±3 m (10 ft) lateral deviation during roll-out.							
2.e.6.	All-engine autopilot go-around.	±3 kt airspeed. ±1.5° pitch angle. ±1.5° AOA.	As per airplane performance data.	Normal all-engine autopilot go-around must be demonstrated (if applicable) at medium weight.		**X**	**X**	**X**	
2.e.7.	One engine inoperative go around.	±3 kt airspeed. ±1.5° pitch angle. ±1.5° AOA. ±2° roll angle. ±2° side-slip angle.	As per airplane performance data.	Engine inoperative go-around required near maximum certificated landing weight with critical engine inoperative. Provide one test with autopilot (if applicable) and one without autopilot. **CCA**: Non-autopilot test to be conducted in non-normal mode.		**X**	**X**	**X**	
2.e.8.	Directional control (rudder effectiveness) with symmetric reverse thrust.	±5 kt airspeed. ±2°/s yaw rate.	Landing.	Apply rudder pedal input in both directions using full reverse thrust until reaching full thrust reverser minimum operating speed.		**X**	**X**	**X**	
2.e.9.	Directional control (rudder effectiveness) with asymmetric reverse thrust.	±5 kt airspeed. ±3° heading angle.	Landing.	With full reverse thrust on the operating engine(s), maintain heading with rudder pedal input until maximum rudder pedal input or thrust reverser minimum operation speed is reached.		**X**	**X**	**X**	
2.f.	**Ground Effect.**								
	Test to demonstrate Ground Effect.	±1° elevator angle. ±0.5° stabilizer angle. ±5% of net thrust or equivalent. ±1° AOA. ±1.5 m (5 ft) or ±10% of height. ±3 kt airspeed. ±1° pitch angle.	Landing.	A rationale must be provided with justification of results. **CCA:** Test in normal or non-normal control mode, as applicable.		**X**	**X**	**X**	See paragraph 5 of this Attachment for additional information.
2.g.	**Windshear.**								
	Four tests, two takeoff and two landing, with one of each conducted in still air and the other	See Attachment 5 of this appendix.	Takeoff and Landing.	Requires windshear models that provide training in the specific skills needed to recognize windshear phenomena and to execute recovery procedures. See Attachment 5 of this appendix for tests, tolerances, and procedures.			**X**	**X**	See Attachment 5 of this appendix for information related to Level A and B simulators.

	with windshear active to demonstrate windshear models.								
2.h.	**Flight Maneuver and Envelope Protection Functions.**								
	Note. — The requirements of 2.h are only applicable to computer-controlled airplanes. Time history results of response to control inputs during entry into each envelope protection function (i.e. with normal and degraded control states if their function is different) are required. Set thrust as required to reach the envelope protection function.								
2.h.1.	Overspeed.	±5 kt airspeed.	Cruise.			X	X	X	
2.h.2.	Minimum Speed.	±3 kt airspeed.	Takeoff, Cruise, and Approach or Landing.			X	X	X	
2.h.3.	Load Factor.	±0.1g normal load factor	Takeoff, Cruise.			X	X	X	
2.h.4.	Pitch Angle.	±1.5° pitch angle	Cruise, Approach.			X	X	X	
2.h.5.	Bank Angle.	±2° or ±10% bank angle	Approach.			X	X	X	
2.h.6.	Angle of Attack.	±1.5° angle of attack	Second Segment Climb, and Approach or Landing.			X	X	X	
2.i.	**Engine and Airframe Icing Effects**								
2.i.	Engine and Airframe Icing Effects Demonstration (High Angle of Attack)		Takeoff or Approach or Landing [One flight condition – two tests (ice on and off)]	Time history of a full stall and initiation of the recovery. Tests are intended to demonstrate representative aerodynamic effects caused by in-flight ice accretion. Flight test validation data is not required. Two tests are required to demonstrate engine and airframe icing effects. One test will demonstrate the FSTDs baseline performance without ice accretion, and the second test will demonstrate the aerodynamic effects of ice accretion relative to the baseline test. The test must utilize the icing model(s) as described in the required Statement of Compliance in Table A1A, section 2.j. Test must include rationale that describes the icing effects being demonstrated. Icing effects may include, but are not limited to, the following effects as applicable to the particular airplane type: ▪ Decrease in stall angle of attack ▪ Changes in pitching moment ▪ Decrease in control effectiveness ▪ Changes in control forces ▪ Increase in drag ▪ Change in stall buffet characteristics and threshold of perception ▪ Engine effects (power reduction/variation, vibration, etc. where expected to be present on the aircraft in the ice accretion scenario being tested)			X	X	Tests will be evaluated for representative effects on relevant aerodynamic and other parameters such as angle of attack, control inputs, and thrust/power settings. Plotted parameters must include: • Altitude • Airspeed • Normal acceleration • Engine power • Angle of attack • Pitch attitude • Bank angle • Flight control inputs • Stall warning and stall buffet onset
3. Motion System.									
3.a.	**Frequency response.**								

		As specified by the sponsor for FSTD qualification.	Not applicable.	Appropriate test to demonstrate required frequency response.	X	X	X	X	See paragraph 6 of this Attachment.
3.b.	**Turn-around check.**								
		As specified by the sponsor for FSTD qualification.	Not applicable.	Appropriate test to demonstrate required smooth turn-around.	X	X	X	X	See paragraph 6 of this Attachment.
3.c	**Motion effects.**				X	X	X	X	Refer to Attachment 3 of this Appendix on subjective testing.
3.d.	**Motion system repeatability.**								
	Motion system repeatability	±0.05 g actual platform linear accelerations.	None.		X	X	X	X	Ensure that motion system hardware and software (in normal FSTD operating mode) continue to perform as originally qualified. Performance changes from the original baseline can be readily identified with this information. See paragraph 6.c. of this Attachment.
3.e.	**Motion cueing fidelity**								
3.e.1.	Motion cueing fidelity – Frequency-domain criterion.	As specified by the FSTD manufacturer for initial qualification.	Ground and flight.	For the motion system as applied during training, record the combined modulus and phase of the motion cueing algorithm and motion platform over the frequency range appropriate to the characteristics of the simulated aircraft. This test is only required for initial FSTD qualification.			X	X	Testing may be accomplished by the FSTD manufacturer and results provided as a statement of compliance.
3.e.2.	Reserved								
3.f	Characteristic motion vibrations. The following tests with recorded results and an SOC are required for characteristic motion vibrations, which can be sensed at the flight deck where applicable by airplane type.	None.	Ground and flight.					X	The recorded test results for characteristic buffets should allow the comparison of relative amplitude versus frequency. See also paragraph 6.e. of this Attachment.
3.f.1.	Thrust effect with brakes set.	The FSTD test results must exhibit the overall appearance and trends of the airplane data, with at least three (3) of the predominant frequency “spikes”	Ground.	Test must be conducted at maximum possible thrust with brakes set.				X	

		being present within ± 2 Hz of the airplane data.							
3.f.2.	Buffet with landing gear extended.	The FSTD test results must exhibit the overall appearance and trends of the airplane data, with at least three (3) of the predominant frequency “spikes” being present within ± 2 Hz of the airplane data.	Flight.	Test condition must be for a normal operational speed and not at the gear limiting speed.				**X**	
3.f.3.	Buffet with flaps extended.	The FSTD test results must exhibit the overall appearance and trends of the airplane data, with at least three (3) of the predominant frequency “spikes” being present within ± 2 Hz of the airplane data.	Flight.	Test condition must be at a normal operational speed and not at the flap limiting speed.				**X**	
3.f.4.	Buffet with speedbrakes deployed.	The FSTD test results must exhibit the overall appearance and trends of the airplane data, with at least three (3) of the predominant frequency “spikes” being present within ± 2 Hz of the airplane data.	Flight.	Test condition must be at a typical speed for a representative buffet.				**X**	
3.f.5.	Stall buffet	The FSTD test results must exhibit the overall appearance and trends of the airplane data, with at least three (3) of the predominant frequency “spikes” being present within ± 2 Hz of the airplane data.	Cruise (High Altitude), Second Segment Climb, and Approach or Landing	Tests must be conducted for an angle of attack range between the buffet threshold of perception to the pilot and the stall angle of attack. Post stall characteristics are not required.			**X**	**X**	If stabilized flight data between buffet threshold of perception and the stall angle of attack are not available, PSD analysis should be conducted for a time span between initial buffet and the stall angle of attack. Test required only for FSTDs qualified for full stall training tasks or for those aircraft which exhibit stall buffet before the activation of the stall warning system.
3.f.6.	Buffet at high airspeeds or high Mach.	The FSTD test results must exhibit the overall appearance and trends of the airplane data, with at least three (3) of the predominant frequency “spikes” being present within ± 2 Hz of the airplane data.	Flight.					**X**	Test condition should be for high-speed maneuver buffet/wind-up-turn or alternatively Mach buffet.

3.f.7.	In-flight vibrations for propeller driven airplanes.	The FSTD test results must exhibit the overall appearance and trends of the airplane data, with at least three (3) of the predominant frequency "spikes" being present within ± 2 Hz of the airplane data.	Flight (clean configuration).					X	Test should be conducted to be representative of in-flight vibrations for propeller-driven airplanes.
4. Visual System.									
4.a.	**Visual scene quality**								
4.a.1.	Continuous collimated cross-cockpit visual field of view.	Cross-cockpit, collimated visual display providing each pilot with a minimum of 176° horizontal and 36° vertical continuous field of view.	Not applicable.	Required as part of MQTG but not required as part of continuing evaluations.			X	X	Field of view should be measured using a visual test pattern filling the entire visual scene (all channels) consisting of a matrix of black and white 5° squares. Installed alignment should be confirmed in an SOC (this would generally consist of results from acceptance testing).
	Continuous collimated cross-cockpit visual field of view.	Continuous collimated field-of-view providing at least 45° horizontal and 30° vertical field-of-view for each pilot seat. Both pilot seat visual systems must be operable simultaneously.	Not applicable.	Required as part of MQTG but not required as part of continuing evaluations.	X	X			A vertical field-of-view of 30° may be insufficient to meet visual ground segment requirements.
4.a.2.	System geometry	5° even angular spacing within ±1° as measured from either pilot eye point and within 1.5° for adjacent squares.	Not applicable.	The angular spacing of any chosen 5° square and the relative spacing of adjacent squares must be within the stated tolerances.	X	X	X	X	The purpose of this test is to evaluate local linearity of the displayed image at either pilot eye point. System geometry should be measured using a visual test pattern filling the entire visual scene (all channels) with a matrix of black and white 5° squares with light points at the intersections. For continuing qualification testing, the use of an optical checking device is encouraged. This device should typically consist of a hand-held go/no go gauge to check that the relative positioning is maintained.

4.a.3	Surface resolution (object detection).	Not greater than 2 arc minutes.	Not applicable.	An SOC is required and must include the relevant calculations and an explanation of those calculations. This requirement is applicable to any level of simulator equipped with a daylight visual system.			**X**	**X**	Resolution will be demonstrated by a test of objects shown to occupy the required visual angle in each visual display used on a scene from the pilot's eyepoint. The object will subtend 2 arc minutes to the eye. This may be demonstrated using threshold bars for a horizontal test. A vertical test should also be demonstrated.
4.a.4	Light point size.	Not greater than 5 arc minutes.	Not applicable.	An SOC is required and must include the relevant calculations and an explanation of those calculations. This requirement is applicable to any level of simulator equipped with a daylight visual system.			**X**	**X**	Light point size should be measured using a test pattern consisting of a centrally located single row of white light points displayed as both a horizontal and vertical row. It should be possible to move the light points relative to the eyepoint in all axes. At a point where modulation is just discernible in each visual channel, a calculation should be made to determine the light spacing.
4.a.5	Raster surface contrast ratio.	Not less than 5:1.	Not applicable.	This requirement is applicable to any level of simulator equipped with a daylight visual system.			**X**	**X**	Surface contrast ratio should be measured using a raster drawn test pattern filling the entire visual scene (all channels). The test pattern should consist of black and white squares, 5° per square, with a white square in the center of each channel. Measurement should be made on the center bright square for each channel using a 1° spot photometer. This value should have a minimum brightness of 7 cd/m^2 (2 ft-lamberts). Measure any adjacent dark squares.

									The contrast ratio is the bright square value divided by the dark square value. *Note 1. — During contrast ratio testing, FSTD aft-cab and flight deck ambient light levels should be as low as possible.* *Note 2. — Measurements should be taken at the center of squares to avoid light spill into the measurement device.*
4.a.6	Light point contrast ratio.	Not less than 25:1.	Not applicable.	An SOC is required and must include the relevant calculations.			**X**	**X**	Light point contrast ratio should be measured using a test pattern demonstrating an area of greater than 1° area filled with white light points and should be compared to the adjacent background. *Note. — Light point modulation should be just discernible on calligraphic systems but will not be discernable on raster systems.* Measurements of the background should be taken such that the bright square is just out of the light meter FOV. *Note. — During contrast ratio testing, FSTD aft-cab and flight deck ambient light levels should be as low as practical.*
	Light point contrast ratio.	Not less than 10:1.	Not applicable.		**X**	**X**			
4.a.7	Light point brightness.	Not less than 20 cd/m^2 (5.8 ft-lamberts).	Not applicable.				**X**	**X**	Light points should be displayed as a matrix creating a square. On calligraphic systems the light points should just merge. On raster systems the light points should overlap such that the square is continuous

									(individual light points will not be visible).
4.a.8	Surface brightness.	Not less than 20 cd/m^2 (5.8 ft-lamberts) on the display.	Not applicable.	This requirement is applicable to any level of simulator equipped with a daylight visual system.			**X**	**X**	Surface brightness should be measured on a white raster, measuring the brightness using the 1° spot photometer. Light points are not acceptable. Use of calligraphic capabilities to enhance raster brightness is acceptable.
4.a.9	Black level and sequential contrast.	Black intensity: Background brightness – Black polygon brightness < 0.015 cd/m^2 (0.004 ft-lamberts). Sequential contrast: Maximum brightness – (Background brightness – Black polygon brightness) > 2,000:1.	Not applicable.		**X**	**X**	**X**	**X**	All projectors should be turned off and the cockpit environment made as dark as possible. A background reading should be taken of the remaining ambient light on the screen. The projectors should then be turned on and a black polygon displayed. A second reading should then be taken and the difference between this and the ambient level recorded. A full brightness white polygon should then be measured for the sequential contrast test. This test is generally only required for **light valve projectors**.
4.a.10	Motion blur.	When a pattern is rotated about the eyepoint at 10°/s, the smallest detectable gap must be 4 arc min or less.	Not applicable.		**X**	**X**	**X**	**X**	A test pattern consists of an array of 5 peak white squares with black gaps between them of decreasing width. The range of black gap widths should at least extend above and below the required detectable gap, and be in steps of 1 arc min. The pattern is rotated at the required rate. Two arrays of squares should be provided, one rotating in

									heading and the other in pitch, to provide testing in both axes. A series of stationary numbers identifies the gap number. *Note.— This test can be limited by the display technology. Where this is the case the responsible Flight Standards office should be consulted on the limitations.* This test is generally only required for **light valve projectors**.
4.a.11	Speckle test.	Speckle contrast must be < 10%.	Not applicable.	An SOC is required describing the test method.	**X**	**X**	**X**	**X**	This test is generally only required for **laser projectors**.
4.b	**Head-Up Display (HUD)**								
4.b.1	Static Alignment.	Static alignment with displayed image. HUD bore sight must align with the center of the displayed image spherical pattern. Tolerance +/- 6 arc min.	**N/A**				**X**	**X**	Alignment requirement applies to any HUD system in use or both simultaneously if they are used simultaneously for training.
4.b.2	System display.	All functionality in all flight modes must be demonstrated.	**N/A**				**X**	**X**	A statement of the system capabilities should be provided and the capabilities demonstrated
4.b.3	HUD attitude versus FSTD attitude indicator (pitch and roll of horizon).	Pitch and roll align with aircraft instruments.	Flight.				**X**	**X**	
4.c	**Enhanced Flight Vision System (EFVS)**								
4.c.1	Registration test.	Alignment between EFVS display and out of the window image must represent the alignment typical of the aircraft and system type.	Takeoff point and on approach at 200 ft.				**X**	**X**	*Note.— The effects of the alignment tolerance in 4.b.1 should be taken into account.*
4.c.2	EFVS RVR and visibility calibration.	The scene represents the EFVS view at 350 m (1,200 ft) and 1,609 m	Flight.				**X**	**X**	Infra-red scene representative of both 350 m (1,200 ft), and 1,609 m (1 sm) RVR.

		(1 sm) RVR including correct light intensity.							Visual scene may be removed.
4.c.3	Thermal crossover.	Demonstrate thermal crossover effects during day to night transition.	Day and night.				X	X	The scene will correctly represent the thermal characteristics of the scene during a day to night transition.
4.d	**Visual ground segment**								
4.d.1	Visual ground segment (VGS).	Near end: the correct number of approach lights within the computed VGS must be visible. Far end: ±20% of the computed VGS. The threshold lights computed to be visible must be visible in the FSTD.	Trimmed in the landing configuration at 30 m (100 ft) wheel height above touchdown zone on glide slope at an RVR setting of 300 m (1,000 ft) or 350 m (1,200 ft).	This test is designed to assess items impacting the accuracy of the visual scene presented to a pilot at DH on an ILS approach. These items include: 1) RVR/Visibility; 2) glide slope (G/S) and localizer modeling accuracy (location and slope) for an ILS; 3) for a given weight, configuration and speed representative of a point within the airplane's operational envelope for a normal approach and landing; and 4) Radio altimeter. *Note. — If non-homogeneous fog is used, the vertical variation in horizontal visibility should be described and included in the slant range visibility calculation used in the VGS computation.*	X	X	X	X	
4.e	**Visual System Capacity**								
4.e.1	System capacity – Day mode.	Not less than: 10,000 visible textured surfaces, 6,000 light points, 16 moving models.	Not applicable.				X	X	Demonstrated through use of a visual scene rendered with the same image generator modes used to produce scenes for training. The required surfaces, light points, and moving models should be displayed simultaneously.
4.e.2	System capacity – Twilight/night mode.	Not less than: 10,000 visible textured surfaces, 15,000 light points, 16 moving models.	Not applicable.				X	X	Demonstrated through use of a visual scene rendered with the same image generator modes used to produce scenes for training. The required surfaces, light points, and moving models should be displayed simultaneously.

5. Sound System. The sponsor will not be required to repeat the airplane tests (i.e., tests 5.a.1. through 5.a.8. (or 5.b.1. through 5.b.9.) and 5.c., as appropriate) during continuing qualification evaluations if frequency response and background noise test results are within tolerance when compared to the initial qualification evaluation results, and the sponsor shows that no software changes have occurred that will affect the airplane test results. If the frequency response test method is chosen and fails, the sponsor may elect to fix the frequency response problem and repeat the test or the sponsor may elect to repeat the airplane tests. If the airplane tests are repeated during continuing qualification evaluations, the results may be compared against initial qualification evaluation results or airplane master data. All tests in this section must be presented using an unweighted 1/3-octave band format from band 17 to 42 (50 Hz to 16 kHz). A minimum 20 second average must be taken at the location corresponding to the airplane data set. The airplane and flight simulator results must be produced using comparable data analysis techniques.									
5.a.	**Turbo-jet airplanes.**								All tests in this section should be presented using an unweighted 1/3-octave band format from at least band 17 to 42 (50 Hz to 16 kHz). A measurement of minimum 20 s should be taken at the location corresponding to the approved data set. The approved data set and FSTD results should be produced using comparable data analysis techniques. Refer to paragraph 7 of this Attachment
5.a.1.	Ready for engine start.	Initial evaluation: ± 5 dB per 1/3 octave band. Recurrent evaluation: cannot exceed ±5 dB difference on three consecutive bands when compared to initial evaluation and the average of the absolute differences between initial and recurrent evaluation results cannot exceed 2 dB.	Ground.	Normal condition prior to engine start. The APU should be on if appropriate.				**X**	For initial evaluation, it is acceptable to have some 1/3 octave bands out of ± 5 dB tolerance but not more than 2 that are consecutive and in any case within ± 7 dB from approved reference data, providing that the overall trend is correct. Where initial evaluation employs approved subjective tuning to develop the approved reference standard, recurrent evaluation tolerances should be used during recurrent evaluations.
5.a.2.	All engines at idle.	Initial evaluation: ± 5 dB per 1/3 octave band. Recurrent evaluation: cannot exceed ±5 dB difference on three consecutive bands when compared to initial	Ground.	Normal condition prior to takeoff.				**X**	For initial evaluation, it is acceptable to have some 1/3 octave bands out of ± 5 dB tolerance but not more than 2 that are consecutive and in any case within ± 7 dB from approved reference data, providing that the overall trend is correct.

		evaluation and the average of the absolute differences between initial and recurrent evaluation results cannot exceed 2 dB.							Where initial evaluation employs approved subjective tuning to develop the approved reference standard, recurrent evaluation tolerances should be used during recurrent evaluations.
5.a.3.	All engines at maximum allowable thrust with brakes set.	Initial evaluation: ± 5 dB per 1/3 octave band. Recurrent evaluation: cannot exceed ±5 dB difference on three consecutive bands when compared to initial evaluation and the average of the absolute differences between initial and recurrent evaluation results cannot exceed 2 dB.	Ground.	Normal condition prior to takeoff.				X	For initial evaluation, it is acceptable to have some 1/3 octave bands out of ± 5 dB tolerance but not more than 2 that are consecutive and in any case within ± 7 dB from approved reference data, providing that the overall trend is correct. Where initial evaluation employs approved subjective tuning to develop the approved reference standard, recurrent evaluation tolerances should be used during recurrent evaluations.
5.a.4.	Climb	Initial evaluation: ± 5 dB per 1/3 octave band. Recurrent evaluation: cannot exceed ±5 dB difference on three consecutive bands when compared to initial evaluation and the average of the absolute differences between initial and recurrent evaluation results cannot exceed 2 dB.	En-route climb.	Medium altitude.				X	For initial evaluation, it is acceptable to have some 1/3 octave bands out of ± 5 dB tolerance but not more than 2 that are consecutive and in any case within ± 7 dB from approved reference data, providing that the overall trend is correct. Where initial evaluation employs approved subjective tuning to develop the approved reference standard, recurrent evaluation tolerances should be used during recurrent evaluations.
5.a.5.	Cruise	Initial evaluation: ± 5 dB per 1/3 octave band. Recurrent evaluation: cannot exceed ±5 dB difference on three consecutive bands when compared to initial evaluation and the	Cruise.	Normal cruise configuration.				X	For initial evaluation, it is acceptable to have some 1/3 octave bands out of ± 5 dB tolerance but not more than 2 that are consecutive and in any case within ± 7 dB from approved reference data, providing that the overall trend is correct.

		average of the absolute differences between initial and recurrent evaluation results cannot exceed 2 dB.							Where initial evaluation employs approved subjective tuning to develop the approved reference standard, recurrent evaluation tolerances should be used during recurrent evaluations.
5.a.6.	Speed brake/spoilers extended (as appropriate).	Initial evaluation: ± 5 dB per 1/3 octave band. Recurrent evaluation: cannot exceed ±5 dB difference on three consecutive bands when compared to initial evaluation and the average of the absolute differences between initial and recurrent evaluation results cannot exceed 2 dB.	Cruise.	Normal and constant speed brake deflection for descent at a constant airspeed and power setting.				X	For initial evaluation, it is acceptable to have some 1/3 octave bands out of ± 5 dB tolerance but not more than 2 that are consecutive and in any case within ± 7 dB from approved reference data, providing that the overall trend is correct. Where initial evaluation employs approved subjective tuning to develop the approved reference standard, recurrent evaluation tolerances should be used during recurrent evaluations.
5.a.7	Initial approach.	Initial evaluation: ± 5 dB per 1/3 octave band. Recurrent evaluation: cannot exceed ±5 dB difference on three consecutive bands when compared to initial evaluation and the average of the absolute differences between initial and recurrent evaluation results cannot exceed 2 dB.	Approach.	Constant airspeed, gear up, flaps/slats as appropriate.				X	For initial evaluation, it is acceptable to have some 1/3 octave bands out of ± 5 dB tolerance but not more than 2 that are consecutive and in any case within ± 7 dB from approved reference data, providing that the overall trend is correct. Where initial evaluation employs approved subjective tuning to develop the approved reference standard, recurrent evaluation tolerances should be used during recurrent evaluations.
5.a.8	Final approach.	Initial evaluation: ± 5 dB per 1/3 octave band. Recurrent evaluation: cannot exceed ±5 dB difference on three consecutive bands when compared to initial evaluation and the average of the absolute differences between	Landing.	Constant airspeed, gear down, landing configuration flaps.				X	For initial evaluation, it is acceptable to have some 1/3 octave bands out of ± 5 dB tolerance but not more than 2 that are consecutive and in any case within ± 7 dB from approved reference data, providing that the overall trend is correct.

		initial and recurrent evaluation results cannot exceed 2 dB.							Where initial evaluation employs approved subjective tuning to develop the approved reference standard, recurrent evaluation tolerances should be used during recurrent evaluations.
5.b	**Propeller-driven airplanes**								All tests in this section should be presented using an unweighted 1/3-octave band format from at least band 17 to 42 (50 Hz to 16 kHz). A measurement of minimum 20 s should be taken at the location corresponding to the approved data set. The approved data set and FSTD results should be produced using comparable data analysis techniques. Refer to paragraph 3.7 of this Appendix.
5.b.1.	Ready for engine start.	Initial evaluation: ± 5 dB per 1/3 octave band. Recurrent evaluation: cannot exceed ±5 dB difference on three consecutive bands when compared to initial evaluation and the average of the absolute differences between initial and recurrent evaluation results cannot exceed 2 dB.	Ground.	Normal condition prior to engine start. The APU should be on if appropriate.				**X**	For initial evaluation, it is acceptable to have some 1/3 octave bands out of ± 5 dB tolerance but not more than 2 that are consecutive and in any case within ± 7 dB from approved reference data, providing that the overall trend is correct. Where initial evaluation employs approved subjective tuning to develop the approved reference standard, recurrent evaluation tolerances should be used during recurrent evaluations.
5.b.2	All propellers feathered, if applicable.	Initial evaluation: ± 5 dB per 1/3 octave band. Recurrent evaluation: cannot exceed ±5 dB difference on three consecutive bands when	Ground.	Normal condition prior to takeoff.				**X**	For initial evaluation, it is acceptable to have some 1/3 octave bands out of ± 5 dB tolerance but not more than 2 that are consecutive and in any case within ± 7 dB from approved reference data,

		compared to initial evaluation and the average of the absolute differences between initial and recurrent evaluation results cannot exceed 2 dB.							providing that the overall trend is correct. Where initial evaluation employs approved subjective tuning to develop the approved reference standard, recurrent evaluation tolerances should be used during recurrent evaluations.
5.b.3.	Ground idle or equivalent.	Initial evaluation: ± 5 dB per 1/3 octave band. Recurrent evaluation: cannot exceed ±5 dB difference on three consecutive bands when compared to initial evaluation and the average of the absolute differences between initial and recurrent evaluation results cannot exceed 2 dB.	Ground.	Normal condition prior to takeoff.				X	For initial evaluation, it is acceptable to have some 1/3 octave bands out of ± 5 dB tolerance but not more than 2 that are consecutive and in any case within ± 7 dB from approved reference data, providing that the overall trend is correct. Where initial evaluation employs approved subjective tuning to develop the approved reference standard, recurrent evaluation tolerances should be used during recurrent evaluations.
5.b.4	Flight idle or equivalent.	Initial evaluation: ± 5 dB per 1/3 octave band. Recurrent evaluation: cannot exceed ±5 dB difference on three consecutive bands when compared to initial evaluation and the average of the absolute differences between initial and recurrent evaluation results cannot exceed 2 dB.	Ground.	Normal condition prior to takeoff.				X	For initial evaluation, it is acceptable to have some 1/3 octave bands out of ± 5 dB tolerance but not more than 2 that are consecutive and in any case within ± 7 dB from approved reference data, providing that the overall trend is correct. Where initial evaluation employs approved subjective tuning to develop the approved reference standard, recurrent evaluation tolerances should be used during recurrent evaluations.
5.b.5	All engines at maximum allowable power with brakes set.	Initial evaluation: ± 5 dB per 1/3 octave band. Recurrent evaluation: cannot exceed ±5 dB difference on three consecutive bands when compared to initial	Ground.	Normal condition prior to takeoff.				X	For initial evaluation, it is acceptable to have some 1/3 octave bands out of ± 5 dB tolerance but not more than 2 that are consecutive and in any case within ± 7 dB from approved reference data,

		evaluation and the average of the absolute differences between initial and recurrent evaluation results cannot exceed 2 dB.							providing that the overall trend is correct. Where initial evaluation employs approved subjective tuning to develop the approved reference standard, recurrent evaluation tolerances should be used during recurrent evaluations.
5.b.6	Climb.	Initial evaluation: ± 5 dB per 1/3 octave band. Recurrent evaluation: cannot exceed ±5 dB difference on three consecutive bands when compared to initial evaluation and the average of the absolute differences between initial and recurrent evaluation results cannot exceed 2 dB.	En-route climb.	Medium altitude.				X	For initial evaluation, it is acceptable to have some 1/3 octave bands out of ± 5 dB tolerance but not more than 2 that are consecutive and in any case within ± 7 dB from approved reference data, providing that the overall trend is correct. Where initial evaluation employs approved subjective tuning to develop the approved reference standard, recurrent evaluation tolerances should be used during recurrent evaluations.
5.b.7	Cruise	Initial evaluation: ± 5 dB per 1/3 octave band. Recurrent evaluation: cannot exceed ±5 dB difference on three consecutive bands when compared to initial evaluation and the average of the absolute differences between initial and recurrent evaluation results cannot exceed 2 dB.	Cruise.	Normal cruise configuration.				X	For initial evaluation, it is acceptable to have some 1/3 octave bands out of ± 5 dB tolerance but not more than 2 that are consecutive and in any case within ± 7 dB from approved reference data, providing that the overall trend is correct. Where initial evaluation employs approved subjective tuning to develop the approved reference standard, recurrent evaluation tolerances should be used during recurrent evaluations.
5.b.8	Initial approach.	Initial evaluation: ± 5 dB per 1/3 octave band. Recurrent evaluation: cannot exceed ±5 dB difference on three consecutive bands when compared to initial evaluation and the	Approach.	Constant airspeed, gear up, flaps extended as appropriate, RPM as per operating manual.				X	For initial evaluation, it is acceptable to have some 1/3 octave bands out of ± 5 dB tolerance but not more than 2 that are consecutive and in any case within ± 7 dB from approved reference data, providing that the overall trend is correct.

		average of the absolute differences between initial and recurrent evaluation results cannot exceed 2 dB.							Where initial evaluation employs approved subjective tuning to develop the approved reference standard, recurrent evaluation tolerances should be used during recurrent evaluations.
5.b.9	Final approach.	Initial evaluation: ± 5 dB per 1/3 octave band. Recurrent evaluation: cannot exceed ±5 dB difference on three consecutive bands when compared to initial evaluation and the average of the absolute differences between initial and recurrent evaluation results cannot exceed 2 dB.	Landing.	Constant airspeed, gear down, landing configuration flaps, RPM as per operating manual.				**X**	For initial evaluation, it is acceptable to have some 1/3 octave bands out of ± 5 dB tolerance but not more than 2 that are consecutive and in any case within ± 7 dB from approved reference data, providing that the overall trend is correct. Where initial evaluation employs approved subjective tuning to develop the approved reference standard, recurrent evaluation tolerances should be used during recurrent evaluations.
5.c.	**Special cases.**	Initial evaluation: ± 5 dB per 1/3 octave band. Recurrent evaluation: cannot exceed ±5 dB difference on three consecutive bands when compared to initial evaluation and the average of the absolute differences between initial and recurrent evaluation results cannot exceed 2 dB.	As appropriate.					**X**	This applies to special steady-state cases identified as particularly significant to the pilot, important in training, or unique to a specific airplane type or model. For initial evaluation, it is acceptable to have some 1/3 octave bands out of ± 5 dB tolerance but not more than 2 that are consecutive and in any case within ± 7 dB from approved reference data, providing that the overall trend is correct. Where initial evaluation employs approved subjective tuning to develop the approved reference standard, recurrent evaluation tolerances should be used during recurrent evaluations
5.d	**FSTD background noise**	Initial evaluation: background noise levels must fall below the sound levels described		Results of the background noise at initial qualification must be included in the QTG document and approved by the responsible Flight Standards office. The measurements are to be				**X**	The simulated sound will be evaluated to ensure that the background noise does not interfere with training.

* * * * *

		in Paragraph 7.c (5) of this Attachment. Recurrent evaluation: ±3 dB per 1/3 octave band compared to initial evaluation.		made with the simulation running, the sound muted and a dead cockpit.					Refer to paragraph 7 of this Attachment. This test should be presented using an unweighted 1/3 octave band format from band 17 to 42 (50 Hz to 16 kHz).
5.e	**Frequency response**	Initial evaluation: not applicable. Recurrent evaluation: cannot exceed ±5 dB difference on three consecutive bands when compared to initial evaluation and the average of the absolute differences between initial and recurrent evaluation results cannot exceed 2 dB.	Ground (static with all systems switched off)					X	Only required if the results are to be used during continuing qualification evaluations in lieu of airplane tests. The results must be approved by the responsible Flight Standards office during the initial qualification. This test should be presented using an unweighted 1/3 octave band format from band 17 to 42 (50 Hz to 16 kHz).
6	**SYSTEMS INTEGRATION**								
6.a.	**System response time**								
6.a.1	Transport delay.	Motion system and instrument response: 100 ms (or less) after airplane response. Visual system response: 120 ms (or less) after airplane response.	Pitch, roll and yaw.				X	X	One separate test is required in each axis. Where EFVS systems are installed, the EFVS response should be within + or - 30 ms from visual system response, and not before motion system response. *Note.— The delay from the airplane EFVS electronic elements should be added to the 30 ms tolerance before comparison with visual system reference.*
	Transport delay.	300 milliseconds or less after controller movement.	Pitch, roll and yaw.		X	X			

Table A2E

Alternative Data Sources, Procedures, and Instrumentation				
QPS REQUIREMENTS The standards in this table are required if the data gathering methods described in paragraph 9 of Appendix A are not used.				**INFORMATION**
Table of Objective Tests	**Sim Level**		**Alternative Data Sources, Procedures, and Instrumentation**	**Notes**
Test Entry Number and Title	**A**	**B**		

* * * * * * *

1.a.2. Performance. Taxi Rate of Turn vs. Nosewheel Steering Angle		**X**	Data may be acquired by using a constant tiller position, measured with a protractor or full rudder pedal application for steady state turn, and synchronized video of heading indicator. If less than full rudder pedal is used, pedal position must be recorded.	A single procedure may not be adequate for all airplane steering systems, therefore appropriate measurement procedures must be devised and proposed for the responsible Flight Standards office concurrence.

* * * * * * *

2.a.1.a. Handling Qualities. Static Control Checks. Pitch Controller Position vs. Force and Surface Position Calibration	**X**	**X**	Surface position data may be acquired from flight data recorder (FDR) sensor or, if no FDR sensor, at selected, significant column positions (encompassing significant column position data points), acceptable to the responsible Flight Standards office, using a control surface protractor on the ground. Force data may be acquired by using a hand held force gauge at the same column position data points.	For airplanes with reversible control systems, surface position data acquisition should be accomplished with winds less than 5 kts.

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2.a.2.a. Handling Qualities. Static Control Checks. Roll Controller Position vs. Force and Surface Position Calibration	**X**	**X**	Surface position data may be acquired from flight data recorder (FDR) sensor or, if no FDR sensor, at selected, significant wheel positions (encompassing significant wheel position data points), acceptable to the responsible Flight Standards office, using a control surface protractor on the ground. Force data may be acquired by using a hand held force gauge at the same wheel position data points.	For airplanes with reversible control systems, surface position data acquisition should be accomplished with winds less than 5 kts.
2.a.3.a. Handling Qualities. Static Control Checks. Rudder Pedal Position vs. Force and Surface Position Calibration	**X**	**X**	Surface position data may be acquired from flight data recorder (FDR) sensor or, if no FDR sensor, at selected, significant rudder pedal positions (encompassing significant rudder pedal position data points), acceptable to the responsible Flight Standards office, using a control surface protractor on the ground. Force data may be acquired by using a hand held force gauge at the same rudder pedal position data points.	For airplanes with reversible control systems, surface position data acquisition should be accomplished with winds less than 5 kts.

Attachments 3 * * *

Table A3C

Functions and Subjective Tests					
QPS REQUIREMENTS					
Entry Number	Additional Airport Models Beyond Minimum Required for Qualification Class II Airport Models	Simulator Level			
		A	B	C	D

This table specifies the minimum airport model content and functionality necessary to add airport models to a simulator's model library, beyond those necessary for qualification at the stated level, without the necessity of further involvement of the responsible Flight Standards office or TPAA.

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Attachment 4 * * *

Attachment 4 to Appendix A to Part 60—Figure A4A—Sample Letter, Request for Initial, Upgrade, or Reinstatement Evaluation

Information

Attachment 4 to Appendix A to Part 60—FigureA4C—Sample Letter of Compliance

Attachment 4 to Appendix A to Part 60—Figure A4C – Sample Letter of Compliance

Date _______

RE: Request for Initial/Upgrade Evaluation Date

This is to advise you of our intent to request an (initial or upgrade) evaluation of our (FFS Manufacturer), (Aircraft Type/Level) Full Flight Simulator (FFS), (FAA ID Number, if previously qualified), located in (City, State) at the (Facility) on (Proposed Evaluation Date). (The proposed evaluation date shall not be more than 180 days following the date of this letter.) The FFS will be sponsored by (Name of Training Center/Air Carrier), FAA Designator (4 Letter Code). The FFS will be sponsored as follows: (Select One)

☐ The FFS will be used within the sponsor's FAA approved training program and placed on the sponsor's Training/Operations Specifications.

☐ The FFS will be used for dry lease only.

We agree to provide the formal request for the evaluation to your staff as follows: (check one)

☐ For QTG tests run at the factory, not later, than 45 days prior to the proposed evaluation date with the additional "l/3 on-site" tests provided not later than 14 days prior to the proposed evaluation date.

☐ For QTG tests run on-site, not later than 30 days prior to the proposed evaluation date.

We understand that the formal request will contain the following documents:

1. Sponsor's Letter of Request (*Company Compliance Letter*).
2. Principal Operations Inspector (POI) or Training Center Program Manager's (TCPM) endorsement.
3. Complete QTG.

If we are unable to meet the above requirements, we understand this may result in a significant delay, perhaps 45 days or more, in rescheduling and completing the evaluation.

(The sponsor should add additional comments as necessary).

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

A copy of this letter of intent has been provided to (Name), the Principal Operations Inspector (POI) and/or Training Center Program Manager (TCPM).

Sincerely,

Attachment: FFS Information Form
cc: POI/TCPM

INFORMATION

(Date)

Mr. (Name of Training Program Approval Authority):
(Name of responsible Flight Standards office)
(Address)
(City/State/Zip)

Dear Mr. (Name of TPAA):

RE: Letter of Compliance

(Operator Sponsor Name) requests evaluation of our (Aircraft Type) FFS for Level (__) qualification. The (FFS Manufacturer Name) FFS with (Visual System Manufacturer Name/Model) system is fully defined on the FFS Information page of the accompanying Qualification Test Guide (QTG). We have completed the tests of the FFS and certify that it meets all applicable requirements of FAR parts 121, 125, or 135), and the guidance of (AC 120-40B or 14 CFR Part 60). Appropriate hardware and software configuration control procedures have been established. Our Pilot(s), (Name(s)), who are qualified on (Aircraft Type) aircraft have assessed the FFS and have found that it conforms to the (Operator/Sponsor) (Aircraft Type) flight deck configuration and that the simulated systems and subsystems function equivalently to those in the aircraft. The above named pilot(s) have also assessed the performance and the flying qualities of the FFS and find that it represents the respective aircraft.

(Added Comments may be placed here)

Sincerely,
(Sponsor Representative)

Attachment 4 to Appendix A to Part 60—Figure A4D—Sample Qualification Test Guide Cover Page

INFORMATION

SPONSOR NAME
SPONSOR ADDRESS

FAA QUALIFICATION TEST GUIDE
(SPECIFIC AIRPLANE MODEL)
for example
Stratos BA797-320A
(Type of Simulator)
(Simulator Identification Including Manufacturer, Serial Number, Visual System Used)
(Simulator Level)
(Qualification Performance Standard Used)
(Simulator Location)

FAA Initial Evaluation
Date: ______________

____________________________ Date: ____________
(Sponsor)

____________________________ Date: ____________
FAA

Attachment 4 to Appendix A to Part 60—Figure A4E—Sample Statement of Qualification—Certificate

INFORMATION

Federal Aviation Administration

Certificate of Qualification

This is to certify that representatives of the FAA Completed an evaluation of the

Go-Fast Airlines

Farnsworth Z-100 Full Flight Simulator

FAA Identification Number 999

And pursuant to 14 CFR Part 60 found it to meet its original qualification basis, AC 120-40B (MM/DD/YY)

The Master Qualification Test Guide and the attached Configuration List and Restrictions List Provide the Qualification Basis for this device to operate at

Level D

Until April 30, 2010

Unless sooner rescinded or extended by the FAA

March 15, 2009
(date)

B. Williamson
(for the FAA)

* * * * *

■ 41. In appendix B to part 60:
■ a. In the introductory ''Begin Information'' text:
■ i. In the first sentence, remove ''or Level 6'' and in its place add ''Level 6, or Level 7'';
■ ii. In the second sentence, remove '', NSPM,'';
■ iii. In the last sentence, remove the phrase ''NSPM, or a person or persons assigned by the NSPM'' and add in its place the words ''responsible Flight Standards office''.
■ b. In section 1:
■ i. Remove and reserve paragraph b.;
■ ii. Remove the last sentence of paragraph c.;
■ iii. In paragraph d.(12), add the words ''Flightcrew Member'' after ''as amended,''; and
■ iv. Revise paragraph d.(26).
■ c. In section 11:
■ i. In paragraph o. introductory text, remove the words ''an NSP pilot'' and add in their place the phrase ''a pilot from the responsible Flight Standards office'' and remove second instance of the word ''NSP'';
■ ii. In paragraph r.(1), remove the word ''NSP''; and
■ iii. In paragraph v., remove the phrase ''NSPM or visit the NSPM website'' and add in its place the words ''responsible Flight Standards office''.
■ d. In attachment 1, revise table B1A;
■ e. In attachment 2:
■ i. Revise table B2A;
■ ii. In section 4.b., remove the word ''NSP'' and add in its place the word ''FAA''; and
■ iii. In table B2F, revise entries 2.a.1.a., 2.a.2.a., and 2.a.3.a.;
■ f. In attachment 3, revise table B3C;
■ g. In attachment 4:
■ i. In the table of contents, revise the entry for Figure B4H to read ''[Reserved]'';
■ ii. Revise figures B4A, B4C, B4D, and B4E;
■ iii. Remove and reserve figure B4H;
■ h. Remove the word ''NSPM'' and in its place add the words ''responsible Flight Standards office'' in the following places:
■ i. Section 1. Introduction, paragraph c., first two instances;
■ ii. Section 9. FTD Objective Data Requirements, paragraphs d., d.(1), d.(2), g., h. and i.;
■ iii. Section 10. Special Equipment and Personnel Requirements for Qualification of the FTD, paragraph a;
■ iv. Section 11. Initial (and Upgrade) Qualification Requirements, paragraphs b.(2), b.(3), d., f., g.(1), h., j., k., l., m., n., n.(2), o., p., q., r.(2), s., t., and w.;
■ v. Section 13. Previously Qualified FTDs, paragraphs a.(1), a.(3), a.(4), a.(5), d., and i.;
■ vi. Section 14. Inspection, Continuing Qualification Evaluation, and Maintenance Requirements, paragraphs a., d., and h.;
■ vii. Section 17. Modifications to FTDs, paragraphs b.(1) and b.(2);
■ viii. Section 19. Automatic Loss of Qualification and Procedures for Restoration of Qualification;
■ ix. Section 20. Other Losses of Qualification and Procedures for Restoration of Qualification; Section
■ x. Attachment 2, section 2. Test Requirements, paragraphs a., h., j., k., and l.; and
■ xi. Attachment 2, section 5. Alternative Data Sources, Procedures, and Instrumentation: Level 6 FTD Only, paragraphs c., d.(2), and e.
■ n. Remove the word ''NSP'' in the following places:
■ i. Section 14, paragraph f; and
■ ii. Attachment 3, paragraphs 1.b, and 1.c.

The revisions read as follows:

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

* * * * *

1. Introduction

* * * * *

d. * * *

26. FAA Airman Certification Standards and Practical Test Standards for Airline Transport Pilot, Type Ratings, Commercial Pilot, and Instrument Ratings.

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Attachment 1 to Appendix B to Part 60—General FTD REQUIREMENTS

* * * * *

Table B1A – Minimum FTD Requirements

QPS REQUIREMENTS						INFORMATION
Entry Number	**General FTD Requirements**	**FTD Level**				**Notes**
		4	**5**	**6**	**7**	
1. General Flight deck Configuration.						
1.a.	The FTD must have a flight deck that is a replica of the airplane simulated with controls, equipment, observable flight deck indicators, circuit breakers, and bulkheads properly located, functionally accurate and replicating the airplane. The direction of movement of controls and switches must be identical to that in the airplane. Pilot seat(s) must afford the capability for the occupant to be able to achieve the design “eye position.” Equipment for the operation of the flight deck windows must be included, but the actual windows need not be operable. Fire axes, extinguishers, and spare light bulbs must be available in the flight FTD, but may be relocated to a suitable location as near as practical to the original position. Fire axes, landing gear pins, and any similar purpose instruments need only be represented in silhouette.			**X**	**X**	For FTD purposes, the flight deck consists of all that space forward of a cross section of the fuselage at the most extreme aft setting of the pilots' seats including additional, required flight crewmember duty stations and those required bulkheads aft of the pilot seats. For clarification, bulkheads containing only items such as landing gear pin storage compartments, fire axes and

	The use of electronically displayed images with physical overlay or masking for FTD instruments and/or instrument panels is acceptable provided: (1) All instruments and instrument panel layouts are dimensionally correct with differences, if any, being imperceptible to the pilot; (2) Instruments replicate those of the airplane including full instrument functionality and embedded logic; (3) Instruments displayed are free of quantization (stepping); (4) Instrument display characteristics replicate those of the airplane including: resolution, colors, luminance, brightness, fonts, fill patterns, line styles and symbology; (5) Overlay or masking, including bezels and bugs, as applicable, replicates the airplane panel(s); (6) Instrument controls and switches replicate and operate with the same technique, effort, travel and in the same direction as those in the airplane; (7) Instrument lighting replicates that of the airplane and is operated from the FSTD control for that lighting and, if applicable, is at a level commensurate with other lighting operated by that same control; and (8) As applicable, instruments must have faceplates that replicate those in the airplane; and Level 7 FTD only; The display image of any three dimensional instrument, such as an electro-mechanical instrument, should appear to have the same three dimensional depth as the replicated instrument. The appearance of the simulated instrument, when viewed from the principle operator's angle, should replicate that of the actual airplane instrument. Any instrument reading inaccuracy due to viewing angle and parallax present in the actual airplane instrument should be duplicated in the simulated instrument display image. Viewing angle error and parallax must be minimized on shared instruments such and engine displays and standby indicators.					extinguishers, spare light bulbs, aircraft documents pouches are not considered essential and may be omitted. For Level 6 FTDs, flight deck window panes may be omitted where non-distracting and subjectively acceptable to conduct qualified training tasks.
1.b.	The FTD must have equipment (e.g., instruments, panels, systems, circuit breakers, and controls) simulated sufficiently for the authorized training/checking events to be accomplished. The installed equipment must be located in a spatially correct location and may be in a flight deck or an open flight deck area. Additional equipment required for the authorized training/checking events must be available in the FTD, but may be located in a suitable location as near as practical to the spatially correct position.	**X**	**X**			

	Actuation of equipment must replicate the appropriate function in the airplane. Fire axes, landing gear pins, and any similar purpose instruments need only be represented in silhouette.					
1.c.	Those circuit breakers that affect procedures or result in observable flight deck indications must be properly located and functionally accurate.				**X**	
2. Programming.						
2.a.1	The FTD must provide the proper effect of aerodynamic changes for the combinations of drag and thrust normally encountered in flight. This must include the effect of change in airplane attitude, thrust, drag, altitude, temperature, and configuration. Level 6 additionally requires the effects of changes in gross weight and center of gravity. Level 5 requires only generic aerodynamic programming. An SOC is required.		**X**	**X**		
2.a.2	A flight dynamics model that accounts for various combinations of drag and thrust normally encountered in flight must correspond to actual flight conditions, including the effect of change in airplane attitude, thrust, drag, altitude, temperature, gross weight, moments of inertia, center of gravity location, and configuration. The effects of pitch attitude and of fuel slosh on the aircraft center of gravity must be simulated. An SOC is required.				**X**	
2.b.	The FTD must have the computer capacity, accuracy, resolution, and dynamic response needed to meet the qualification level sought. An SOC is required.	**X**	**X**	**X**	**X**	
2.c.1	Relative responses of the flight deck instruments must be measured by latency tests, or transport delay tests, and may not exceed 300 milliseconds. The instruments must respond to abrupt input at the pilot's position within the allotted time, but not before the time when the airplane responds under the same conditions. (1) Latency: The FTD instrument and, if applicable, the motion system and the visual system response must not be prior to that time when the		**X**	**X**		The intent is to verify that the FTD provides instrument cues that are, within the stated time delays, like the airplane responses. For airplane response, acceleration in the appropriate, corresponding rotational axis is preferred.

	airplane responds and may respond up to 300 milliseconds after that time under the same conditions. (2) Transport Delay: As an alternative to the Latency requirement, a transport delay objective test may be used to demonstrate that the FTD system does not exceed the specified limit. The sponsor must measure all the delay encountered by a step signal migrating from the pilot's control through all the simulation software modules in the correct order, using a handshaking protocol, finally through the normal output interfaces to the instrument display and, if applicable, the motion system, and the visual system.					Additional information regarding Latency and Transport Delay testing may be found in Appendix A, Attachment 2, paragraph 15.
2.c.2.	Relative responses of the motion system, visual system, and flight deck instruments, measured by latency tests or transport delay tests. Motion onset should occur before the start of the visual scene change (the start of the scan of the first video field containing different information) but must occur before the end of the scan of that video field. Instrument response may not occur prior to motion onset. Test results must be within the following limits: 100 ms for the motion (if installed) and instrument systems; and 120 ms for the visual system.				**X**	The intent is to verify that the FTD provides instrument, motion, and visual cues that are, within the stated time delays, like the airplane responses. For airplane response, acceleration in the appropriate, corresponding rotational axis is preferred.
2.d.	Ground handling and aerodynamic programming must include the following:					
2.d.1.	Ground effect.				**X**	Ground effect includes modeling that accounts for roundout, flare, touchdown, lift, drag, pitching moment, trim, and power while in ground effect.
2.d.2.	Ground reaction.				**X**	Ground reaction includes modeling that accounts for strut deflections, tire friction, and side forces. This is the reaction of the airplane upon contact with the runway during landing, and may differ with changes in factors such as gross weight, airspeed, or rate of descent on touchdown.

2.d.3.	Ground handling characteristics, including aerodynamic and ground reaction modeling including steering inputs, operations with crosswind, gusting crosswind, braking, thrust reversing, deceleration, and turning radius.				**X**	
2.e.	If the aircraft being simulated is one of the aircraft listed in § 121.358, Low-altitude windshear system equipment requirements, the FTD must employ windshear models that provide training for recognition of windshear phenomena and the execution of recovery procedures. Models must be available to the instructor/evaluator for the following critical phases of flight: (1) Prior to takeoff rotation; (2) At liftoff; (3) During initial climb; and (4) On final approach, below 500 ft AGL. The QTG must reference the FAA Windshear Training Aid or present alternate airplane related data, including the implementation method(s) used. If the alternate method is selected, wind models from the Royal Aerospace Establishment (RAE), the Joint Airport Weather Studies (JAWS) Project and other recognized sources may be implemented, but must be supported and properly referenced in the QTG. The addition of realistic levels of turbulence associated with each required windshear profile must be available and selectable to the instructor. In addition to the four basic windshear models required for qualification, at least two additional "complex" windshear models must be available to the instructor which represent the complexity of actual windshear encounters. These models must be available in the takeoff and landing configurations and must consist of independent variable winds in multiple simultaneous components. The Windshear Training Aid provides two such example "complex" windshear models that may be used to satisfy this requirement.				**X**	Windshear models may consist of independent variable winds in multiple simultaneous components. The FAA Windshear Training Aid presents one acceptable means of compliance with FTD wind model requirements. The FTD should employ a method to ensure the required survivable and non-survivable windshear scenarios are repeatable in the training environment. For Level 7 FTDs, windshear training tasks may only be qualified for aircraft equipped with a synthetic stall warning system. The qualified windshear profile(s) are evaluated to ensure the synthetic stall warning (and not the stall buffet) is first indication of the stall.
2.f.	The FTD must provide for manual and automatic testing of FTD hardware and software programming to determine compliance with FTD objective tests as prescribed in Attachment 2 of this appendix. An SOC is required.				**X**	Automatic "flagging" of out-of-tolerance situations is encouraged.
2.g.	The FTD must accurately reproduce the following runway conditions: (1) Dry; (2) Wet;				**X**	

	(3) Icy; (4) Patchy Wet; (5) Patchy Icy; and (6) Wet on Rubber Residue in Touchdown Zone. An SOC is required.					
2.h.	The FTD must simulate: (1) brake and tire failure dynamics, including antiskid failure; and (2) decreased brake efficiency due to high brake temperatures, if applicable. An SOC is required				**X**	FTD pitch, side loading, and directional control characteristics should be representative of the airplane.
2.i.	Engine and Airframe Icing Modeling that includes the effects of icing, where appropriate, on the airframe, aerodynamics, and the engine(s). 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 autoflight system) must respond properly to ice accretion consistent with the simulated aircraft. Aircraft OEM data or other acceptable analytical methods must be utilized to develop ice accretion models that are representative of the simulated aircraft's performance degradation in a typical in-flight icing encounter. 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. SOC required.				**X**	SOC should be provided describing the effects which provide training in the specific skills required for recognition of icing phenomena and execution of recovery. The SOC should describe the source data and any analytical methods used to develop ice accretion models including verification that these effects have been tested. Icing effects simulation models are only required for those airplanes authorized for operations in icing conditions. Icing simulation models should be developed to provide training in the specific skills required for recognition of ice accumulation and execution of the required response. See Attachment 7 of this Appendix for further guidance material.

2.j.	The aerodynamic modeling in the FTD must include: (1) Low-altitude level-flight ground effect; (2) Mach effect at high altitude; (3) Normal and reverse dynamic thrust effect on control surfaces; (4) Aeroelastic representations; and (5) Nonlinearities due to sideslip. An SOC is required and must include references to computations of aeroelastic representations and of nonlinearities due to sideslip.				**X**	See Attachment 2 of this appendix, paragraph 5, for further information on ground effect.
2.k.	The FTD must have aerodynamic and ground reaction modeling for the effects of reverse thrust on directional control, if applicable. An SOC is required.				**X**	
3. Equipment Operation.						
3.a.	All relevant instrument indications involved in the simulation of the airplane must automatically respond to control movement or external disturbances to the simulated airplane; e.g., turbulence or windshear. Numerical values must be presented in the appropriate units. For Level 7 FTDs, instrument indications must also respond to effects resulting from icing.		**X**	**X**	**X**	
3.b.1.	Navigation equipment must be installed and operate within the tolerances applicable for the airplane. Levels 6 must also include communication equipment (inter-phone and air/ground) like that in the airplane and, if appropriate to the operation being conducted, an oxygen mask microphone system. Level 5 need have only that navigation equipment necessary to fly an instrument approach.		**X**	**X**		
3.b.2.	Communications, navigation, caution, and warning equipment must be installed and operate within the tolerances applicable for the airplane. Instructor control of internal and external navigational aids. Navigation aids must be usable within range or line-of-sight without restriction, as applicable to the geographic area.				**X**	See Attachment 3 of this appendix for further information regarding long-range navigation equipment.
3.b.3.	Complete navigation database for at least 3 airports with corresponding precision and non-precision approach procedures, including navigational database updates.				**X**	

3.c.1.	Installed systems must simulate the applicable airplane system operation, both on the ground and in flight. Installed systems must be operative to the extent that applicable normal, abnormal, and emergency operating procedures included in the sponsor's training programs can be accomplished. Level 6 must simulate all applicable airplane flight, navigation, and systems operation. Level 5 must have at least functional flight and navigational controls, displays, and instrumentation. Level 4 must have at least one airplane system installed and functional.	**X**	**X**	**X**		
3.c.2.	Simulated airplane systems must operate as the airplane systems operate under normal, abnormal, and emergency operating conditions on the ground and in flight. Once activated, proper systems operation must result from system management by the crew member and not require any further input from the instructor's controls.				**X**	Airplane system operation should be predicated on, and traceable to, the system data supplied by the airplane manufacturer, original equipment manufacturer or alternative approved data for the airplane system or component. At a minimum, alternate approved data should validate the operation of all normal, abnormal, and emergency operating procedures and training tasks the FSTD is qualified to conduct.
3.d.	The lighting environment for panels and instruments must be sufficient for the operation being conducted.	**X**	**X**	**X**	**X**	Back-lighted panels and instruments may be installed but are not required.
3.e.	The FTD must provide control forces and control travel that corresponds to the airplane being simulated. Control forces must react in the same manner as in the airplane under the same flight conditions. For Level 7 FTDs, control systems must replicate airplane operation for the normal and any non-normal modes including back-up systems and should reflect failures of associated systems. Appropriate cockpit indications and messages must be replicated.			**X**	**X**	

3.f.	The FTD must provide control forces and control travel of sufficient precision to manually fly an instrument approach.		**X**			
3.e.	FTD control feel dynamics must replicate the airplane. This must be determined by comparing a recording of the control feel dynamics of the FTD to airplane measurements. For initial and upgrade qualification evaluations, the control dynamic characteristics must be measured and recorded directly from the flight deck controls, and must be accomplished in takeoff, cruise, and landing flight conditions and configurations.				**X**	
4. Instructor or Evaluator Facilities.						
4.a.1.	In addition to the flight crewmember stations, suitable seating arrangements for an instructor/check airman and FAA Inspector must be available. These seats must provide adequate view of crewmember's panel(s).	**X**	**X**	**X**		These seats need not be a replica of an aircraft seat and may be as simple as an office chair placed in an appropriate position.
4.a.2.	In addition to the flight crewmember stations, the FTD must have at least two suitable seats for the instructor/check airman and FAA inspector. These seats must provide adequate vision to the pilot's panel and forward windows. All seats other than flight crew seats need not represent those found in the airplane, but must be adequately secured to the floor and equipped with similar positive restraint devices.				**X**	The responsible Flight Standards office will consider alternatives to this standard for additional seats based on unique flight deck configurations.
4.b.1.	The FTD must have instructor controls that permit activation of normal, abnormal, and emergency conditions as appropriate. Once activated, proper system operation must result from system management by the crew and not require input from the instructor controls.	**X**	**X**	**X**		
4.b.2.	The FTD must have controls that enable the instructor/evaluator to control all required system variables and insert all abnormal or emergency conditions into the simulated airplane systems as described in the sponsor's FAA-approved training program; or as described in the relevant operating manual as appropriate.				**X**	
4.c.	The FTD must have instructor controls for all environmental effects expected to be available at the IOS; e.g., clouds, visibility, icing, precipitation, temperature, storm cells and microbursts, turbulence, and intermediate and high altitude wind speed and direction.				**X**	
4.d.	The FTD must provide the instructor or evaluator the ability to present ground and air hazards.				**X**	For example, another airplane crossing the active runway or converging airborne traffic.
5. Motion System.						

5.a.	The FTD may have a motion system, if desired, although it is not required. If a motion system is installed and additional training, testing, or checking credits are being sought on the basis of having a motion system, the motion system operation may not be distracting and must be coupled closely to provide integrated sensory cues. The motion system must also respond to abrupt input at the pilot's position within the allotted time, but not before the time when the airplane responds under the same conditions.		**X**	**X**	**X**	The motion system standards set out in part 60, Appendix A for at least Level A simulators is acceptable.
5.b.	If a motion system is installed, it must be measured by latency tests or transport delay tests and may not exceed 300 milliseconds. Instrument response may not occur prior to motion onset.			**X**	**X**	The motion system standards set out in part 60, Appendix A for at least Level A simulators is acceptable.
6. Visual System.						
6.a.	The FTD may have a visual system, if desired, although it is not required. If a visual system is installed, it must meet the following criteria:	**X**	**X**	**X**		
6.a.1.	The visual system must respond to abrupt input at the pilot's position. An SOC is required.		**X**	**X**		
6.a.2.	The visual system must be at least a single channel, non-collimated display. An SOC is required.	**X**	**X**	**X**		
6.a.3.	The visual system must provide at least a field-of-view of 18° vertical / 24° horizontal for the pilot flying. An SOC is required.	**X**	**X**	**X**		
6.a.4.	The visual system must provide for a maximum parallax of 10° per pilot. An SOC is required.	**X**	**X**	**X**		
6.a.5.	The visual scene content may not be distracting. An SOC is required.	**X**	**X**	**X**		
6.a.6.	The minimum distance from the pilot's eye position to the surface of a direct view display may not be less than the distance to any front panel instrument. An SOC is required.					
6.a.7.	The visual system must provide for a minimum resolution of 5 arc-minutes for both computed and displayed pixel size. An SOC is required.	**X**	**X**	**X**		
6.b.	If a visual system is installed and additional training, testing, or checking credits are being sought on the basis of having a visual system, a visual system meeting the standards set out for at least a Level A FFS (see Appendix A of this part) will be required. A "direct-view," non-collimated visual system (with the other requirements for a Level A visual system met) may be considered satisfactory for those			**X**		Directly projected, non-collimated visual displays may prove to be unacceptable for dual pilot applications.

	installations where the visual system design "eye point" is appropriately adjusted for each pilot's position such that the parallax error is at or less than 10º simultaneously for each pilot. An SOC is required.					
6.c.	The FTD must have a visual system providing an out-of-the-flight deck view.				**X**	
6.d.	The FTD must provide a continuous visual field-of-view of at least176° horizontally and 36° vertically or the number of degrees necessary to meet the visual ground segment requirement, whichever is greater. The minimum horizontal field-of-view coverage must be plus and minus one-half (½) of the minimum continuous field-of-view requirement, centered on the zero degree azimuth line relative to the aircraft fuselage. An SOC is required and must explain the system geometry measurements including system linearity and field-of-view. Collimation is not required but parallax effects must be minimized (not greater than 10° for each pilot when aligned for the point midway between the left and right seat eyepoints).				**X**	The horizontal field-of-view is traditionally described as a 180º field-of-view. However, the field-of-view is technically no less than 176º. Additional field-of-view capability may be added at the sponsor's discretion provided the minimum fields of view are retained.
6.e.	The visual system must be free from optical discontinuities and artifacts that create non-realistic cues.				**X**	Non-realistic cues might include image "swimming" and image "roll-off," that may lead a pilot to make incorrect assessments of speed, acceleration, or situational awareness.
6.f.	The FTD must have operational landing lights for night scenes. Where used, dusk (or twilight) scenes require operational landing lights.				**X**	
6.g.	The FTD must have instructor controls for the following: (1) Visibility in statute miles (km) and runway visual range (RVR) in ft.(m); (2) Airport selection; and (3) Airport lighting.				**X**	
6.h.	The FTD must provide visual system compatibility with dynamic response programming.				**X**	
6.i.	The FTD must show that the segment of the ground visible from the FTD flight deck is the same as from the airplane flight deck (within established				**X**	This will show the modeling accuracy of RVR, glideslope, and localizer for a given weight, configuration, and speed within

	tolerances) when at the correct airspeed, in the landing configuration, at the appropriate height above the touchdown zone, and with appropriate visibility.					the airplane's operational envelope for a normal approach and landing.
6.j.	The FTD must provide visual cues necessary to assess sink rates (provide depth perception) during takeoffs and landings, to include: (1) Surface on runways, taxiways, and ramps; and (2) Terrain features.				**X**	
6.k.	The FTD must provide for accurate portrayal of the visual environment relating to the FTD attitude.				**X**	Visual attitude vs. FTD attitude is a comparison of pitch and roll of the horizon as displayed in the visual scene compared to the display on the attitude indicator.
6.l.	The FTD must provide for quick confirmation of visual system color, RVR, focus, and intensity. An SOC is required.				**X**	
6.m.	The FTD must be capable of producing at least 10 levels of occulting.				**X**	
6.n.	Night Visual Scenes. When used in training, testing, or checking activities, the FTD must provide night visual scenes with sufficient scene content to recognize the airport, the terrain, and major landmarks around the airport. The scene content must allow a pilot to successfully accomplish a visual landing. Scenes must include a definable horizon and typical terrain characteristics such as fields, roads and bodies of water and surfaces illuminated by airplane landing lights.				**X**	
6.o.	Dusk (or Twilight) Visual Scenes. When used in training, testing, or checking activities, the FTD must provide dusk (or twilight) visual scenes with sufficient scene content to recognize the airport, the terrain, and major landmarks around the airport. The scene content must allow a pilot to successfully accomplish a visual landing. Dusk (or twilight) scenes, as a minimum, must provide full color presentations of reduced ambient intensity, sufficient surfaces with appropriate textural cues that include self-illuminated objects such as road networks, ramp lighting and airport signage, to conduct a visual approach, landing and airport movement (taxi). Scenes must include a definable horizon and typical terrain characteristics such as fields, roads and bodies of water and surfaces illuminated by airplane landing lights. If provided, directional horizon lighting must have correct orientation and be consistent with surface shading effects. Total night or dusk (twilight) scene				**X**	

	content must be comparable in detail to that produced by 10,000 visible textured surfaces and 15,000 visible lights with sufficient system capacity to display 16 simultaneously moving objects. An SOC is required.					
6.p.	Daylight Visual Scenes. The FTD must provide daylight visual scenes with sufficient scene content to recognize the airport, the terrain, and major landmarks around the airport. The scene content must allow a pilot to successfully accomplish a visual landing. Any ambient lighting must not “washout” the displayed visual scene. Total daylight scene content must be comparable in detail to that produced by 10,000 visible textured surfaces and 6,000 visible lights with sufficient system capacity to display 16 simultaneously moving objects. The visual display must be free of apparent and distracting quantization and other distracting visual effects while the FTD is in motion. An SOC is required.				**X**	
6.q.	The FTD must provide operational visual scenes that portray physical relationships known to cause landing illusions to pilots.				**X**	For example: short runways, landing approaches over water, uphill or downhill runways, rising terrain on the approach path, unique topographic features.
6.r.	The FTD must provide special weather representations of light, medium, and heavy precipitation near a thunderstorm on takeoff and during approach and landing. Representations need only be presented at and below an altitude of 2,000 ft. (610 m) above the airport surface and within 10 miles (16 km) of the airport.				**X**	
6.s.	The FTD must present visual scenes of wet and snow-covered runways, including runway lighting reflections for wet conditions, partially obscured lights for snow conditions, or suitable alternative effects.				**X**	
6.t.	The FTD must present realistic color and directionality of all airport lighting.				**X**	
6.u.	The following weather effects as observed on the visual system must be simulated and respective instructor controls provided. (1) Multiple cloud layers with adjustable bases, tops, sky coverage and scud effect; (2) Storm cells activation and/or deactivation;				**X**	Scud effects are low, detached, and irregular clouds below a defined cloud layer.

	(3) Visibility and runway visual range (RVR), including fog and patchy fog effect; (4) Effects on ownship external lighting; (5) Effects on airport lighting (including variable intensity and fog effects); (6) Surface contaminants (including wind blowing effect); (7) Variable precipitation effects (rain, hail, snow); (8) In-cloud airspeed effect; and (9) Gradual visibility changes entering and breaking out of cloud.					
6.v.	The simulator must provide visual effects for: (1) Light poles; (2) Raised edge lights as appropriate; and (3) Glow associated with approach lights in low visibility before physical lights are seen,				**X**	Visual effects for light poles and raised edge lights are for the purpose of providing additional depth perception during takeoff, landing, and taxi training tasks. Three dimensional modeling of the actual poles and stanchions is not required.
7. Sound System.						
7.a.	The FTD must provide flight deck sounds that result from pilot actions that correspond to those that occur in the airplane.			**X**	**X**	
7.b.	The volume control must have an indication of sound level setting which meets all qualification requirements.				**X**	This indication is of the sound level setting as evaluated during the FTD's initial evaluation.
7.c.	The FTD must accurately simulate the sound of precipitation, windshield wipers, and other significant airplane noises perceptible to the pilot during normal and abnormal operations, and include the sound of a crash (when the FTD is landed in an unusual attitude or in excess of the structural gear limitations); normal engine and thrust reversal sounds; and the sounds of flap, gear, and spoiler extension and retraction. Sounds must be directionally representative. An SOC is required.				**X**	

7.d.	The FTD must provide realistic amplitude and frequency of flight deck noises and sounds. FTD performance must be recorded, subjectively assessed for the initial evaluation, and be made a part of the QTG.				**X**	

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Attachment 2 to Appendix B to Part 60—Flight Training Device (FTD) Objective Tests

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Table B2A - Flight Training Device (FTD) Objective Tests								
QPS REQUIREMENTS								INFORMATION
Test		Tolerance	Flight Conditions	Test Details	FTD Level			Notes
Entry Number	Title				5	6	7	
1. Performance.								
1.a.	**Taxi.**							
1.a.1	Minimum radius turn.	±0.9 m (3 ft) or ±20% of airplane turn radius.	Ground.	Plot both main and nose gear loci and key engine parameter(s). Data for no brakes and the minimum thrust required to maintain a steady turn except for airplanes requiring asymmetric thrust or braking to achieve the minimum radius turn.			X	
1.a.2	Rate of turn versus nosewheel steering angle (NWA).	±10% or ±2°/s of turn rate.	Ground.	Record for a minimum of two speeds, greater than minimum turning radius speed with one at a typical taxi speed, and with a spread of at least 5 kt.			X	
1.b.	**Takeoff.**			*Note.— For Level 7 FTD, all airplane manufacturer commonly-used certificated take-off flap settings must be demonstrated at least once either in minimum unstick speed (1.b.3), normal take-off (1.b.4), critical engine failure on take-off (1.b.5) or crosswind take-off (1.b.6).*				
1.b.1	Ground acceleration time and distance.	±1.5 s or ±5% of time; and ±61 m (200 ft) or ±5% of distance. For Level 6 FTD: ±1.5 s or ±5% of time.	Takeoff.	Acceleration time and distance must be recorded for a minimum of 80% of the total time from brake release to V_r. Preliminary aircraft certification data may be used.		X	X	May be combined with normal takeoff (1.b.4.) or rejected takeoff (1.b.7.). Plotted data should be shown using appropriate scales for each portion of the maneuver. For Level 6 FTD, this test is required only if RTO training credit is sought.
1.b.2	Minimum control speed, ground (V_{mcg}) using aerodynamic controls only per applicable airworthiness requirement or alternative engine inoperative test to demonstrate ground control characteristics.	±25% of maximum airplane lateral deviation reached or ±1.5 m (5 ft). For airplanes with reversible flight control systems: ±10% or ±2.2 daN (5 lbf) rudder pedal force.	Takeoff.	Engine failure speed must be within ±1 kt of airplane engine failure speed. Engine thrust decay must be that resulting from the mathematical model for the engine applicable to the FTD under test. If the modeled engine is not the same as the airplane manufacturer's flight test engine, a further test may be run with the same initial conditions using the thrust from the flight test data as the driving parameter.			X	If a V_{mcg} test is not available, an acceptable alternative is a flight test snap engine deceleration to idle at a speed between V_1 and V_1-10 kt, followed by control of heading using aerodynamic control only and recovery should be achieved with the main gear on the ground. To ensure only aerodynamic control, nosewheel steering must be disabled (i.e. castored) or the nosewheel held slightly off the ground.

1.b.3	Minimum unstick speed (V_{mu}) or equivalent test to demonstrate early rotation take-off characteristics.	±3 kt airspeed. ±1.5° pitch angle.	Takeoff.	Record time history data from 10 knots before start of rotation until at least 5 seconds after the occurrence of main gear lift-off.			**X**	V_{mu} is defined as the minimum speed at which the last main landing gear leaves the ground. Main landing gear strut compression or equivalent air/ground signal should be recorded. If a V_{mu} test is not available, alternative acceptable flight tests are a constant high-attitude takeoff run through main gear lift-off or an early rotation takeoff. If either of these alternative solutions is selected, aft body contact/tail strike protection functionality, if present on the airplane, should be active.
1.b.4	Normal take-off.	±3 kt airspeed. ±1.5° pitch angle. ±1.5° AOA. ±6 m (20 ft) height. For airplanes with reversible flight control systems: ±2.2 daN (5 lbf) or ±10% of column force.	Takeoff.	Data required for near maximum certificated takeoff weight at mid center of gravity location and light takeoff weight at an aft center of gravity location. If the airplane has more than one certificated take-off configuration, a different configuration must be used for each weight. Record takeoff profile from brake release to at least 61 m (200 ft) AGL.			**X**	The test may be used for ground acceleration time and distance (1.b.1). Plotted data should be shown using appropriate scales for each portion of the maneuver.
1.b.5	Critical engine failure on take-off.	±3 kt airspeed. ±1.5° pitch angle. ±1.5° AOA. ±6 m (20 ft) height. ±2° roll angle. ±2° side-slip angle. ±3° heading angle. For airplanes with reversible flight control systems: ±2.2 daN (5 lbf) or ±10% of column force; ±1.3 daN (3 lbf) or ±10% of wheel force; and	Takeoff.	Record takeoff profile to at least 61 m (200 ft) AGL. Engine failure speed must be within ±3 kt of airplane data. Test at near maximum takeoff weight			**X**	

		±2.2 daN (5 lbf) or ±10% of rudder pedal force.						
1.b.6	Crosswind take-off.	± 3 kt airspeed. ±1.5° pitch angle. ±1.5° AOA. ±6 m (20 ft) height. ±2° roll angle. ±2° side-slip angle. ±3° heading angle. Correct trends at ground speeds below 40 kt for rudder/pedal and heading angle. For airplanes with reversible flight control systems: ±2.2 daN (5 lbf) or ±10% of column force; ±1.3 daN (3 lbf) or ±10% of wheel force; and ±2.2 daN (5 lbf) or ±10% of rudder pedal force.	Takeoff.	Record takeoff profile from brake release to at least 61 m (200 ft) AGL. This test requires test data, including wind profile, for a crosswind component of at least 60% of the airplane performance data value measured at 10 m (33 ft) above the runway. Wind components must be provided as headwind and crosswind values with respect to the runway.			**X**	In those situations where a maximum crosswind or a maximum demonstrated crosswind is not known, contact the responsible Flight Standards office.
1.b.7.a.	Rejected Takeoff.	±5% of time or ±1.5 s. ±7.5% of distance or ±76 m (250 ft). For Level 6 FTD: ±5% of time or ±1.5 s.	Takeoff.	Record at mass near maximum takeoff weight. Speed for reject must be at least 80% of V_1. Maximum braking effort, auto or manual. Where a maximum braking demonstration is not available, an acceptable alternative is a test using approximately 80% braking and full reverse, if applicable. Time and distance must be recorded from brake release to a full stop.			**X**	Autobrakes will be used where applicable.
1.b.7.b.	Rejected Takeoff.	±5% of time or ±1.5 s.	Takeoff	Record time for at least 80% of the segment from initiation of the rejected takeoff to full stop.		**X**		For Level 6 FTD, this test is required only if RTO training credit is sought.

1.b.8.	Dynamic Engine Failure After Takeoff.	±2°/s or ±20% of body angular rates.	Takeoff.	Engine failure speed must be within ±3 kt of airplane data. Engine failure may be a snap deceleration to idle. Record hands-off from 5 s before engine failure to +5 s or 30° roll angle, whichever occurs first. **CCA**: Test in Normal and Non-normal control state.			**X**	For safety considerations, airplane flight test may be performed out of ground effect at a safe altitude, but with correct airplane configuration and airspeed.
1.c.	**Climb.**							
1.c.1.	Normal Climb, all engines operating.	±3 kt airspeed. ±0.5 m/s (100 ft/ min) or ±5% of rate of climb.	Clean.	Flight test data are preferred; however, airplane performance manual data are an acceptable alternative. Record at nominal climb speed and mid initial climb altitude. FTD performance is to be recorded over an interval of at least 300 m (1, 000 ft).	**X**	**X**	**X**	For Level 5 and Level 6 FTDs, this may be a snapshot test result.
1.c.2.	One-engine-inoperative 2nd segment climb.	±3 kt airspeed. ±0.5 m/s (100 ft/ min) or ±5% of rate of climb, but not less than airplane performance data requirements.	2nd segment climb.	Flight test data is preferred; however, airplane performance manual data is an acceptable alternative. Record at nominal climb speed. FTD performance is to be recorded over an interval of at least 300 m (1,000 ft). Test at WAT (weight, altitude or temperature) limiting condition.			**X**	
1.c.3.	One Engine Inoperative En route Climb.	±10% time, ±10% distance, ±10% fuel used	Clean	Flight test data or airplane performance manual data may be used. Test for at least a 1,550 m (5,000 ft) segment.			**X**	
1.c.4.	One Engine Inoperative Approach Climb for airplanes with icing accountability if provided in the airplane performance data for this phase of flight.	±3 kt airspeed. ±0.5 m/s (100 ft/ min) or ±5% rate of climb, but not less than airplane performance data.	Approach	Flight test data or airplane performance manual data may be used. FTD performance to be recorded over an interval of at least 300 m (1,000 ft). Test near maximum certificated landing weight as may be applicable to an approach in icing conditions.			**X**	Airplane should be configured with all anti-ice and de-ice systems operating normally, gear up and go-around flap. All icing accountability considerations, in accordance with the airplane performance data for an approach in icing conditions, should be applied.
1.d.	**Cruise / Descent.**							
1.d.1.	Level flight acceleration	±5% Time	Cruise	Time required to increase airspeed a minimum of 50 kt, using maximum continuous thrust rating or equivalent.			**X**	

				For airplanes with a small operating speed range, speed change may be reduced to 80% of operational speed change.				
1.d.2.	Level flight deceleration.	±5% Time	Cruise	Time required to decrease airspeed a minimum of 50 kt, using idle power. For airplanes with a small operating speed range, speed change may be reduced to 80% of operational speed change.			**X**	
1.d.3.	Cruise performance.	±.05 EPR or ±3% N1 or ±5% of torque. ±5% of fuel flow.	Cruise.	The test may be a single snapshot showing instantaneous fuel flow, or a minimum of two consecutive snapshots with a spread of at least 3 minutes in steady flight.			**X**	
1.d.4.	Idle descent.	±3 kt airspeed. ±1.0 m/s (200 ft/min) or ±5% of rate of descent.	Clean.	Idle power stabilized descent at normal descent speed at mid altitude. FTD performance to be recorded over an interval of at least 300 m (1,000 ft).			**X**	
1.d.5.	Emergency descent.	±5 kt airspeed. ±1.5 m/s (300 ft/min) or ±5% of rate of descent.	As per airplane performance data.	FTD performance to be recorded over an interval of at least 900 m (3,000 ft).			**X**	Stabilized descent to be conducted with speed brakes extended if applicable, at mid altitude and near V_{mo} or according to emergency descent procedure.
1.e.	**Stopping.**							
1.e.1.	Deceleration time and distance, manual wheel brakes, dry runway, no reverse thrust.	±1.5 s or ±5% of time. For distances up to 1,220 m (4,000 ft), the smaller of ±61 m (200 ft) or ±10% of distance. For distances greater than 1,220 m (4,000 ft), ±5% of distance.	Landing.	Time and distance must be recorded for at least 80% of the total time from touchdown to a full stop. Position of ground spoilers and brake system pressure must be plotted (if applicable). Data required for medium and near maximum certificated landing weight. Engineering data may be used for the medium weight condition.			**X**	
1.e.2.	Deceleration time and distance, reverse thrust, no wheel brakes, dry runway.	±1.5 s or ±5% of time; and the smaller of ±61 m (200 ft) or ±10% of distance.	Landing	Time and distance must be recorded for at least 80% of the total time from initiation of reverse thrust to full thrust reverser minimum operating speed. Position of ground spoilers must be plotted (if applicable). Data required for medium and near maximum certificated landing weight. Engineering data may be used for the medium weight condition.			**X**	
1.e.3.	Stopping distance, wheel brakes, wet runway.	±61 m (200 ft) or ±10% of distance.	Landing.	Either flight test or manufacturer's performance manual data must be used, where available.			**X**	

				Engineering data, based on dry runway flight test stopping distance and the effects of contaminated runway braking coefficients, are an acceptable alternative.				
1.e.4.	Stopping distance, wheel brakes, icy runway.	±61 m (200 ft) or ±10% of distance.	Landing.	Either flight test or manufacturer's performance manual data must be used, where available. Engineering data, based on dry runway flight test stopping distance and the effects of contaminated runway braking coefficients, are an acceptable alternative.			**X**	
1.f.	**Engines.**							
1.f.1.	Acceleration.	For Level 7 FTD: ±10% Ti or ±0.25 s; and ±10% Tt or ±0.25 s. For Level 6 FTD: ±10% Tt or ±0.25 s. For Level 5 FTD: ±1 s	Approach or landing	Total response is the incremental change in the critical engine parameter from idle power to go-around power.	**X**	**X**	**X**	See Appendix F of this part for definitions of T_i, and T_t.
1.f.2.	Deceleration.	For Level 7 FTD: ±10% Ti or ±0.25 s; and ±10% Tt or ±0.25 s. For Level 6 FTD: ±10% Tt or ±0.25 s. For Level 5 FTD: ±1 s	Ground	Total response is the incremental change in the critical engine parameter from maximum take-off power to idle power.	**X**	**X**	**X**	See Appendix F of this part for definitions of T_i, and T_t.
2. Handling Qualities.								
2.a.	**Static Control Tests.**							
	Note.1 — Testing of position versus force is not applicable if forces are generated solely by use of airplane hardware in the FTD. *Note 2 — Pitch, roll and yaw controller position versus force or time should be measured at the control. An alternative method in lieu of external test fixtures at the flight controls would be to have recording and measuring instrumentation built into the FTD. The force and position data from this instrumentation could be directly recorded and matched to the airplane data. Provided the instrumentation was verified by using external measuring equipment while conducting the static control checks, or equivalent means, and that evidence of the satisfactory comparison is included in the MQTG, the instrumentation could be used for both initial and recurrent evaluations for the measurement of all required control checks. Verification of the instrumentation by using external measuring equipment should be repeated if major modifications and/or repairs are made to the control loading system. Such a permanent installation could be used without any time being lost for the installation of external devices. Static and dynamic flight control tests should be accomplished at the same feel or impact pressures as the validation data where applicable.* *Note 3 — (Level 7 FTD only) FTD static control testing from the second set of pilot controls is only required if both sets of controls are not mechanically interconnected on the FTD. A rationale is required from the data provider if a single set of data is applicable to both sides. If controls are mechanically interconnected in the FTD, a single set of tests is sufficient.*							
2.a.1.a.	Pitch controller position versus force and surface position calibration.	±0.9 daN (2 lbf) breakout. ±2.2 daN (5 lbf) or ±10% of force. ±2° elevator angle.	Ground.	Record results for an uninterrupted control sweep to the stops.		**X**	**X**	Test results should be validated with in-flight data from tests such as longitudinal static stability, stalls, etc.
2.a.1.b.	Pitch controller position versus force	±0.9 daN (2 lbf) breakout.	As determined by sponsor	Record results during initial qualification evaluation for an uninterrupted control sweep to the stops. The recorded tolerances apply to subsequent comparisons on continuing qualification evaluations.	**X**			Applicable only on continuing qualification evaluations. The intent is to design the control feel for Level 5 to be able to manually fly an instrument

		±2.2 daN (5 lbf) or ±10% of force.						approach; and not to compare results to flight test or other such data.
2.a.2.a.	Roll controller position versus force and surface position calibration.	±0.9 daN (2 lbf) breakout. ±1.3 daN (3 lbf) or ±10% of force. ±2° aileron angle. ±3° spoiler angle.	Ground.	Record results for an uninterrupted control sweep to the stops.		**X**	**X**	Test results should be validated with in-flight data from tests such as engine-out trims, steady state side-slips, etc.
2.a.2.b.	Roll controller position versus force	±0.9 daN (2 lbf) breakout. ±1.3 daN (3 lbf) or ±10% of force.	As determined by sponsor	Record results during initial qualification evaluation for an uninterrupted control sweep to the stops. The recorded tolerances apply to subsequent comparisons on continuing qualification evaluations.	**X**			Applicable only on continuing qualification evaluations. The intent is to design the control feel for Level 5 to be able to manually fly an instrument approach; and not to compare results to flight test or other such data.
2.a.3.a.	Rudder pedal position versus force and surface position calibration.	±2.2 daN (5 lbf) breakout. ±2.2 daN (5 lbf) or ±10% of force. ±2° rudder angle.	Ground.	Record results for an uninterrupted control sweep to the stops.		**X**	**X**	Test results should be validated with in-flight data from tests such as engine-out trims, steady state side-slips, etc.
2.a.3.b.	Rudder pedal position versus force	±2.2 daN (5 lbf) breakout. ±2.2 daN (5 lbf) or ±10% of force.	As determined by sponsor	Record results during initial qualification evaluation for an uninterrupted control sweep to the stops. The recorded tolerances apply to subsequent comparisons on continuing qualification evaluations.	**X**			Applicable only on continuing qualification evaluations. The intent is to design the control feel for Level 5 to be able to manually fly an instrument approach; and not to compare results to flight test or other such data.
2.a.4.a.	Nosewheel Steering Controller Force and Position Calibration.	±0.9 daN (2 lbf) breakout. ±1.3 daN (3 lbf) or ±10% of force. ±2° NWA.	Ground.	Record results of an uninterrupted control sweep to the stops.			**X**	
2.a.4.b.	Nosewheel Steering Controller Force	±0.9 daN (2 lbf) breakout. ±1.3 daN (3 lbf) or ±10% of force.	Ground.	Record results of an uninterrupted control sweep to the stops.		**X**		
2.a.5.	Rudder Pedal Steering Calibration.	±2° NWA.	Ground.	Record results of an uninterrupted control sweep to the stops.		**X**	**X**	
2.a.6.	Pitch Trim Indicator vs. Surface Position Calibration.	±0.5° trim angle.	Ground.			**X**	**X**	The purpose of the test is to compare FSTD surface position indicator against the FSTD flight controls model computed value.

2.a.7.	Pitch Trim Rate.	±10% of trim rate (°/s) or ±0.1°/s trim rate.	Ground and approach.	Trim rate to be checked at pilot primary induced trim rate (ground) and autopilot or pilot primary trim rate in-flight at go-around flight conditions. For CCA, representative flight test conditions must be used.			**X**	
2.a.8.	Alignment of cockpit throttle lever versus selected engine parameter.	When matching engine parameters: ±5° of TLA. When matching detents: ±3% N1 or ±.03 EPR or ±3% torque, or ±3% maximum rated manifold pressure, or equivalent. Where the levers do not have angular travel, a tolerance of ±2 cm (±0.8 in) applies.	Ground.	Simultaneous recording for all engines. The tolerances apply against airplane data. For airplanes with throttle detents, all detents to be presented and at least one position between detents/ endpoints (where practical). For airplanes without detents, end points and at least three other positions are to be presented.		**X**	**X**	Data from a test airplane or engineering test bench are acceptable, provided the correct engine controller (both hardware and software) is used. In the case of propeller-driven airplanes, if an additional lever, usually referred to as the propeller lever, is present, it should also be checked. This test may be a series of snapshot tests.
2.a.9.a.	Brake pedal position versus force and brake system pressure calibration.	±2.2 daN (5 lbf) or ±10% of force. ±1.0 MPa (150 psi) or ±10% of brake system pressure.	Ground.	Relate the hydraulic system pressure to pedal position in a ground static test. Both left and right pedals must be checked.			**X**	FTD computer output results may be used to show compliance.
2.a.9.b.	Brake pedal position versus force	±2.2 daN (5 lbf) or ±10% of force.	Ground.	Two data points are required: zero and maximum deflection. Computer output results may be used to show compliance.		**X**		FTD computer output results may be used to show compliance. Test not required unless RTO credit is sought.
2.b.	**Dynamic Control Tests.**							
	Note.— Tests 2.b.1, 2.b.2 and 2.b.3 are not applicable for FTDs where the control forces are completely generated within the airplane controller unit installed in the FTD. Power setting may be that required for level flight unless otherwise specified. See paragraph 4 of Appendix A, Attachment 2.							
2.b.1.	Pitch Control.	**For underdamped systems**: $T(P_0)$ ±10% of P_0 or ±0.05 s. $T(P_1)$ ±20% of P_1 or ±0.05 s. $T(P_2)$ ±30% of P_2 or ±0.05 s. $T(P_n)$ ±10*(n+1)% of P_n	Takeoff, Cruise, and Landing.	Data must be for normal control displacements in both directions (approximately 25% to 50% of full throw or approximately 25% to 50% of maximum allowable pitch controller deflection for flight conditions limited by the maneuvering load envelope). Tolerances apply against the absolute values of each period (considered independently).			**X**	n = the sequential period of a full oscillation. Refer to paragraph 4 of Appendix A, Attachment 2 for additional information. For overdamped and critically damped systems, see Figure A2B of Appendix A for an illustration of the reference measurement.

		or ±0.05 s. $T(A_n)$ ±10% of A_{max}, where A_{max} is the largest amplitude or ±0.5% of the total control travel (stop to stop). $T(A_d)$ ±5% of A_d = residual band or ±0.5% of the maximum control travel = residual band. ±1 significant overshoots (minimum of 1 significant overshoot). Steady state position within residual band. *Note 1.— Tolerances should not be applied on period or amplitude after the last significant overshoot.* *Note 2.— Oscillations within the residual band are not considered significant and are not subject to tolerances.* **For overdamped and critically damped systems only**, the following tolerance applies: $T(P_0)$ ±10% of P_0 or ±0.05 s.						
2.b.2.	Roll Control.	Same as 2.b.1.	Takeoff, Cruise, and Landing.	Data must be for normal control displacement (approximately 25% to 50% of full throw or approximately 25% to 50% of maximum allowable roll controller deflection for flight conditions limited by the maneuvering load envelope).			**X**	Refer to paragraph 4 of Appendix A, Attachment 2 for additional information. For overdamped and critically damped systems, see Figure A2B of Appendix A for an illustration of the reference measurement.
2.b.3.	Yaw Control.	Same as 2.b.1.	Takeoff, Cruise, and Landing.	Data must be for normal control displacement (approximately 25% to 50% of full throw).			**X**	Refer to paragraph 4 of Appendix A, Attachment 2 for additional information.

								For overdamped and critically damped systems, see Figure A2B of Appendix A for an illustration of the reference measurement.
2.b.4.	Small Control Inputs – Pitch.	±0.15°/s body pitch rate or ±20% of peak body pitch rate applied throughout the time history.	Approach or Landing.	Control inputs must be typical of minor corrections made while established on an ILS approach (approximately 0.5 to 2°/s pitch rate). Test in both directions. Show time history data from 5 s before until at least 5 s after initiation of control input. If a single test is used to demonstrate both directions, there must be a minimum of 5 s before control reversal to the opposite direction. **CCA**: Test in normal and non-normal control state.			**X**	
2.b.5.	Small Control Inputs – Roll.	±0.15°/s body roll rate or ±20% of peak body roll rate applied throughout the time history.	Approach or landing.	Control inputs must be typical of minor corrections made while established on an ILS approach (approximately 0.5 to 2°/s roll rate). Test in one direction. For airplanes that exhibit non-symmetrical behavior, test in both directions. Show time history data from 5 s before until at least 5 s after initiation of control input. If a single test is used to demonstrate both directions, there must be a minimum of 5 s before control reversal to the opposite direction. **CCA**: Test in normal and non-normal control state.			**X**	
2.b.6.	Small Control Inputs – Yaw.	±0.15°/s body yaw rate or ±20% of peak body yaw rate applied throughout the time history.	Approach or landing.	Control inputs must be typical of minor corrections made while established on an ILS approach (approximately 0.5 to 2°/s yaw rate). Test in both directions. Show time history data from 5 s before until at least 5 s after initiation of control input. If a single test is used to demonstrate both directions, there must be a minimum of 5 s before control reversal to the opposite direction. **CCA:** Test in normal and non-normal control state.			**X**	

2.c.	**Longitudinal Control Tests.**							
	Power setting is that required for level flight unless otherwise specified.							
2.c.1.a.	Power Change Dynamics.	±3 kt airspeed. ±30 m (100 ft) altitude. ±1.5° or ±20% of pitch angle.	Approach.	Power change from thrust for approach or level flight to maximum continuous or go-around power. Time history of uncontrolled free response for a time increment equal to at least 5 s before initiation of the power change to the completion of the power change + 15 s. **CCA:** Test in normal and non-normal control mode			**X**	
2.c.1.b.	Power Change Force.	±5 lb (2.2 daN) or, ±20% pitch control force.	Approach.	May be a series of snapshot test results. Power change dynamics test as described in test 2.c.1.a. will be accepted. **CCA:** Test in Normal and Non-normal control mode.	**X**	**X**		
2.c.2.a.	Flap/Slat Change Dynamics.	±3 kt airspeed. ±30 m (100 ft) altitude. ±1.5° or ±20% of pitch angle.	Takeoff through initial flap retraction, and approach to landing.	Time history of uncontrolled free response for a time increment equal to at least 5 s before initiation of the reconfiguration change to the completion of the reconfiguration change + 15 s. **CCA:** Test in normal and non-normal control mode			**X**	
2.c.2.b.	Flap/Slat Change Force.	±5 lb (2.2 daN) or, ±20% pitch control force.	Takeoff through initial flap retraction, and approach to landing.	May be a series of snapshot test results. Flap/Slat change dynamics test as described in test 2.c.2.a. will be accepted. **CCA:** Test in Normal and Non-normal control mode.	**X**	**X**		
2.c.3.	Spoiler/Speedbrake Change Dynamics.	±3 kt airspeed. ±30 m (100 ft) altitude. ±1.5° or ±20% of pitch angle.	Cruise.	Time history of uncontrolled free response for a time increment equal to at least 5 s before initiation of the configuration change to the completion of the configuration change +15 s. Results required for both extension and retraction. **CCA:** Test in normal and non-normal control mode			**X**	
2.c.4.a.	Gear Change Dynamics.	±3 kt airspeed. ±30 m (100 ft) altitude. ±1.5° or ±20% of pitch angle.	Takeoff (retraction), and Approach (extension).	Time history of uncontrolled free response for a time increment equal to at least 5 s before initiation of the configuration change to the completion of the configuration change + 15 s. **CCA:** Test in normal and non-normal control mode			**X**	
2.c.4.b.	Gear Change Force.	±5 lb (2.2 daN) or, ±20% pitch control force.	Takeoff (retraction) and Approach (extension).	May be a series of snapshot test results. Gear change dynamics test as described in test 2.c.4.a. will be accepted.	**X**	**X**		

				CCA: Test in Normal and Non-normal control mode.				
2.c.5.	Longitudinal Trim.	±1° elevator angle. ±0.5° stabilizer or trim surface angle. ±1° pitch angle. ±5% of net thrust or equivalent.	Cruise, Approach, and Landing.	Steady-state wings level trim with thrust for level flight. This test may be a series of snapshot tests. Level 5 FTD may use equivalent stick and trim controllers in lieu of elevator and trim surface. **CCA**: Test in normal or non-normal control mode, as applicable.	**X**	**X**	**X**	
2.c.6.	Longitudinal Maneuvering Stability (Stick Force/g).	±2.2 daN (5 lbf) or ±10% of pitch controller force. Alternative method: ±1° or ±10% of the change of elevator angle.	Cruise, Approach, and Landing.	Continuous time history data or a series of snapshot tests may be used. Test up to approximately 30° of roll angle for approach and landing configurations. Test up to approximately 45° of roll angle for the cruise configuration. Force tolerance not applicable if forces are generated solely by the use of airplane hardware in the FTD. Alternative method applies to airplanes which do not exhibit stick-force-per-g characteristics. **CCA:** Test in normal or non-normal control mode		**X**	**X**	
2.c.7.	Longitudinal Static Stability.	±2.2 daN (5 lbf) or ±10% of pitch controller force. Alternative method: ±1° or ±10% of the change of elevator angle.	Approach.	Data for at least two speeds above and two speeds below trim speed. The speed range must be sufficient to demonstrate stick force versus speed characteristics. This test may be a series of snapshot tests. Force tolerance is not applicable if forces are generated solely by the use of airplane hardware in the FTD. Alternative method applies to airplanes which do not exhibit speed stability characteristics. Level 5 must exhibit positive static stability, but need not comply with the numerical tolerance. **CCA:** Test in normal or non-normal control mode, as applicable.	**X**	**X**	**X**	
2.c.8.a.	Approach to Stall Characteristics	±3 kt airspeed for initial buffet, stall warning, and stall speeds. Control inputs must be plotted and demonstrate	Second Segment Climb, High Altitude Cruise (Near Performance Limited Condition), and Approach or Landing	Each of the following stall entry methods must be demonstrated in at least one of the three required flight conditions: ▪ Stall entry at wings level (1g) ▪ Stall entry in turning flight of at least 25° bank angle (accelerated stall)			**X**	Tests may be conducted at centers of gravity typically required for airplane certification stall testing.

		correct trend and magnitude. ±2.0° pitch angle ±2.0° angle of attack ±2.0° bank angle ±2.0° sideslip angle Additionally, for those simulators with reversible flight control systems: ±10% or ±5 lb (2.2 daN)) Stick/Column force (prior to "g break" only).		▪ Stall entry in a power-on condition (required only for turboprop aircraft) The required cruise condition must be conducted in a flaps-up (clean) configuration. The second segment climb and approach/landing conditions must be conducted at different flap settings. For airplanes that exhibit stall buffet as the first indication of a stall, for qualification of this task, the FTD must be equipped with a vibration system that meets the applicable subjective and objective requirements in Appendix A of this Part.				
2.c.8.b.	Stall Warning (actuation of stall warning device.)	±3 kts. airspeed, ±2° bank for speeds greater than actuation of stall warning device or initial buffet.	Second Segment Climb, and Approach or Landing.	The stall maneuver must be entered with thrust at or near idle power and wings level (1g). Record the stall warning signal and initial buffet if applicable. **CCA:** Test in Normal and Non-normal control states.	**X**	**X**		
2.c.9.a.	Phugoid Dynamics.	±10% of period. ±10% of time to one half or double amplitude or ±0.02 of damping ratio.	Cruise.	Test must include three full cycles or that necessary to determine time to one half or double amplitude, whichever is less. **CCA:** Test in non-normal control mode.		**X**	**X**	
2.c.9.b.	Phugoid Dynamics.	±10% period, Representative damping.	Cruise.	The test must include whichever is less of the following: Three full cycles (six overshoots after the input is completed), or the number of cycles sufficient to determine representative damping. **CCA:** Test in non-normal control mode.	**X**			
2.c.10	Short Period Dynamics.	±1.5° pitch angle or ±2°/s pitch rate. ±0.1 g normal acceleration	Cruise.	**CCA:** (Level 7 FTD) Test in normal and non-normal control mode. (Level 6 FTD) Test in non-normal control mode.		**X**	**X**	
2.c.11.	**(Reserved)**							
2.d.	**Lateral Directional Tests.**							
	Power setting is that required for level flight unless otherwise specified.							
2.d.1.	Minimum control speed, air (V_{mca}) or landing (V_{mcl}), per applicable airworthiness requirement or low speed engine-inoperative handling characteristics in the air.	±3 kt airspeed.	Takeoff or Landing (whichever is most critical in the airplane).	Takeoff thrust must be set on the operating engine(s). Time history or snapshot data may be used. **CCA**: Test in normal or non-normal control state, as applicable.			**X**	Minimum speed may be defined by a performance or control limit which prevents demonstration of V_{mca} or V_{mcl} in the conventional manner.

2.d.2.	Roll Response (Rate).	±2°/s or ±10% of roll rate. For airplanes with reversible flight control systems (Level 7 FTD only): ±1.3 daN (3 lbf) or ±10% of wheel force.	Cruise, and Approach or Landing.	Test with normal roll control displacement (approximately one-third of maximum roll controller travel). This test may be combined with step input of flight deck roll controller test 2.d.3.	**X**	**X**	**X**	
2.d.3.	Step input of flight deck roll controller.	±2° or ±10% of roll angle.	Approach or Landing.	This test may be combined with roll response (rate) test 2.d.2. **CCA:** (Level 7 FTD) Test in normal and non-normal control mode. (Level 6 FTD) Test in non-normal control mode.		**X**	**X**	With wings level, apply a step roll control input using approximately one-third of the roll controller travel. When reaching approximately 20° to 30° of bank, abruptly return the roll controller to neutral and allow approximately 10 seconds of airplane free response.
2.d.4.a.	Spiral Stability.	Correct trend and ±2° or ±10% of roll angle in 20 s. If alternate test is used: correct trend and ±2° aileron angle.	Cruise, and Approach or Landing.	Airplane data averaged from multiple tests may be used. Test for both directions. As an alternative test, show lateral control required to maintain a steady turn with a roll angle of approximately 30°. **CCA:** Test in non-normal control mode.			**X**	
2.d.4.b.	Spiral Stability.	Correct trend and ±3° or ±10% of roll angle in 20 s.	Cruise	Airplane data averaged from multiple tests may be used. Test for both directions. As an alternative test, show lateral control required to maintain a steady turn with a roll angle of approximately 30°. **CCA:** Test in non-normal control mode.		**X**		
2.d.4.c.	Spiral Stability.	Correct trend	Cruise	Airplane data averaged from multiple tests may be used. **CCA:** Test in non-normal control mode.	**X**			
2.d.5.	Engine Inoperative Trim.	±1° rudder angle or ±1° tab angle or equivalent rudder pedal. ±2° side-slip angle.	Second Segment Climb, and Approach or Landing.	This test may consist of snapshot tests.			**X**	Test should be performed in a manner similar to that for which a pilot is trained to trim an engine failure condition. 2nd segment climb test should be at takeoff thrust. Approach or landing test should be at thrust for level flight.
2.d.6.a.	Rudder Response.	±2°/s or ±10% of yaw rate.	Approach or Landing.	For Level 7 FTD: Test with stability augmentation on and off.		**X**	**X**	

				Test with a step input at approximately 25% of full rudder pedal throw. Not required if rudder input and response is shown in Dutch Roll test (test 2.d.7). **CCA:** Test in normal and non-normal control mode				
2.d.6.b.	Rudder Response.	Roll rate ±2°/sec, bank angle ±3°.	Approach or Landing.	May be roll response to a given rudder deflection. **CCA:** Test in Normal and Non-normal control states.	**X**			May be accomplished as a yaw response test, in which case the procedures and requirements of test 2.d.6.a. will apply.
2.d.7.	Dutch Roll	±0.5 s or ±10% of period. ±10% of time to one half or double amplitude or ±.02 of damping ratio. (Level 7 FTD only): ±1 s or ±20% of time difference between peaks of roll angle and side-slip angle.	Cruise, and Approach or Landing.	Test for at least six cycles with stability augmentation off. **CCA:** Test in non-normal control mode.		**X**	**X**	
2.d.8.	Steady State Sideslip.	For a given rudder position: ±2° roll angle; ±1° side-slip angle; ±2° or ±10% of aileron angle; and ±5° or ±10% of spoiler or equivalent roll controller position or force. For airplanes with reversible flight control systems (Level 7 FTD only): ±1.3 daN (3 lbf) or ±10% of wheel force.	Approach or Landing.	This test may be a series of snapshot tests using at least two rudder positions (in each direction for propeller-driven airplanes), one of which must be near maximum allowable rudder. (Level 5 and Level 6 FTD only): Sideslip angle is matched only for repeatability and only on continuing qualification evaluations.	**X**	**X**	**X**	

		±2.2 daN (5 lbf) or ±10% of rudder pedal force.						
2.e.	**Landings.**							
2.e.1.	Normal Landing.	±3 kt airspeed. ±1.5° pitch angle. ±1.5° AOA. ±3 m (10 ft) or ±10% of height. For airplanes with reversible flight control systems: ±2.2 daN (5 lbf) or ±10% of column force.	Landing.	Test from a minimum of 61 m (200 ft) AGL to nosewheel touchdown. **CCA:** Test in normal and non-normal control mode, if applicable.			**X**	Two tests should be shown, including two normal landing flaps (if applicable) one of which should be near maximum certificated landing mass, the other at light or medium mass.
2.e.2.	Minimum Flap Landing.	±3 kt airspeed. ±1.5° pitch angle. ±1.5° AOA. ±3 m (10 ft) or ±10% of height. For airplanes with reversible flight control systems: ±2.2 daN (5 lbf) or ±10% of column force.	Minimum Certified Landing Flap Configuration.	Test from a minimum of 61 m (200 ft) AGL to nosewheel touchdown. Test at near maximum certificated landing weight.			**X**	
2.e.3.	Crosswind Landing.	±3 kt airspeed. ±1.5° pitch angle. ±1.5° AOA. ±3 m (10 ft) or ±10% of height. ±2° roll angle. ±2° side-slip angle. ±3° heading angle.	Landing.	Test from a minimum of 61 m (200 ft) AGL to a 50% decrease in main landing gear touchdown speed. It requires test data, including wind profile, for a crosswind component of at least 60% of airplane performance data value measured at 10 m (33 ft) above the runway. Wind components must be provided as headwind and crosswind values with respect to the runway.			**X**	In those situations where a maximum crosswind or a maximum demonstrated crosswind is not known, contact the responsible Flight Standards office.

		For airplanes with reversible flight control systems: ±2.2 daN (5 lbf) or ±10% of column force. ±1.3 daN (3 lbf) or ±10% of wheel force. ±2.2 daN (5 lbf) or ±10% of rudder pedal force.						
2.e.4.	One Engine Inoperative Landing.	±3 kt airspeed. ±1.5° pitch angle. ±1.5° AOA. ±3 m (10 ft) or ±10% of height. ±2° roll angle. ±2° side-slip angle. ±3° heading angle.	Landing.	Test from a minimum of 61 m (200 ft) AGL to a 50% decrease in main landing gear touchdown speed.			**X**	
2.e.5.	Autopilot landing (if applicable).	±1.5 m (5 ft) flare height. ±0.5 s or ± 10% of Tf. ±0.7 m/s (140 ft/min) rate of descent at touchdown. ±3 m (10 ft) lateral deviation during roll-out.	Landing.	If autopilot provides roll-out guidance, record lateral deviation from touchdown to a 50% decrease in main landing gear touchdown speed. Time of autopilot flare mode engage and main gear touchdown must be noted.			**X**	See Appendix F of this part for definition of T_f.
2.e.6.	All-engine autopilot go-around.	±3 kt airspeed. ±1.5° pitch angle. ±1.5° AOA.	As per airplane performance data.	Normal all-engine autopilot go-around must be demonstrated (if applicable) at medium weight.			**X**	
2.e.7.	One engine inoperative go around.	±3 kt airspeed. ±1.5° pitch angle. ±1.5° AOA. ±2° roll angle.	As per airplane performance data.	Engine inoperative go-around required near maximum certificated landing weight with critical engine inoperative. Provide one test with autopilot (if applicable) and one without autopilot.			**X**	

		±2° side-slip angle.		**CCA**: Non-autopilot test to be conducted in non-normal mode.				
2.e.8.	Directional control (rudder effectiveness) with symmetric reverse thrust.	±5 kt airspeed. ±2°/s yaw rate.	Landing.	Apply rudder pedal input in both directions using full reverse thrust until reaching full thrust reverser minimum operating speed.			**X**	
2.e.9.	Directional control (rudder effectiveness) with asymmetric reverse thrust.	±5 kt airspeed. ±3° heading angle.	Landing.	With full reverse thrust on the operating engine(s), maintain heading with rudder pedal input until maximum rudder pedal input or thrust reverser minimum operation speed is reached.			**X**	
2.f.	**Ground Effect.**							
	Test to demonstrate Ground Effect.	±1° elevator angle. ±0.5° stabilizer angle. ±5% of net thrust or equivalent. ±1° AOA. ±1.5 m (5 ft) or ±10% of height. ±3 kt airspeed. ±1° pitch angle.	Landing.	A rationale must be provided with justification of results. **CCA:** Test in normal or non-normal control mode, as applicable.			**X**	See paragraph on Ground Effect in this attachment for additional information.
2.g.	**Reserved**							
2.h.	**Flight Maneuver and Envelope Protection Functions.**							
	Note. — The requirements of 2.h are only applicable to computer-controlled airplanes. Time history results of response to control inputs during entry into each envelope protection function (i.e. with normal and degraded control states if their function is different) are required. Set thrust as required to reach the envelope protection function.							
2.h.1.	Overspeed.	±5 kt airspeed.	Cruise.				**X**	
2.h.2.	Minimum Speed.	±3 kt airspeed.	Takeoff, Cruise, and Approach or Landing.				**X**	
2.h.3.	Load Factor.	±0.1g normal load factor	Takeoff, Cruise.				**X**	
2.h.4.	Pitch Angle.	±1.5° pitch angle	Cruise, Approach.				**X**	
2.h.5.	Bank Angle.	±2° or ±10% bank angle	Approach.				**X**	
2.h.6.	Angle of Attack.	±1.5° angle of attack	Second Segment Climb, and Approach or Landing.				**X**	
3. Reserved								
4. Visual System.								
4.a.	**Visual scene quality**							
4.a.1.	Continuous cross-cockpit visual field of view.	Visual display providing each pilot with a minimum of 176° horizontal and 36° vertical continuous field of view.	Not applicable.	Required as part of MQTG but not required as part of continuing evaluations.			**X**	Field of view should be measured using a visual test pattern filling the entire visual scene (all channels) consisting of a matrix of black and white 5° squares.

								Installed alignment should be confirmed in an SOC (this would generally consist of results from acceptance testing).
4.a.2.	System Geometry	Geometry of image should have no distracting discontinuities.					**X**	
4.a.3	Surface resolution (object detection).	Not greater than 4 arc minutes.	Not applicable.				**X**	Resolution will be demonstrated by a test of objects shown to occupy the required visual angle in each visual display used on a scene from the pilot's eyepoint. The object will subtend 4 arc minutes to the eye. This may be demonstrated using threshold bars for a horizontal test. A vertical test should also be demonstrated. The subtended angles should be confirmed by calculations in an SOC.
4.a.4	Light point size.	Not greater than 8 arc minutes.	Not applicable.				**X**	Light point size should be measured using a test pattern consisting of a centrally located single row of white light points displayed as both a horizontal and vertical row. It should be possible to move the light points relative to the eyepoint in all axes. At a point where modulation is just discernible in each visual channel, a calculation should be made to determine the light spacing. An SOC is required to state test method and calculation.
4.a.5	Raster surface contrast ratio.	Not less than 5:1.	Not applicable.				**X**	Surface contrast ratio should be measured using a raster drawn test pattern filling the entire visual scene (all channels). The test pattern should consist of black and white squares, 5° per square, with a white square in the center of each channel.

								Measurement should be made on the center bright square for each channel using a 1° spot photometer. This value should have a minimum brightness of 7 cd/m^2 (2 ft-lamberts). Measure any adjacent dark squares. The contrast ratio is the bright square value divided by the dark square value. *Note 1. — During contrast ratio testing, FTD aft-cab and flight deck ambient light levels should be as low as possible.* *Note 2. — Measurements should be taken at the center of squares to avoid light spill into the measurement device.*
4.a.6	Light point contrast ratio.	Not less than 10:1.	Not applicable.				**X**	Light point contrast ratio should be measured using a test pattern demonstrating an area of greater than 1° area filled with white light points and should be compared to the adjacent background. *Note. — Light point modulation should be just discernible on calligraphic systems but will not be discernable on raster systems.* Measurements of the background should be taken such that the bright square is just out of the light meter FOV. *Note. — During contrast ratio testing, FTD aft-cab and flight deck ambient light levels should be as low as practical.*
4.a.7	Light point brightness.	Not less than 20 cd/m^2 (5.8 ft-lamberts).	Not applicable.				**X**	Light points should be displayed as a matrix creating a square. On calligraphic systems the light points should just merge.

								On raster systems the light points should overlap such that the square is continuous (individual light points will not be visible).
4.a.8	Surface brightness.	Not less than 14 cd/m^2 (4.1 ft-lamberts) on the display.	Not applicable.				**X**	Surface brightness should be measured on a white raster, measuring the brightness using the 1° spot photometer. Light points are not acceptable. Use of calligraphic capabilities to enhance raster brightness is acceptable.
4.b	**Head-Up Display (HUD)**							
4.b.1	Static Alignment.	Static alignment with displayed image. HUD bore sight must align with the center of the displayed image spherical pattern. Tolerance +/- 6 arc min.					**X**	Alignment requirement only applies to the pilot flying.
4.b.2	System display.	All functionality in all flight modes must be demonstrated.					**X**	A statement of the system capabilities should be provided and the capabilities demonstrated
4.b.3	HUD attitude versus FTD attitude indicator (pitch and roll of horizon).	Pitch and roll align with aircraft instruments.	Flight				**X**	Alignment requirement only applies to the pilot flying.
4.c	**Enhanced Flight Vision System (EFVS)**							
4.c.1	Registration test.	Alignment between EFVS display and out of the window image must represent the alignment typical of the aircraft and system type.	Takeoff point and on approach at 200 ft.				**X**	Alignment requirement only applies to the pilot flying. *Note.— The effects of the alignment tolerance in 4.b.1 should be taken into account.*
4.c.2	EFVS RVR and visibility calibration.	The scene represents the EFVS view at 350 m (1,200 ft) and 1,609 m (1 sm) RVR including correct light intensity.	Flight				**X**	Infra-red scene representative of both 350 m (1,200 ft), and 1,609 m (1 sm) RVR. Visual scene may be removed.
4.c.3	Thermal crossover.	Demonstrate thermal crossover effects during day to night transition.	Day and night				**X**	The scene will correctly represent the thermal

								characteristics of the scene during a day to night transition.
4.d	**Visual ground segment**							
4.d.1	Visual ground segment (VGS).	Near end: the correct number of approach lights within the computed VGS must be visible. Far end: ±20% of the computed VGS. The threshold lights computed to be visible must be visible in the FTD.	Trimmed in the landing configuration at 30 m (100 ft) wheel height above touchdown zone on glide slope at an RVR setting of 300 m (1,000 ft) or 350 m (1,200 ft).	This test is designed to assess items impacting the accuracy of the visual scene presented to a pilot at DH on an ILS approach. These items include: 1) RVR/Visibility; 2) glide slope (G/S) and localizer modeling accuracy (location and slope) for an ILS; 3) for a given weight, configuration and speed representative of a point within the airplane's operational envelope for a normal approach and landing; and 4) Radio altimeter. *Note. — If non-homogeneous fog is used, the vertical variation in horizontal visibility should be described and included in the slant range visibility calculation used in the VGS computation.*			**X**	Pre-position for this test is encouraged but may be achieved via manual or autopilot control to the desired position.
4.e	**Visual System Capacity**							
4.e.1	System capacity – Day mode.	Not less than: 10,000 visible textured surfaces, 6,000 light points, 16 moving models.	Not applicable				**X**	Demonstrated through use of a visual scene rendered with the same image generator modes used to produce scenes for training. The required surfaces, light points, and moving models should be displayed simultaneously.
4.e.2	System capacity – Twilight/night mode.	Not less than: 10,000 visible textured surfaces, 15,000 light points, 16 moving models.	Not applicable				**X**	Demonstrated through use of a visual scene rendered with the same image generator modes used to produce scenes for training. The required surfaces, light points, and moving models should be displayed simultaneously.
5. Sound System. The sponsor will not be required to repeat the operational sound tests (i.e., tests 5.a.1. through 5.a.8. (or 5.b.1. through 5.b.9.) and 5.c., as appropriate) during continuing qualification evaluations if frequency response and background noise test results are within tolerance when compared to the initial qualification evaluation results, and the sponsor shows that no software changes have occurred that will affect the FTD's sound system. If the frequency response test method is chosen and fails, the sponsor may elect to fix the frequency response problem and repeat the test or the sponsor may elect to repeat the operational sound tests. If the operational sound tests are repeated during continuing qualification								

evaluations, the results may be compared against initial qualification evaluation results. All tests in this section must be presented using an unweighted 1/3-octave band format from band 17 to 42 (50 Hz to 16 kHz). A minimum 20 second average must be taken at a common location from where the initial evaluation sound results were gathered.								
5.a.	**Turbo-jet airplanes.**							All tests in this section should be presented using an unweighted 1/3-octave band format from at least band 17 to 42 (50 Hz to 16 kHz). A measurement of minimum 20 s should be taken at the location corresponding to the approved data set. Refer to paragraph 7 of Appendix A, Attachment 2.
5.a.1.	Ready for engine start.	Initial evaluation: Subjective assessment of 1/3 octave bands. Recurrent evaluation: cannot exceed ±5 dB difference on three consecutive bands when compared to initial evaluation and the average of the absolute differences between initial and recurrent evaluation results cannot exceed 2 dB.	Ground.	Normal condition prior to engine start. The APU must be on if appropriate.			**X**	
5.a.2.	All engines at idle.	Initial evaluation: Subjective assessment of 1/3 octave bands. Recurrent evaluation: cannot exceed ±5 dB difference on three consecutive bands when compared to initial evaluation and the average of the absolute differences between initial and recurrent evaluation results cannot exceed 2 dB.	Ground.	Normal condition prior to takeoff.			**X**	
5.a.3.	All engines at maximum allowable thrust with brakes set.	Initial evaluation: Subjective assessment of 1/3 octave bands. Recurrent evaluation: cannot exceed ±5 dB difference on three consecutive bands when	Ground.	Normal condition prior to takeoff.			**X**	

		compared to initial evaluation and the average of the absolute differences between initial and recurrent evaluation results cannot exceed 2 dB.						
5.a.4.	Climb	Initial evaluation: Subjective assessment of 1/3 octave bands. Recurrent evaluation: cannot exceed ±5 dB difference on three consecutive bands when compared to initial evaluation and the average of the absolute differences between initial and recurrent evaluation results cannot exceed 2 dB.	En-route climb.	Medium altitude.			**X**	
5.a.5.	Cruise	Initial evaluation: Subjective assessment of 1/3 octave bands. Recurrent evaluation: cannot exceed ±5 dB difference on three consecutive bands when compared to initial evaluation and the average of the absolute differences between initial and recurrent evaluation results cannot exceed 2 dB.	Cruise.	Normal cruise configuration.			**X**	
5.a.6.	Speed brake/spoilers extended (as appropriate).	Initial evaluation: Subjective assessment of 1/3 octave bands. Recurrent evaluation: cannot exceed ±5 dB difference on three consecutive bands when compared to initial evaluation and the average of the absolute differences between initial and recurrent evaluation results cannot exceed 2 dB.	Cruise.	Normal and constant speed brake deflection for descent at a constant airspeed and power setting.			**X**	
5.a.7	Initial approach.	Initial evaluation: Subjective assessment of 1/3 octave bands.	Approach.	Constant airspeed, gear up, flaps/slats as appropriate.			**X**	

		Recurrent evaluation: cannot exceed ±5 dB difference on three consecutive bands when compared to initial evaluation and the average of the absolute differences between initial and recurrent evaluation results cannot exceed 2 dB.						
5.a.8	Final approach.	Initial evaluation: Subjective assessment of 1/3 octave bands. Recurrent evaluation: cannot exceed ±5 dB difference on three consecutive bands when compared to initial evaluation and the average of the absolute differences between initial and recurrent evaluation results cannot exceed 2 dB.	Landing.	Constant airspeed, gear down, landing configuration flaps.			**X**	
5.b	**Propeller-driven airplanes**							All tests in this section should be presented using an unweighted 1/3-octave band format from at least band 17 to 42 (50 Hz to 16 kHz). A measurement of minimum 20 s should be taken at the location corresponding to the approved data set. Refer to paragraph 7 of Appendix A, Attachment 2.
5.b.1.	Ready for engine start.	Initial evaluation: Subjective assessment of 1/3 octave bands. Recurrent evaluation: cannot exceed ±5 dB difference on three consecutive bands when compared to initial evaluation and the average of the absolute differences between initial and recurrent evaluation results cannot exceed 2 dB.	Ground.	Normal condition prior to engine start. The APU must be on if appropriate.			**X**	

5.b.2	All propellers feathered, if applicable.	Initial evaluation: Subjective assessment of 1/3 octave bands. Recurrent evaluation: cannot exceed ±5 dB difference on three consecutive bands when compared to initial evaluation and the average of the absolute differences between initial and recurrent evaluation results cannot exceed 2 dB.	Ground.	Normal condition prior to take-off.			**X**	
5.b.3.	Ground idle or equivalent.	Initial evaluation: Subjective assessment of 1/3 octave bands. Recurrent evaluation: cannot exceed ±5 dB difference on three consecutive bands when compared to initial evaluation and the average of the absolute differences between initial and recurrent evaluation results cannot exceed 2 dB.	Ground.	Normal condition prior to takeoff.			**X**	
5.b.4	Flight idle or equivalent.	Initial evaluation: Subjective assessment of 1/3 octave bands. Recurrent evaluation: cannot exceed ±5 dB difference on three consecutive bands when compared to initial evaluation and the average of the absolute differences between initial and recurrent evaluation results cannot exceed 2 dB.	Ground.	Normal condition prior to takeoff.			**X**	
5.b.5	All engines at maximum allowable power with brakes set.	Initial evaluation: Subjective assessment of 1/3 octave bands. Recurrent evaluation: cannot exceed ±5 dB difference on three consecutive bands when compared to initial evaluation and the	Ground.	Normal condition prior to takeoff.			**X**	

		average of the absolute differences between initial and recurrent evaluation results cannot exceed 2 dB.						
5.b.6	Climb.	Initial evaluation: Subjective assessment of 1/3 octave bands. Recurrent evaluation: cannot exceed ±5 dB difference on three consecutive bands when compared to initial evaluation and the average of the absolute differences between initial and recurrent evaluation results cannot exceed 2 dB.	En-route climb.	Medium altitude.			**X**	
5.b.7	Cruise	Initial evaluation: Subjective assessment of 1/3 octave bands. Recurrent evaluation: cannot exceed ±5 dB difference on three consecutive bands when compared to initial evaluation and the average of the absolute differences between initial and recurrent evaluation results cannot exceed 2 dB.	Cruise.	Normal cruise configuration.			**X**	
5.b.8	Initial approach.	Initial evaluation: Subjective assessment of 1/3 octave bands. Recurrent evaluation: cannot exceed ±5 dB difference on three consecutive bands when compared to initial evaluation and the average of the absolute differences between initial and recurrent evaluation results cannot exceed 2 dB.	Approach.	Constant airspeed, gear up, flaps extended as appropriate, RPM as per operating manual.			**X**	
5.b.9	Final approach.	Initial evaluation: Subjective assessment of 1/3 octave bands.	Landing.	Constant airspeed, gear down, landing configuration flaps, RPM as per operating manual.			**X**	

		Recurrent evaluation: cannot exceed ±5 dB difference on three consecutive bands when compared to initial evaluation and the average of the absolute differences between initial and recurrent evaluation results cannot exceed 2 dB.						
5.c.	**Special cases.**	Initial evaluation: Subjective assessment of 1/3 octave bands. Recurrent evaluation: cannot exceed ±5 dB difference on three consecutive bands when compared to initial evaluation and the average of the absolute differences between initial and recurrent evaluation results cannot exceed 2 dB.	As appropriate.				**X**	This applies to special steady-state cases identified as particularly significant to the pilot, important in training, or unique to a specific airplane type or model.
5.d	**FTD background noise**	Initial evaluation: background noise levels must fall below the sound levels described in Appendix A, Attachment 2, Paragraph 7.c (5). Recurrent evaluation: ±3 dB per 1/3 octave band compared to initial evaluation.		Results of the background noise at initial qualification must be included in the QTG document and approved by the responsible Flight Standards office. The measurements are to be made with the simulation running, the sound muted and a dead cockpit.			**X**	The simulated sound will be evaluated to ensure that the background noise does not interfere with training. Refer to paragraph 7 of this Appendix A, Attachment 2. This test should be presented using an unweighted 1/3 octave band format from band 17 to 42 (50 Hz to 16 kHz).
5.e	**Frequency response**	Initial evaluation: not applicable. Recurrent evaluation: cannot exceed ±5 dB difference on three consecutive bands when compared to initial evaluation and the average of the absolute differences between initial and recurrent evaluation results cannot exceed 2 dB.					**X**	Only required if the results are to be used during continuing qualification evaluations in lieu of airplane tests. The results must be approved by the responsible Flight Standards office during the initial qualification. This test should be presented using an unweighted 1/3 octave band format from band 17 to 42 (50 Hz to 16 kHz).

* * * * *

6	**SYSTEMS INTEGRATION**							
6.a.	**System response time**							
6.a.1	Transport delay.	Instrument response: 100 ms (or less) after airplane response. Visual system response: 120 ms (or less) after airplane response.	Pitch, roll and yaw.				**X**	One separate test is required in each axis. Where EFVS systems are installed, the EFVS response should be within + or - 30 ms from visual system response, and not before motion system response. *Note.— The delay from the airplane EFVS electronic elements should be added to the 30 ms tolerance before comparison with visual system reference.*
6.a.2	Transport delay.	300 milliseconds or less after controller movement.	Pitch, roll and yaw.		**X**	**X**		If transport delay is the chosen method to demonstrate relative responses, the sponsor and the responsible Flight Standards office will use the latency values to ensure proper FTD response when reviewing those existing tests where latency can be identified (e.g., short period, roll response, rudder response).

Table B2F

Alternative Data Sources, Procedures, and Instrumentation Level 6 FTD		
QPS REQUIREMENTS The standards in this table are required if the data gathering methods described in paragraph 9 of Appendix B are not used.		INFORMATION
Objective Test Reference Number and Title	**Alternative Data Sources, Procedures, and Instrumentation**	**Notes**

* * * * * * *

2.a.1.a. Handling qualities. Static control tests. Pitch controller position vs. force and surface position calibration	Surface position data may be acquired from flight data recorder (FDR) sensor or, if no FDR sensor, at selected, significant column positions (encompassing significant column position data points), acceptable to the responsible Flight Standards office, using a control surface protractor on the ground. Force data may be acquired by using a hand held force gauge at the same column position data points.	For airplanes with reversible control systems, surface position data acquisition should be accomplished with winds less than 5 kts.
2.a.2.a. Handling qualities. Static control tests. Wheel position vs. force and surface position calibration.	Surface position data may be acquired from flight data recorder (FDR) sensor or, if no FDR sensor, at selected, significant wheel positions (encompassing significant wheel position data points), acceptable to the responsible Flight Standards office, using a control surface protractor on the ground. Force data may be acquired by using a hand held force gauge at the same wheel position data points.	For airplanes with reversible control systems, surface position data acquisition should be accomplished with winds less than 5 kts.
2.a.3.a. Handling qualities. Static control tests. Rudder pedal position vs. force and surface position calibration.	Surface position data may be acquired from flight data recorder (FDR) sensor or, if no FDR sensor, at selected, significant rudder pedal positions (encompassing significant rudder pedal position data points), acceptable to the responsible Flight Standards office, using a control surface protractor on the ground. Force data may be acquired by using a hand held force gauge at the same rudder pedal position data points.	For airplanes with reversible control systems, surface position data acquisition should be accomplished with winds less than 5 kts.

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Attachment 3 to Appendix B to Part 60—Flight Training Device (FTD) Subjective Evaluation

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Table B3C

Table of Functions and Subjective Tests Level 4 FTD	
QPS requirements	
Entry No.	**Operations tasks** **Tasks in this table are subject to evaluation if appropriate for the airplane system or systems simulated as indicated in the SOQ Configuration List as defined in Appendix B, Attachment 2 of this part.**
1.	Level 4 FTDs are required to have at least one operational system. The responsible Flight Standards office will accomplish a functions check of all installed systems, switches, indicators, and equipment at all crewmembers' and instructors' stations, and determine that the flight deck (or flight deck area) design and functions replicate the appropriate airplane.

* * * * *

Attachment 4 to Appendix B to Part 60—Sample Documents

* * * * *

Attachment 4 to Appendix B to Part 60—Figure B4A—Sample Letter, Request for Initial, Upgrade, or Reinstatement Evaluation

Information

Date _______

RE: Request for Initial/Upgrade Evaluation Date

This is to advise you of our intent to request an (initial or upgrade) evaluation of our (FTD Manufacturer), (Aircraft Type/Level) Flight Training Device (FTD), (FAA ID Number, if previously qualified), located in (City, State) at the (Facility) on (Proposed Evaluation Date). (The proposed evaluation date shall not be more than 180 days following the date of this letter.) The FTD will be sponsored by (Name of Training Center/Air Carrier), FAA Designator (4 Letter Code). The FTD will be sponsored as follows; (Select One)

☐ The FTD will be used within the sponsor's FAA approved training program and placed on the sponsor's Training/Operations Specifications.

☐ The FTD will be used for dry lease only.

We agree to provide the formal request for the evaluation to your staff as follows: (check one)

☐ For QTG tests run at the factory, not later, than 45 days prior to the proposed evaluation date with the additional "l/3 on-site" tests provided not later than 14 days prior to the proposed evaluation date.

☐ For QTG tests run on-site, not later than 30 days prior to the proposed evaluation date.

We understand that the formal request will contain the following documents:

1. Sponsor's Letter of Request (*Company Compliance Letter*).
2. Principal Operations Inspector (POI) or Training Center Program Manager's (TCPM) endorsement.
3. Complete QTG.

If we are unable to meet the above requirements, we understand this may result in a significant delay, perhaps 45 days or more, in rescheduling and completing the evaluation.

(The sponsor should add additional comments as necessary).

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

A copy of this letter of intent has been provided to (Name), the Principal Operations Inspector (POI) and/or Training Center Program Manager (TCPM).

Sincerely,

Attachment: FTD Information and Characteristics Form

cc: POI/TCPM

* * * * *

Attachment 4 to Appendix B to Part 60—Figure B4C—Sample Letter of Compliance

Information

(Date)

Mr. (Name of Training Program Approval Authority):
(Name of responsible Flight Standards office)
(Address)
(City/State/Zip)

Dear Mr. (Name of TPAA):

RE: Letter of Compliance

(Operator Sponsor Name) requests evaluation of our (Aircraft Type) FTD for Level (__) qualification. The (FTD Manufacturer Name) FTD with (Visual System Manufacturer Name/Model) system is fully defined on the FTD Information page of the accompanying Qualification Test Guide (QTG). We have completed the tests of the FTD and certify that it meets all applicable requirements of FAR parts 121, 125, or 135), and the guidance of (AC 120-40B or 14 CFR Part 60). Appropriate hardware and software configuration control procedures have been established. Our Pilot(s), (Name(s)), who are qualified on (Aircraft Type) aircraft have assessed the FTD and have found that it conforms to the (Operator/Sponsor) (Aircraft Type) flight deck configuration and that the simulated systems and subsystems function equivalently to those in the aircraft. The above named pilot(s) have also assessed the performance and the flying qualities of the FTD and find that it represents the respective aircraft.

(Added Comments may be placed here)

Sincerely,

(Sponsor Representative)

Attachment 4 to Appendix B to Part 60—Figure B4D—Sample Qualification Test Guide Cover Page

Information

SPONSOR NAME

SPONSOR ADDRESS

FAA QUALIFICATION TEST GUIDE

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

(Type of FTD)

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

(FTD Level)

(Qualification Performance Standard Used)

(FTD Location)

FAA Initial Evaluation

Date: ______________

____________________________ Date: ____________

(Sponsor)

____________________________ Date: ____________

FAA

* * * * *

Attachment 4 to Appendix B to Part 60—Figure B4E—Sample Statement of Qualification—Certificate

Information

Federal Aviation Administration

Certificate of Qualification

This is to certify that representatives of the FAA
Completed an evaluation of the

Go-Fast Airlines

Farnsworth Z-100 Flight Training Device

FAA Identification Number 998

And pursuant to 14 CFR Part 60 found it to meet its original qualification basis, AC 120-45A (MM/DD/YY)

The Master Qualification Test Guide and the attached
Configuration List and Restrictions List
Provide the Qualification Basis for this device to operate at

Level 6

Until March 31, 2010

Unless sooner rescinded or extended by the FAA

February 15, 2009	*B. Williamson*
(date)	(for the FAA)

* * * * *

■ 42. In appendix C to part 60:

■ a. In the introductory ''Begin Information'' text:

■ i. Remove the word ''NSPM'' and add in its place the words ''Flight Standards Service'' in the first sentence; and

■ ii. In the last sentence, remove the phrase ''NSPM, or a person assigned by the NSPM,'' and add in its place the words ''responsible Flight Standards office''.

■ b. In section 1:

■ i. Remove and reserve paragraph b.;

■ ii. Remove the last sentence of paragraph c.;

■ iii. In paragraph d.(10), add the words ''Flightcrew Member'' after ''as amended,''; and

■ iv. Revise paragraph d.(25).

■ c. In section 11:

■ i. In paragraph o. introductory text, remove the words ''an NSP pilot'' and add in their place the words ''a pilot from the responsible Flight Standards office'' and remove the word ''NSP'';

■ ii. In paragraph r.(1), remove the word ''NSP''; and

■ iii. In paragraph v., remove the phrase ''NSPM or visit the NSPM website'' and add in its place the words ''responsible Flight Standards office''.

■ d. In attachment 1, in table C1A, revise the entries for 4.a., 6.c., 6.d., and 6.u.;

■ e. In attachment 2:

■ i. In section 8, paragraph d., remove the first instance of the word ''NSPM'' and add in its place the words ''the responsible Flight Standards office'';

■ ii. In table C2A, revise the entries for 1.j.4., 2.a., and 4.a.2;

■ iii. In table C2E, revise the entry for 1.b.2.;

■ f. In attachment 3:

■ i. In section 2, in the first paragraph (h), remove the last sentence and redesignate the second paragraph h. and paragraph i. as paragraphs i. and j, respectively; and

■ ii. In table C3C, revise the introductory text.

■ g. In attachment 4:

■ i. Revise the table of contents entry for Figure C4H to read ''Figure C4H [Reserved]'';

■ ii. Revise figures C4A C4C, C4D, and C4E; and

■ iii. Remove and reserve figure C4H.

■ h. Remove the word ''NSPM'' and in its place add the words ''responsible Flight Standards office'' in the following places:

■ i. Section 1, paragraph c., the first two instances;

■ ii. Section 9, paragraphs d., d.(1), d.(2), g., h., and i.;

■ iii. Section 10, paragraph a;

■ iv. Section 11, paragraphs b.(2), b.(3), d., e.(2), f., g.(1), h., j. k., l., m., n., n.(2), o., p., q., r.(2), s., t., and w.;

■ v. Section 13, paragraphs a.(1), a.(3), a.(4), a.(5), d., and i.;

■ vi. Section 14, paragraphs a., d., e., and e.(1);

■ vii. Section 17, paragraphs b.(1) and b.(2);

■ viii. Section 19;

■ ix. Section 20;

■ x. Attachment 2, section 1, paragraph b.;

■ xi. Attachment 2, section 2, paragraphs a., h., j., k., and l.;

■ xii. Attachment 2, section 4, paragraph b.(1);

■ xiii. Attachment 2, section 6, paragraph d.(2);

■ xiv. Attachment 2, section 8, paragraphs b., c., the second instance of d., f., and g.;

■ xv. Attachment 2, section 9, paragraphs a., b., b.(2) and c.(2)(i);

■ xvi. Attachment 2, section 12, paragraph a.;

■ xvii. Attachment 2, section 14, paragraph b.(4)(d);

■ xviii. Attachment 2, section 16, paragraphs a.(2) and b.(2);

■ xix. Attachment 2, section 17, paragraphs c., d.(2), e., and g.;

■ xx. Attachment 3, section 1, paragraphs f. and g.; and

■ xxi. Attachment 3, section 2, paragraph b.

■ i. In appendix C to part 60, remove the word ''NSP'' from the following places:

■ i. Section 14, paragraph g.; and

■ ii. Attachment 3, paragraphs 2.d. and 2.f.

The revisions read as follows:

Appendix C to Part 60 Qualification Performance Standards for Helicopter Full Flight Simulators

* * * * *

1. Introduction

* * * * *

d. * * *

(25) FAA Airman Certification Standards and Practical Test Standards for Airline Transport Pilot, Type Ratings, Commercial Pilot, and Instrument Ratings.

* * * * *

Attachment 1 to Appendix C to Part 60—General Simulator Requirements

* * * * *

Table C1A

Minimum Simulator Requirements					
	QPS REQUIREMENTS	Simulator Levels			INFORMATION
Entry Number	General Simulator Requirements	B	C	D	Notes
* * * * * * *					
4.a.	In addition to the flight crewmember stations, the simulator must have at least two suitable seats for the instructor/check airman and FAA inspector. These seats must provide adequate vision to the pilot's panel and forward windows. All seats other than flight crew seats need not represent those found in the helicopter but must be adequately secured to the floor and equipped with similar positive restraint devices.	X	X	X	The responsible Flight Standards office will consider alternatives to this standard for additional seats based on unique flight deck configurations
* * * * * * *					
6.c.	The simulator must provide a continuous visual field-of-view of at least 146° horizontally and 36° vertically per pilot seat. Both pilot seat visual systems must be operable simultaneously. Horizontal field-of-view is centered on the zero degree azimuth line relative to the aircraft fuselage. The minimum horizontal field-of-view coverage must be plus and minus one-half (½) of the minimum continuous field-of-view requirement, centered on the zero degree azimuth line relative to the aircraft fuselage. An SOC must explain the geometry of the installation. Capability for a field-of-view in excess of the minimum is not required for qualification at Level C. However, where specific tasks require extended fields of view beyond the 146° by 36° (e.g., to accommodate the use of “chin windows” where the accommodation is either integral with or separate from the primary visual system display), then the extended fields of view must be provided. When considering the installation and use of augmented fields of view, the sponsor must meet with the NSPM to determine the training, testing, checking, and experience tasks for which the augmented field-of-view capability may be required. An SOC is required.		X		Optimization of the vertical field-of-view may be considered with respect to the specific helicopter flight deck cut-off angle. The sponsor may request the responsible Flight Standards office to evaluate the FFS for specific authorization(s) for the following: (1) Specific areas within the database needing higher resolution to support landings, take-offs and ground cushion exercises and training away from a heliport, including elevated heliport, helidecks and confined areas. (2) For cross-country flights, sufficient scene details to allow for ground to map navigation over a sector length equal to 30

					minutes at an average cruise speed. (3) For offshore airborne radar approaches (ARA), harmonized visual/radar representations of installations.
6.d.	The simulator must provide a continuous visual field-of-view of at least 176° horizontally and 56° vertically per pilot seat. Both pilot seat visual systems must be operable simultaneously. Horizontal field-of-view is centered on the zero degree azimuth line relative to the aircraft fuselage. The minimum horizontal field-of-view coverage must be plus and minus one-half (½) of the minimum continuous field-of-view requirement, centered on the zero degree azimuth line relative to the aircraft fuselage. An SOC must explain the geometry of the installation. Capability for a field-of-view in excess of the minimum is not required for qualification at Level D. However, where specific tasks require extended fields of view beyond the 176º by 56º (e.g., to accommodate the use of “chin windows” where the accommodation is either integral with or separate from the primary visual system display), then the extended fields of view must be provided. When considering the installation and use of augmented fields of view, the sponsor must meet with the responsible Flight Standards office to determine the training, testing, checking, and experience tasks for which the augmented field-of-view capability may be required. An SOC is required.			**X**	Optimization of the vertical field-of-view may be considered with respect to the specific helicopter flight deck cut-off angle. The sponsor may request the responsible Flight Standards office to evaluate the FFS for specific authorization(s) for the following: (1) Specific areas within the database needing higher resolution to support landings, take-offs and ground cushion exercises and training away from a heliport, including elevated heliport, helidecks and confined areas. (2) For cross-country flights, sufficient scene details to allow for ground to map navigation over a sector length equal to 30 minutes at an average cruise speed. (3) For offshore airborne radar approaches (ARA), harmonized visual/radar representations of installations.

*   *   *   *   *   *   *

6.u.	The simulator must present visual scenes of wet and snow-covered runways, including runway lighting reflections for wet conditions, and partially obscured lights for snow conditions.		**X**	**X**	The responsible Flight Standards office will consider suitable alternative effects.

*   *   *   *   *   *   *

* * * * *

Attachment 2 to Appendix C to Part 60—FFS Objective Tests

* * * * *

Table C2A

Full Flight Simulator (FFS) Objective Tests								
QPS REQUIREMENTS								INFORMATION
Test		Tolerance(s)	Flight Condition	Test Details	Simulator Level			Notes
Entry Number	Title				B	C	D	

* * * * * * *

1.j.4.	Autorotational Landing.	Torque - ±3%, Rotor Speed - ±3%, Vertical Velocity - ±100 fpm (0.50m/sec) or 10%, Pitch Attitude - ±2°, Bank Attitude - ±2°, Heading - ±5°, Longitudinal Control Position - ±10%, Lateral Control Position - ±10%, Directional Control Position - ±10%, Collective Control Position - ±10%.	Landing.	Record the results of an autorotational deceleration and landing from a stabilized autorotational descent, to touch down. If flight test data containing all required parameters for a complete power-off landing is not available from the aircraft manufacturer for this test and other qualified flight test personnel are not available to acquire this data, the sponsor may coordinate with the responsible Flight Standards office to determine if it is appropriate to accept alternative testing means.		X	X	Alternative approaches for acquiring this data may be acceptable, depending on the aircraft as well as the personnel and the data recording, reduction, and interpretation facilities to be used, are: 1) a simulated autorotational flare and reduction of rate of descent (ROD) at altitude; or 2) a power-on termination following an autorotational approach and flare.

* * * * * * *

2.a.	**Control System Mechanical Characteristics.**				
	For simulators requiring Static or Dynamic tests at the controls (i.e., cyclic, collective, and pedal), special test fixtures will not be required during initial or upgrade evaluations if the				Contact the responsible Flight

	sponsor's QTG/MQTG shows both test fixture results and the results of an alternative approach, such as computer plots produced concurrently showing satisfactory agreement. Repeat of the alternative method during the initial or upgrade evaluation satisfies this test requirement. For initial and upgrade evaluations, the control dynamic characteristics must be measured at and recorded directly from the flight deck controls, and must be accomplished in hover, climb, cruise, and autorotation.				Standards office for clarification of any issue regarding helicopters with reversible controls or where the required validation data is not attainable.

* * * * * * *

4.a.2.	**Transport Delay**				
					If Transport Delay is the chosen method to demonstrate relative responses, the sponsor and the responsible Flight Standards office will use the latency values to ensure proper simulator response when reviewing those existing tests where latency can be identified (e.g., short period, roll response, rudder response).

* * * * * * *

Table C2E

Alternative Data Sources, Procedures, and Instrumentation			
QPS REQUIREMENTS The standards in this table are required if the data gathering methods described in paragraph 9 of Appendix C are not used.			**INFORMATION**
--Table of Objective Tests -- **Test Entry Number and Title**	**Level B Only**	**Alternative Data Sources, Procedures, and Instrumentation**	**Notes**

* * * * * * *

1.b.2. Performance. On Surface Taxi Rate of Turn vs. Nosewheel Steering Angle	X	Data may be acquired by using a constant tiller position (measured with a protractor), or full pedal application for steady state turn, and synchronized video of heading indicator. If less than full pedal is used, pedal position must be recorded.	A single procedure may not be adequate for all rotorcraft steering systems. Appropriate measurement procedures must be devised and proposed for responsible Flight Standards office concurrence.

* * * * * * *

* * * * *

Attachment 3 to Appendix C to Part 60—Simulator Subjective Evaluation

* * * * *

Table C3C

Functions and Subjective Tests				
QPS REQUIREMENTS				
Entry Number	**Visual Scene Content** **Additional Airport or Landing Area Models Beyond Minimum Required for Qualification** **Class II Airport or Landing Area Models**	**Simulator Level**		
		B	**C**	**D**

This table specifies the minimum airport or helicopter landing area visual model content and functionality necessary to add visual models to a simulator's visual model library (i.e., beyond those necessary for qualification at the stated level) without the necessity of further involvement of the responsible Flight Standards office or TPAA.

* * * * * * *

* * * * *

Attachment 4 to Appendix C to Part 60—Figure C4A—Sample Letter, Request for Initial, Upgrade, or Reinstatement Evaluation

Information

Date _______

RE: Request for Initial/Upgrade Evaluation Date

This is to advise you of our intent to request an (initial or upgrade) evaluation of our (FFS Manufacturer), (Aircraft Type/Level) Full Flight Simulator (FFS), (FAA ID Number, if previously qualified), located in (City, State) at the (Facility) on (Proposed Evaluation Date). (The proposed evaluation date shall not be more than 180 days following the date of this letter.) The FFS will be sponsored by (Name of Training Center/Air Carrier), FAA Designator (4 Letter Code). The FFS will be sponsored as follows; (Select One)

☐ The FFS will be used within the sponsor's FAA approved training program and placed on the sponsor's Training/Operations Specifications.

☐ The FFS will be used for dry lease only.

We agree to provide the formal request for the evaluation to your staff as follows: (check one)

☐ For QTG tests run at the factory, not later, than 45 days prior to the proposed evaluation date with the additional "l/3 on-site" tests provided not later than 14 days prior to the proposed evaluation date.

☐ For QTG tests run on-site, not later than 30 days prior to the proposed evaluation date.

We understand that the formal request will contain the following documents:

1. Sponsor's Letter of Request (*Company Compliance Letter*).
2. Principal Operations Inspector (POI) or Training Center Program Manager's (TCPM) endorsement.
3. Complete QTG.

If we are unable to meet the above requirements, we understand this may result in a significant delay, perhaps 45 days or more, in rescheduling and completing the evaluation.

(The sponsor should add additional comments as necessary).

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

A copy of this letter of intent has been provided to (Name), the Principal Operations Inspector (POI) and/or Training Center Program Manager (TCPM).

Sincerely,

Attachment: FFS Information Form

cc: POI/TCPM

* * * * *

Attachment 4 to Appendix C to Part 60—Figure C4C—Sample Letter of Compliance

Information

(Date)

Mr. (Name of Training Program Approval Authority):
(Name of responsible Flight Standards office)
(Address)
(City/State/Zip)

Dear Mr. (Name of TPAA):

RE: Letter of Compliance

(Operator Sponsor Name) requests evaluation of our (Aircraft Type) FFS for Level (__) qualification. The (FFS Manufacturer Name) FFS with (Visual System Manufacturer Name/Model) system is fully defined on the FFS Information page of the accompanying Qualification Test Guide (QTG). We have completed the tests of the FFS and certify that it meets all applicable requirements of FAR parts 121, 125, or 135), and the guidance of (AC 120-40B or 14 CFR Part 60). Appropriate hardware and software configuration control procedures have been established. Our Pilot(s), (Name(s)), who are qualified on (Aircraft Type) aircraft have assessed the FFS and have found that it conforms to the (Operator/Sponsor) (Aircraft Type) flight deck configuration and that the simulated systems and subsystems function equivalently to those in the aircraft. The above named pilot(s) have also assessed the performance and the flying qualities of the FFS and find that it represents the respective aircraft.
(Added Comments may be placed here)

Sincerely,
(Sponsor Representative)

Attachment 4 to Appendix C to Part 60—Figure C4D—Sample Qualification Test Guide Cover Page

Information

SPONSOR NAME

SPONSOR ADDRESS

FAA QUALIFICATION TEST GUIDE

(SPECIFIC Helicopter MODEL)
for example
Farnsworth Z-100

(Type of Simulator)

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

(Simulator Level)

(Qualification Performance Standard Used)

(Simulator Location)

FAA Initial Evaluation

Date: _____________

_________________________ Date: ___________
(Sponsor)

_________________________ Date: ___________
FAA

Attachment 4 to Appendix C to Part 60—Figure C4E—Sample Statement of Qualification—Certificate

Information

Federal Aviation Administration

Certificate of Qualification

This is to certify that representatives of the FAA
Completed an evaluation of the

Go-Fast Airlines

Farnsworth Z-100 Full Flight Simulator

FAA Identification Number 0999

And pursuant to 14 CFR Part 60 found it to meet its original qualification basis, AC 120-63 (MM/DD/YY)

The Master Qualification Test Guide and the attached
Configuration List and List of Qualified Tasks
Provide the Qualification Basis for this device to operate at

Level D

Until April 30, 2010

Unless sooner rescinded or extended by the FAA

March 15, 2009	C. *Nordlie*
(date)	(for the FAA)

* * * * *

■ 43. In appendix D to part 60:

■ a. In the introductory ''Begin Information'' text:

■ i. Remove ''NSPM'' and add in its place the words ''Flight Standards Service'' in the first sentence; and

■ ii. Remove the phrase ''NSPM, or a person or persons assigned by the NSPM'' and add in its place the words ''responsible Flight Standards office'' in the last sentence.

■ b. In section 1:

■ i. Remove and reserve paragraph b.;

■ ii. Remove the last sentence of paragraph c.;

■ iii. In paragraph d.(12), add the words ''Flightcrew Member'' after ''as amended,''; and

■ iv. Revise paragraph d.(28;

■ c. In section 11:

■ i. In paragraph o. introductory text, remove the words ''an NSP pilot'' and add in their place the words ''a pilot from the responsible Flight Standards office'' and remove the second instance of the word ''NSP'';

■ ii. In paragraph r.(1), remove the word ''NSP''; and

■ iii. In paragraph v., remove the phrase ''NSPM or visit the NSPM website'' and add in its place the words ''responsible Flight Standards office''.

■ d. In section 17, paragraph c., remove the word ''D4H'' and add in its place the word ''D4I'';

■ e. In attachment 1, in table D1A, revise the entry for 6.c.;

■ f. In attachment 2, in table D2A, revise the entries for 1.j.4. and 2.a.;

■ g. In attachment 3:

■ i. In section 1, paragraph g., remove the first instance of the word ''NPSM'' and add in its place the words ''responsible Flight Standards office'' and remove the last sentence; and

■ ii. Revise the introductory text to table D3C.

■ h. In attachment 4:

■ i. Remove the table of contents entry ''Figure A4C Sample Letter of Compliance'' and add in its place ''Figure D4C Sample Letter of Compliance'';

■ ii. Revise the table of contents entry ''Figure D4H Sample Continuing Qualification Evaluation Requirements Page'' to read ''Figure D4H [Reserved]'';

■ iii. Revise figures D4A, D4C, D4D, and D4E;

■ iv. Redesignate Figure A4H as Figure D4H; and

■ v. Remove and reserve newly redesignated Figure D4H.

■ i. Remove the word ''NSPM'' and in its place add the words ''responsible Flight Standards office'' in the following places:

■ i. Section 1, paragraph c., the first two instances;

■ ii. Section 9, paragraphs d., d.(1), d.(1)(a), g., h., and i.;

■ iii. Section 10, paragraph a.;

■ iv. Section 11, paragraphs b.(2), b.(3), d., e.(2), f., g.(1), h., j., k., l., m., n., n.(2), o., p., q., r.(2), s., t., and w.;

■ v. Section 13, paragraphs a.(1), a.(3), a.(4), a.(5), d., i., and j.;

■ vi. Section 14, paragraphs a., d., h.;

■ vii. Section 17, paragraphs b.(1) and (2);

■ viii. Section 19 and 20;

■ ix. Attachment 2, section 2, paragraphs a., h., i., j., and k.; and

■ x. Attachment 3, section 1, paragraph f.

■ j. In appendix D to part 60, remove the word ''NSP'' from the following places:

■ i. Section 14, paragraph f.; and

■ ii. Attachment 3, paragraphs 2.c. and 2.d.

Appendix D to Part 60 Qualification Performance Standards for Helicopter Flight Training Devices

* * * * *

1. Introduction

* * * * *

d. * * *

(28) FAA Airman Certification Standards and Practical Test Standards for Airline Transport Pilot, Type Ratings, Commercial Pilot, and Instrument Ratings.

* * * * *

Attachment 1 to Appendix D to Part 60—General FTD Requirements

* * * * *

Table D1A

Minimum FTD Requirements						
QPS REQUIREMENTS						INFORMATION
Entry Number	General FTD Requirements	FTD Level				Notes
		4	5	6	7	

* * * * * * *

6.c.	The FTD must provide a continuous visual field-of-view of at least 146° horizontally and 36° vertically for both pilot seats, simultaneously. The minimum horizontal field-of-view coverage must be plus and minus one-half (½) of the minimum continuous field-of-view requirement, centered on the zero degree azimuth line relative to the aircraft fuselage. Additional horizontal field-of-view capability may be added at the sponsor's discretion provided the minimum field-of-view is retained. Capability for a field-of-view in excess of these minima is not required for qualification at Level 7. However, where specific tasks require extended fields of view beyond the 146° by 36° (e.g., to accommodate the use of "chin windows" where the accommodation is either integral with or separate from the primary visual system display), then such extended fields of view must be provided. An SOC is required and must explain the geometry of the installation.				**X**	Optimization of the vertical field-of-view may be considered with respect to the specific helicopter flight deck cut-off angle. When considering the installation/use of augmented fields of view, as described here, it will be the responsibility of the sponsor to meet with the responsible Flight Standards office to determine the training, testing, checking, or experience tasks for which the augmented field-of-view capability may be critical to that approval.

* * * * * * *

* * * * *

Attachment 2 to Appendix D to Part 60—Flight Training Device (FTD) Objective Tests

* * * * *

Table D2A

Flight Training Device (FTD) Objective Tests								
QPS REQUIREMENTS								INFORMATION
Test		Tolerances	Flight Conditions	Test Details	FTD Level			Notes
Entry Number	Title				5	6	7	

* * * * * * *

1.j.4.	Autorotational Landing.	Torque - ±3%, Rotor Speed - ±3%, Vertical Velocity - ±100 fpm (0.50 m/sec) or 10%, Pitch Attitude - ±2°, Bank Attitude - ±2°, Heading - ±5°, Longitudinal Control Position - ±10%, Lateral Control Position - ±10%, Directional Control Position - ±10%, Collective Control Position - ±10%.	Landing.	Record the results of an autorotational deceleration and landing from a stabilized autorotational descent, to touch down.			**X**	If flight test data containing all required parameters for a complete power-off landing is not available from the aircraft manufacturer for this test, and other qualified flight test personnel are not available to acquire this data, the sponsor must coordinate with the responsible Flight Standards office to determine if it would be appropriate to accept alternative testing means. Alternative approaches to this

								data acquisition that may be acceptable are: 1) a simulated autorotational flare and reduction of rate of descent (ROD) at altitude; or 2) a power-on termination following an autorotational approach and flare.
2.	**Handling Qualities.**							
2.a.	Control System Mechanical Characteristics.	Contact the responsible Flight Standards office for clarification of any issue regarding helicopters with reversible controls.						

* * * * * * *

* * * * *

Attachment 3 to Appendix D to Part 60—Flight Training Device (FTD) Subjective Evaluation

* * * * *

Table D3C

Table of Functions and Subjective Tests Level 7 FTD Visual Requirements Additional Visual Models Beyond Minimum Required for Qualification Class II Airport or Helicopter Landing Area Models	
QPS REQUIREMENTS	
Entry Number	**Operations Tasks**

This table specifies the minimum airport or helicopter landing area visual model content and functionality necessary to add visual models to an FTD's visual model library (i.e., beyond those necessary for qualification at the stated level) without the necessity of further involvement of the responsible Flight Standards office or TPAA.

* * * * * * *

* * * * *

Attachment 4 to Appendix D to Part 60—Sample Documents

Table of Contents

* * * * *

* * * * *

Attachment 4 to Appendix D to Part 60—Figure D4A—Sample Letter, Request for Initial, Upgrade, or Reinstatement Evaluation

Information

Date _______

RE: Request for Initial/Upgrade Evaluation Date

This is to advise you of our intent to request an (initial or upgrade) evaluation of our (FTD Manufacturer), (Aircraft Type/Level) Flight Training Device (FTD), (FAA ID Number, if previously qualified), located in (City, State) at the (Facility) on (Proposed Evaluation Date). (The proposed evaluation date shall not be more than 180 days following the date of this letter.) The FTD will be sponsored by (Name of Training Center/Air Carrier), FAA Designator (4 Letter Code). The FTD will be sponsored as follows; (Select One)

☐ The FTD will be used within the sponsor's FAA approved training program and placed on the sponsor's Training/Operations Specifications.

☐ The FTD will be used for dry lease only.

We agree to provide the formal request for the evaluation to your staff as follows: (check one)

☐ For QTG tests run at the factory, not later, than 45 days prior to the proposed evaluation date with the additional "l/3 on-site" tests provided not later than 14 days prior to the proposed evaluation date.

☐ For QTG tests run on-site, not later than 30 days prior to the proposed evaluation date.

We understand that the formal request will contain the following documents:

1. Sponsor's Letter of Request (*Company Compliance Letter*).
2. Principal Operations Inspector (POI) or Training Center Program Manager's (TCPM) endorsement.
3. Complete QTG.

If we are unable to meet the above requirements, we understand this may result in a significant delay, perhaps 45 days or more, in rescheduling and completing the evaluation.

(The sponsor should add additional comments as necessary).

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

A copy of this letter of intent has been provided to (Name), the Principal Operations Inspector (POI) and/or Training Center Program Manager (TCPM).

Sincerely,

Attachment: FTD Information Form
cc: POI/TCPM

* * * * *

Attachment 4 to Appendix D to Part 60—Figure D4C—Sample Letter of Compliance

Information

(Date)

Mr. (Name of Training Program Approval Authority):
(Name of responsible Flight Standards office)
(Address)
(City/State/Zip)

Dear Mr. (Name of TPAA):

RE: Letter of Compliance

(Operator Sponsor Name) requests evaluation of our (Aircraft Type) FTD for Level (__) qualification. The (FTD Manufacturer Name) FTD with (Visual System Manufacturer Name/Model) system is fully defined on the FTD Information page of the accompanying Qualification Test Guide (QTG). We have completed the tests of the FTD and certify that it meets all applicable requirements of FAR parts 121, 125, or 135), and the guidance of (AC 120-40B or 14 CFR Part 60). Appropriate hardware and software configuration control procedures have been established. Our Pilot(s), (Name(s)), who are qualified on (Aircraft Type) aircraft have assessed the FTD and have found that it conforms to the (Operator/Sponsor) (Aircraft Type) flight deck configuration and that the simulated systems and subsystems function equivalently to those in the aircraft. The above named pilot(s) have also assessed the performance and the flying qualities of the FTD and find that it represents the respective aircraft.

(Added Comments may be placed here)

Sincerely,
(Sponsor Representative)

Attachment 4 to Appendix D to Part 60—Figure D4D—Sample Qualification Test Guide Cover Page

Information

SPONSOR NAME

SPONSOR ADDRESS

FAA QUALIFICATION TEST GUIDE

(SPECIFIC HELICOPTER MODEL)

(*for example*)

(Vertiflite AB-320)

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

(FTD Level)

(Qualification Performance Standard Used)

(FTD Location)

FAA Initial Evaluation

Date: ______________

____ Date: ____________

(Sponsor)

____ Date: ____________

FAA

Attachment 4 to Appendix D to Part 60—Figure D4E—Sample Statement of Qualification—Certificate

Information

Federal Aviation Administration

Certificate of Qualification

This is to certify that representatives of the FAA
Completed an evaluation of the

Go-Fast Training Center

Vertiflite AB-320 Flight Training Device

FAA Identification Number 889

And found it to meet the standards set forth in

14 CFR Part 60, Appendix D

Qualification Performance Standards

The Master Qualification Test Guide and the attached
Configuration List and List of Qualified Tasks
Provide the Qualification Basis for this device to operate at

Level 6

Until April 30, 2010

Unless sooner rescinded or extended by the FAA

March 15, 2009	C. *Nordlie*
(date)	(for the FAA)

* * * * *

■ 44. In appendix E to part 60:

■ a. Remove the word ''NSPM'' and in its place add the words ''responsible Flight Standards office'' in paragraphs a., b., d.(2), d.(3), e., f., g., h., h.(4), i.(1), j.(2)(b), and j.(4)(d).

■ b. Remove the word ''NSPM'' in paragraphs h.(1) and (2).

■ c. Remove paragraph i.(4).

■ d. Revise table E1.

The revision reads as follows:

Appendix E to Part 60 Qualification Performance Standards for Quality Management Systems for Flight Simulation Training Devices

* * * * *

TABLE E1—FSTD QUALITY MANAGEMENT SYSTEM

Entry No.	QPS Requirement	Information (Reference)
E1.1.	A QMS manual that prescribes the policies, processes, or procedures outlined in this table.	§ 60.5(a).
E1.2.	A policy, process, or procedure specifying how the sponsor will identify deficiencies in the QMS.	§ 60.5(b).
E1.3.	A policy, process, or procedure specifying how the sponsor will document how the QMS program will be changed to address deficiencies.	§ 60.5(b).
E1.4.	A policy, process, or procedure specifying how the sponsor will address proposed program changes (for programs that do not meet the minimum requirements as notified by the responsible Flight Standards office) to the responsible Flight Standards office and receive approval prior to their implementation.	§ 60.5(c).
E1.5.	A policy, process, or procedure specifying how the sponsor will document that at least one FSTD is used within the sponsor's FAA-approved flight training program for the aircraft or set of aircraft at least once within the 12-month period following the initial or upgrade evaluation conducted by the responsible Flight Standards office and at least once within each subsequent 12-month period thereafter.	§ 60. 7(b)(5).
E1.6.	A policy, process, or procedure specifying how the sponsor will document that at least one FSTD is used within the sponsor's FAA-approved flight training program for the aircraft or set of aircraft at least once within the 12-month period following the first continuing qualification evaluation conducted by the responsible Flight Standards office and at least once within each subsequent 12-month period thereafter.	§ 60.7(b)(6).
E1.7.	A policy, process, or procedure specifying how the sponsor will obtain an annual written statement from a qualified pilot (who has flown the subject aircraft or set of aircraft during the preceding 12-month period) that the performance and handling qualities of the subject FSTD represents the subject aircraft or set of aircraft (within the normal operating envelope). Required only if the subject FSTD is not used in the sponsor's FAA-approved flight training program for the aircraft or set of aircraft at least once within the preceding 12-month period.	§ 60.5(b)(7) and § 60.7(d)(2).
E1.8.	A policy, process, or procedure specifying how independent feedback (from persons recently completing training, evaluation, or obtaining flight experience; instructors and check airmen using the FSTD for training, evaluation or flight experience sessions; and FSTD technicians and maintenance personnel) will be received and addressed by the sponsor regarding the FSTD and its operation.	§ 60.9(b)(1).
E1.9.	A policy, process, or procedure specifying how and where the FSTD SOQ will be posted, or accessed by an appropriate terminal or display, in or adjacent to the FSTD.	§ 60.9(b)(2).
E1.10.	A policy, process, or procedure specifying how the sponsor's management representative (MR) is selected and identified by name to the responsible Flight Standards office.	§ 60.9(c) and Appendix E, paragraph(d).
E1.11.	A policy, process, or procedure specifying the MR authority and responsibility for the following:	§ 60.9(c)(2), (3), and (4).
E1.11.a.	Monitoring the on-going qualification of assigned FSTDs to ensure all matters regarding FSTD qualification are completed as required by this part.	
E1.11.b.	Ensuring that the QMS is properly maintained by overseeing the QMS policies, practices, or procedures and modifying as necessary.	
E1.11.c.	Regularly briefing sponsor's management on the status of the on-going FSTD qualification program and the effectiveness and efficiency of the QMS.	
E1.11.d.	Serving as the primary contact point for all matters between the sponsor and the responsible Flight Standards office regarding the qualification of assigned FSTDs.	
E1.11.e.	Delegating the MR assigned duties to an individual at each of the sponsor's locations, as appropriate.	
E1.12.	A policy, process, or procedure specifying how the sponsor will:	§ 60.13; QPS Appendices A, B, C, and D.
E1.12.a.	Ensure that the data made available to the responsible Flight Standards office (the validation data package) includes the aircraft manufacturer's flight test data (or other data approved by the responsible Flight Standards office) and all relevant data developed after the type certificate was issued (*e.g.,* data developed in response to an airworthiness directive) if the data results from a change in performance, handling qualities, functions, or other characteristics of the aircraft that must be considered for flight crewmember training, evaluation, or experience requirements.	
E1.12.b.	Notify the responsible Flight Standards office within 10 working days of becoming aware that an addition to or a revision of the flight related data or airplane systems related data is available if this data is used to program or operate a qualified FSTD.	
E1.12.c.	Maintain a liaison with the manufacturer of the aircraft being simulated (or with the holder of the aircraft type certificate for the aircraft being simulated if the manufacturer is no longer in business), and if appropriate, with the person who supplied the aircraft data package for the FFS for the purposes of receiving notification of data package changes.	
E1.13.	A policy, process, or procedure specifying how the sponsor will make available all special equipment and qualified personnel needed to conduct tests during initial, continuing qualification, or special evaluations.	§ 60.14.

TABLE E1—FSTD QUALITY MANAGEMENT SYSTEM—Continued

Entry No.	QPS Requirement	Information (Reference)
E1.14.	A policy, process, or procedure specifying how the sponsor will submit to the responsible Flight Standards office a request to evaluate the FSTD for initial qualification at a specific level and simultaneously request the TPAA forward a concurring letter to the responsible Flight Standards office; including how the MR will use qualified personnel to confirm the following:.	§ 60.15(a)–(d); § 60.15(b); § 60.15(b)(i); § 60.15(b)(ii); § 60.15(b)(iii).
E1.14.a.	That the performance and handling qualities of the FSTD represent those of the aircraft or set of aircraft within the normal operating envelope.	
E1.14.b.	The FSTD systems and sub-systems (including the simulated aircraft systems) functionally represent those in the aircraft or set of aircraft.	
E1.14.c.	The flight deck represents the configuration of the specific type or aircraft make, model, and series aircraft being simulated, as appropriate.	
E1.15.	A policy, process, or procedure specifying how the subjective and objective tests are completed at the sponsor's training facility for an initial evaluation.	§ 60.15(e).
E1.16.	A policy, process, or procedure specifying how the sponsor will update the QTG with the results of the FAA-witnessed tests and demonstrations together with the results of the objective tests and demonstrations after the responsible Flight Standards office completes the evaluation for initial qualification.	§ 60.15(h).
E1.17.	A policy, process, or procedure specifying how the sponsor will make the MQTG available to the responsible Flight Standards office upon request.	§ 60.15(i).
E1.18.	A policy, process, or procedure specifying how the sponsor will apply to the responsible Flight Standards office for additional qualification(s) to the SOQ.	§ 60.16(a); § 60.16(a)(1)(i); and § 60.16(a)(1)(ii).
E1.19.	A policy, process, or procedure specifying how the sponsor completes all required Attachment 2 objective tests each year in a minimum of four evenly spaced inspections as specified in the appropriate QPS.	§ 60.19(a)(1) QPS Appendices A, B, C, or D.
E1.20.	A policy, process, or procedure specifying how the sponsor completes and records a functional preflight check of the FSTD within the preceding 24 hours of FSTD use, including a description of the functional preflight.	§ 60.19(a)(2) QPS Appendices A, B, C, or D.
E1.21.	A policy, process, or procedure specifying how the sponsor schedules continuing qualification evaluations with the responsible Flight Standards office.	§ 60.19(b)(2).
E1.22.	A policy, process, or procedure specifying how the sponsor ensures that the FSTD has received a continuing qualification evaluation at the interval described in the MQTG.	§ 60.19(b)(5)–(6).
E1.23.	A policy, process, or procedure describing how discrepancies are recorded in the FSTD discrepancy log, including.	§ 60.19(c); § 60.19(c)(2)(i); § 60.19(c)(2)(ii).
E1.23.a.	A description of how the discrepancies are entered and maintained in the log until corrected.	
E1.23.b.	A description of the corrective action taken for each discrepancy, the identity of the individual taking the action, and the date that action is taken.	
E1.24.	A policy, process, or procedure specifying how the discrepancy log is kept in a form and manner acceptable to the Administrator and kept in or adjacent to the FSTD. (An electronic log that may be accessed by an appropriate terminal or display in or adjacent to the FSTD is satisfactory.).	§ 60.19(c)(2)(iii).
E1.25.	A policy, process, or procedure that requires each instructor, check airman, or representative of the Administrator conducting training, evaluation, or flight experience, and each person conducting the preflight inspection, who discovers a discrepancy, including any missing, malfunctioning, or inoperative components in the FSTD, to write or cause to be written a description of that discrepancy into the discrepancy log at the end of the FSTD preflight or FSTD use session.	§ 60.20.
E1.26.	A policy, process, or procedure specifying how the sponsor will apply for initial qualification based on the final aircraft data package approved by the aircraft manufacturer if operating an FSTD based on an interim qualification.	§ 60.21(c).
E1.27.	A policy, process, or procedure specifying how the sponsor determines whether an FSTD change qualifies as a modification as defined in § 60.23.	§ 60.23(a)(1)–(2).
E1.28.	A policy, process, or procedure specifying how the sponsor will ensure the FSTD is modified in accordance with any FSTD Directive regardless of the original qualification basis.	§ 60.23(b).
E1.29.	A policy, process, or procedure specifying how the sponsor will notify the responsible Flight Standards office and TPAA of their intent to use a modified FSTD and to ensure that the modified FSTD will not be used prior to:.	§ 60.23(c)(1)(i),(ii), and (iv).
E1.29.a.	Twenty-one days since the sponsor notified the responsible Flight Standards office and the TPAA of the proposed modification and the sponsor has not received any response from either the responsible Flight Standards office or the TPAA; or.	
E1.29.b.	Twenty-one days since the sponsor notified the responsible Flight Standards office and the TPAA of the proposed modification and one has approved the proposed modification and the other has not responded; or.	
E1.29.c.	The FSTD successfully completing any evaluation the responsible Flight Standards office may require in accordance with the standards for an evaluation for initial qualification or any part thereof before the modified FSTD is placed in service.	
E1.30	A policy, process, or procedure specifying how, after an FSTD modification is approved by the responsible Flight Standards office, the sponsor will:	§ 60.23(d)–(e).

TABLE E1—FSTD QUALITY MANAGEMENT SYSTEM—Continued

Entry No.	QPS Requirement	Information (Reference)
E1.30.a.	Post an addendum to the SOQ until as the responsible Flight Standards office issues a permanent, updated SOQ.	
E1.30.b.	Update the MQTG with current objective test results and appropriate objective data for each affected objective test or other MQTG section affected by the modification.	
E1.30.c.	File in the MQTG the requirement from the responsible Flight Standards office to make the modification and the record of the modification completion.	
E1.31.	A policy, process, or procedure specifying how the sponsor will track the length of time a component has been missing, malfunctioning, or inoperative (MMI), including:.	§ 60.25(b)–(c), and QPS Appendices A, B, C, or D.
E1.31.a.	How the sponsor will post a list of MMI components in or adjacent to the FSTD	
E1.31.b.	How the sponsor will notify the responsible Flight Standards office if the MMI has not been repaired or replaced within 30 days.*.	
E1.32.	A policy, process, or procedure specifying how the sponsor will notify the responsible Flight Standards office and how the sponsor will seek requalification of the FSTD if the FSTD is moved and reinstalled in a different location.	§ 60.27(a)(3).
E1.33.	A policy, process, or procedure specifying how the sponsor will maintain control of the following: (The sponsor must specify how these records are maintained in plain language form or in coded form; but if the coded form is used, the sponsor must specify how the preservation and retrieval of information will be conducted.).	§ 60.31.
E1.33.a.	The MQTG and each amendment	
E1.33.b.	A record of all FSTD modifications required by this part since the issuance of the original SOQ.	
E1.33.c.	Results of the qualification evaluations (initial and each upgrade) since the issuance of the original SOQ.	
E1.33.d.	Results of the objective tests conducted in accordance with this part for a period of 2 years.	
E1.33.e.	Results of the previous three continuing qualification evaluations, or the continuing qualification evaluations from the previous 2 years, whichever covers a longer period..	
E1.33.f.	Comments obtained in accordance with § 60.9(b);	
E1.33.g.	A record of all discrepancies entered in the discrepancy log over the previous 2 years, including the following:	
E1.33.g.1.	A list of the components or equipment that were or are missing, malfunctioning, or inoperative.	
E1.33.g.2.	The action taken to correct the discrepancy	
E1.33.g.3.	The date the corrective action was taken	
E1.33.g.4.	The identity of the person determining that the discrepancy has been corrected.	

* **Note:** If the sponsor has an approved discrepancy prioritization system, this item is satisfied by describing how discrepancies are prioritized, what actions are taken, and how the sponsor will notify the responsible Flight Standards office if the MMI has not been repaired or replaced within the specified timeframe.

Appendix F to Part 60—[Amended]

■ 45. In appendix F to part 60:

■ a. In section 2, remove the word ''NSPM'' and in its place add the words ''responsible Flight Standards office'' and remove the phrase ''National Simulator Program Manager (NSPM)—the FAA manager responsible for the overall administration and direction of the National Simulator Program (NSP), or a person approved by that FAA manager.''; and

■ b. In section 3, remove the phrase ''NSPM National Simulator Program Manager''.

PART 61—CERTIFICATION: PILOTS, FLIGHT INSTRUCTORS, AND GROUND INSTRUCTORS

■ 46. The authority citation for part 61 continues to read as follows:

Authority: 49 U.S.C. 106(f), 106(g), 40113, 44701–44703, 44707, 44709–44711, 44729, 44903, 45102–45103, 45301–45302; Sec. 2307 Pub. L. 114–190, 130 Stat. 615 (49 U.S.C. 44703 note).

§ 61.58 [Amended]

■ 47. Amend § 61.58 by removing paragraphs (j) and (k).

§ 61.313 [Amended]

■ 48. Amend § 61.313 in paragraph (h)(1) by removing the word ''light'' and adding in its place the word ''flight''.

PART 67—MEDICAL STANDARDS AND CERTIFICATION

■ 49. The authority citation for part 67 continues to read as follows:

Authority: 49 U.S.C. 106(g), 40113, 44701–44703, 44707, 44709–44711, 45102–45103, 45301–45303.

§ 67.4 [Amended]

■ 50. Amend § 67.4 in paragraph (b) by removing the numbers ''26200'' and adding in their place the numbers ''25082''.

§ 67.409 [Amended]

■ 51. Amend § 67.409 in paragraph (a) by removing the phrase ''and in duplicate'' and by removing the numbers ''26080'' and adding in their place the numbers ''25082''.

PART 73—SPECIAL USE AIRSPACE

■ 52. The authority citation for part 73 continues to read as follows:

Authority: 49 U.S.C. 106(f), 106(g), 40103, 40113, 40120; E.O. 10854, 24 FR 9565, 3 CFR, 1959–1963 Comp., p. 389.

■ 53. Amend § 73.19 by revising paragraphs (a), (b) introductory text, and (c) to read as follows:

§ 73.19 Reports by using agency.

(a) Each using agency must prepare a report on the use of each restricted area assigned thereto during any part of the preceding 12-month period ended September 30, and transmit it by the following January 31 of each year to the Manager, Operations Support Group in the ATO Service Center office of the Federal Aviation Administration having jurisdiction over the area in which the restricted area is located, with a copy to the Manager, Airspace Policy Group, Federal Aviation Administration, 800 Independence Avenue SW, Washington, DC 20591.

(b) In the report under this section the using agency must:

* * * * *

(c) If it is determined that the information submitted under paragraph (b) of this section is not sufficient to evaluate the nature and extent of the use of a restricted area, the FAA may request the using agency to submit supplementary reports. Within 60 days after receiving a request for additional information, the using agency must submit such information as the FAA Service Center Operations Support Group Manager considers appropriate. Supplementary reports must be sent to the FAA officials designated in paragraph (a) of this section.

PART 91—GENERAL OPERATING AND FLIGHT RULES

■ 54. The authority citation for part 91 continues to read as follows:

Authority: 49 U.S.C. 106(f), 106(g), 40101, 40103, 40105, 40113, 40120, 44101, 44111, 44701, 44704, 44709, 44711, 44712, 44715, 44716, 44717, 44722, 46306, 46315, 46316, 46504, 46506–46507, 47122, 47508, 47528–47531, 47534, Pub. L. 114–190, 130 Stat. 615 (49 U.S.C. 44703 note); articles 12 and 29 of the Convention on International Civil Aviation (61 Stat. 1180), (126 Stat. 11).

§ 91.9 [Amended]

■ 55. Amend § 91.9 in paragraph (c) by removing the phrase ‘‘part 45’’ and adding in its place the phrase ‘‘part 45 or 48’’.

§ 91.157 [Amended]

■ 56. Amend § 91.157 in paragraph (b)(4) introductory text by adding the word ‘‘less’’ after the phrase ‘‘6 degrees or’’ and by removing the word ‘‘more’’ before the phrase ‘‘below the horizon’’.

§ 91.203 [Amended]

■ 57. Amend § 91.203 in paragraph (a)(1) by removing the phrase ‘‘part 47’’ and adding in its place the phrase ‘‘part 47 or 48’’.

§ 91.511 [Amended]

■ 58. Amend § 91.511 in paragraph (a) introductory text by adding the words ‘‘operating under this subpart’’ after the word ‘‘person’’ in the first sentence.

§ 91.609 [Amended]

■ 59. Amend § 91.609 in paragraph (g) by adding the words ‘‘49 CFR’’ before both instances of the words ‘‘part 830’’.

§ 91.1001 [Amended]

■ 60. Amend § 91.1001 in paragraph (b)(9) by removing ‘‘(b)(1)(v)’’ and adding in its place ‘‘(b)(5)(vi)’’.

PART 97—STANDARD INSTRUMENT PROCEDURES

■ 61. The authority citation for part 97 continues to read as follows:

Authority: 49 U.S.C. 106(f), 106(g), 40103, 40106, 40113, 40114, 40120, 44502, 44514, 44701, 44719, and 44721–44722.

§ 97.20 [Amended]

■ 62. Amend § 97.20 in paragraph (b) by:

■ a. Removing the phrase ‘‘FAA’s Rules Docket (AGC–200) and at the National Flight Data Center, 800 Independence Avenue SW., Washington, DC 20590’’ and adding in its place the phrase ‘‘U.S. Department of Transportation, Docket Operations, 1200 New Jersey Avenue SE, West Building Ground Floor, Room W12–140, Washington, DC 20590, and at Aeronautical Information Services, 1305 East-West Highway, Silver Spring, MD 20910’’; and

■ b. Removing the phrase ‘‘call 202–741–6030’’ and adding in its place the words phrase ‘‘email: *fedreg.legal@nara.gov*’’.

PART 101—MOORED BALLOONS, KITES, AMATEUR ROCKETS, UNMANNED FREE BALLOONS

■ 63. The authority citation for part 101 continues to read as follows:

Authority: 49 U.S.C. 106(f), 106(g), 40101 note, 40103, 40113–40114, 45302, 44502, 44514, 44701–44702, 44721, 46308.

§ 101.21 [Amended]

■ 64. Amend § 101.21 in paragraph (a) by removing citation ‘‘§ 101.25(b)(7)(ii)’’ and adding in its place citation ‘‘§ 101.25(g)(2)’’.

PART 107—SMALL UNMANNED AIRCRAFT SYSTEMS

■ 65. The authority citation for part 107 continues to read as follows:

Authority: 49 U.S.C. 106(f), 40101 note, 40103(b), 44701(a)(5), 44807.

■ 66. Revise the heading for § 107.9 to read as follows:

§ 107.9 Safety event reporting.

* * * * *

PART 121—OPERATING REQUIREMENTS: DOMESTIC, FLAG, AND SUPPLEMENTAL OPERATIONS

■ 67. The authority citation for part 121 continues to read as follows:

Authority: 49 U.S.C. 106(f), 106(g), 40103, 40113, 40119, 41706, 42301 preceding note added by Pub. L. 112–95, sec. 412, 126 Stat. 89, 44101, 44701–44702, 44705, 44709–44711, 44713, 44716–44717, 44722, 44729, 44732; 46105; Pub. L. 111–216, 124 Stat. 2348 (49 U.S.C. 44701 note); Pub. L. 112–95 126 Stat 62 (49 U.S.C. 44732 note).

§ 121.310 [Amended]

■ 68. Amend § 121.310 in paragraph (b)(2)(iii) by removing the words ‘‘turbopropeller powered’’ and adding in their place the words ‘‘turbopropeller-powered’’.

§ 121.311 Seats, safety belts, and shoulder harnesses. [Amended]

■ 69. Amend § 121.311 in paragraph (b)(2)(ii)(C) introductory text by removing the citation ‘‘(B)(2)(ii)(A)’’ and adding in its place the citation ‘‘(b)(2)(ii)(A)’’.

§ 121.359 [Amended]

■ 70. Amend § 121.359 in paragraph (h) by adding the phrase ‘‘49 CFR’’ before both instances of the phrase ‘‘part 830’’.

§ 121.391 [Amended]

■ 71. Amend § 121.391 in paragraph (d) by removing the word ‘‘exists’’ and adding in its place the word ‘‘exits’’.

§ 121.523 [Amended]

■ 72. Amend § 121.523 in paragraph (c) by removing the second instance of the word ‘‘duty’’ in the third sentence and adding in its place the word ‘‘during’’.

§ 121.703 [Amended]

■ 73. Amend § 121.703 in paragraph (f) by removing the citation ‘‘14 CFR part 830’’ and adding in its place the citation ‘‘49 CFR part 830’’.

§ 121.909 [Amended]

■ 74. Amend § 121.909 in paragraph (a) by removing the phrase ‘‘made, through the FAA office responsible for approval of the certificate holder’s operations specifications, to the Manager of the Air Transportation Division’’ and adding in its place the phrase ‘‘made to the responsible Flight Standards office’’.

§ 121.923 [Amended]

■ 75. Amend § 121.923 in paragraph (a)(2) by removing the phrase ‘‘made, through the FAA office directly responsible for oversight of the training provider, to the Manager of the Air Transportation Division’’ and adding in its place the phrase ''made to the responsible Flight Standards office''.

■ 76. Amend § 121.1115 by revising table 2 to read as follows:

§ 121.1115 Limit of validity.

* * * * *

TABLE 2—AIRPLANES EXCLUDED FROM § 26.21

Airplane model	Default LOV [flight cycles (FC) or flight hours (FH)]
Airbus:	
Caravelle	15,000 FC/24,000 FH
Avions Marcel Dassault:	
Breguet Aviation Mercure 100C	20,000 FC/16,000 FH
Boeing:	
Boeing 707 (–100 Series and –200 Series)	20,000 FC
Boeing 707 (–300 Series and –400 Series)	20,000 FC
Boeing 720	30,000 FC
Bombardier:	
CL–44D4 and CL–44J	20,000 FC
BD–700	15,000 FC
Bristol Aeroplane Company:	
Britannia 305	10,000 FC
British Aerospace Airbus, Ltd.:	
BAC 1–11 (all models)	85,000 FC
British Aerospace (Commercial Aircraft) Ltd.:	
Armstrong Whitworth Argosy A.W. 650 Series 101	20,000 FC
BAE Systems (Operations) Ltd.:	
BAe 146–100A (all models)	50,000 FC
BAe 146–200–07	50,000 FC
BAe 146–200–07 Dev	50,000 FC
BAe 146–200–11	50,000 FC
BAe 146–200–07A	47,000 FC
BAe 146–200–11 Dev	43,000 FC
BAe 146–300 (all models)	40,000 FC
Avro 146–RJ70A (all models)	40,000 FC
Avro 146–RJ85A and 146–RJ100A (all models)	50,000 FC
D & R Nevada, LLC:	
Convair Model 22	1,000 FC/1,000 FH
Convair Model 23M	1,000 FC/1,000 FH
deHavilland Aircraft Company, Ltd.:	
D.H. 106 Comet 4C	8,000 FH
Gulfstream:	
GV	40,000 FH
GV–SP	40,000 FH
Ilyushin Aviation Complex:	
IL–96T	10,000 FC/30,000 FH
Lockhead:	
300–50A01(USAF C 141A)	20,000 FC

* * * * *

PART 125— CERTIFICATION AND OPERATIONS: AIRPLANES HAVING A SEATING CAPACITY OF 20 OR MORE PASSENGERS OR A MAXIMUM PAYLOAD CAPACITY OF 6,000 POUNDS OR MORE; AND RULES GOVERNING PERSONS ON BOARD SUCH AIRCRAFT

■ 77. The authority citation for part 125 continues to read as follows:

Authority: 49 U.S.C. 106(f), 106(g), 40113, 44701–44702, 44705, 44710–44711, 44713, 44716–44717, 44722.

§ 125.285 [Amended]

■ 78. Amend § 125.285 in paragraph (d) by removing the citation ''(c)(3)'' and adding in its place the citation ''(c)(2)''.

PART 129—OPERATIONS: FOREIGN AIR CARRIERS AND FOREIGN OPERATORS OF U.S.-REGISTERED AIRCRAFT ENGAGED IN COMMON CARRIAGE

■ 79. The authority citation for part 129 continues to read as follows:

Authority: 49 U.S.C. 1372, 40113, 40119, 44101, 44701–44702, 44705, 44709–44711, 44713, 44716–44717, 44722, 44901–44904, 44906, 44912, 46105, Pub. L. 107–71 sec. 104.

§ 129.18 [Amended]

■ 80. Amend § 129.18 in paragraph (b) introductory text by removing the word ''or'' and adding in its place the word ''of''.

■ 81. Amend § 129.115 by revising table 2 to read as follows:

§ 129.115 Limit of validity.

* * * * *

TABLE 2—AIRPLANES EXCLUDED FROM § 26.21

Airplane model	Default LOV [flight cycles (FC) or flight hours (FH)]
Airbus:	
Caravelle	15,000 FC/24,000 FH
Avions Marcel Dassault:	
Breguet Aviation Mercure 100C	20,000 FC/16,000 FH
Boeing:	
Boeing 707 (–100 Series and –200 Series)	20,000 FC
Boeing 707 (–300 Series and –400 Series)	20,000 FC
Boeing 720	30,000 FC
Bombardier:	
CL–44D4 and CL–44J	20,000 FC
BD–700	15,000 FC
Bristol Aeroplane Company:	
Britannia 305	10,000 FC
British Aerospace Airbus, Ltd.:	
BAC 1–11 (all models)	85,000 FC
British Aerospace (Commercial Aircraft) Ltd.:	
Armstrong Whitworth Argosy A.W. 650 Series 101	20,000 FC
BAE Systems (Operations) Ltd.:	
BAe 146–100A (all models)	50,000 FC
BAe 146–200–07	50,000 FC
BAe 146–200–07 Dev	50,000 FC
BAe 146–200–11	50,000 FC
BAe 146–200–07A	47,000 FC
BAe 146–200–11 Dev	43,000 FC
BAe 146–300 (all models)	40,000 FC
Avro 146–RJ70A (all models)	40,000 FC
Avro 146–RJ85A and 146–RJ100A (all models)	50,000 FC
D & R Nevada, LLC:	
Convair Model 22	1,000 FC/1,000 FH
Convair Model 23M	1,000 FC/1,000 FH
deHavilland Aircraft Company, Ltd.:	
D.H. 106 Comet 4C	8,000 FH
Gulfstream:	
GV	40,000 FH
GV–SP	40,000 FH
Ilyushin Aviation Complex:	
IL–96T	10,000 FC/30,000 FH
Lockheed:	
300–50A01 (USAF C 141A)	20,000 FC

* * * * *

PART 135—OPERATING REQUIREMENTS: COMMUTER AND ON DEMAND OPERATIONS AND RULES GOVERNING PERSONS ON BOARD SUCH AIRCRAFT

■ 82. The authority citation for part 135 continues to read as follows:

Authority: 49 U.S.C. 106(f), 106(g), 40113, 41706, 44701–44702, 44705, 44709, 44711–44713, 44715–44717, 44722, 44730, 45101–45105; Public Law 112–95, 126 Stat. 58 (49 U.S.C. 44730).

§ 135.415 [Amended]

■ 83. Amend § 135.415 in paragraph (f) by adding the words ‘‘49 CFR’’ before the words ‘‘part 830’’.

PART 141—PILOT SCHOOLS

■ 84. The authority citation for part 141 continues to read as follows:

Authority: 49 U.S.C. 106(f), 106(g), 40113, 44701–44703, 44707, 44709, 44711, 45102–45103, 45301–45302.

■ 85. Amend appendix I to part 141 by revising paragraph 4.(a)(3)(ii) and adding paragraphs 4.(i)(2)(i) and (ii) to read as follows:

Appendix I to Part 141—Additional Aircraft Category and/or Class Rating Course

* * * * *

4. Flight Training

(a) * * *

(3) * * *

(ii) Ten hours of training in a complex airplane, a turbine-powered airplane, or a technically advanced airplane that meets the requirements of § 61.129(j), or any combination thereof. The airplane must be appropriate to land or sea for the rating sought;

* * * * *

(i) * * *

(2) * * *

(i) Five training flights in a glider with a certificated flight instructor on the launch/tow procedures approved for the course and on the appropriate approved areas of operation listed in appendix D of part 141, paragraph 4.(d)(6); and

(ii) Three training flights in a glider with a certificated flight instructor in preparation for the practical test within 2 calendar months preceding the date of the test.

* * * * *

PART 183—REPRESENTATIVES OF THE ADMINISTRATOR

■ 86. The authority citation for part 183 continues to read as follows:

Authority: 31 U.S.C. 9701; 49 U.S.C. 106(f), 106(g), 40113, 44702, 45303.

§ 183.11 [Amended]

■ 87. Amend § 183.11 in paragraph (d) by:

■ a. Removing the words ‘‘Associate Administrator for Air Traffic’’ and adding in their place the words ‘‘Associate Administrator for Aviation Safety’’; and

■ b. Adding the word ''Designated'' before the phrase ''Air Traffic Control Tower Operator Examiners''.

■ 88. Amend § 183.25 by revising paragraph (c) to read as follows:

§ 183.25 Technical personnel examiners.

* * * * *

(c) A designated air traffic control tower operator examiner may—

(1) Accept applications for, and conduct, written and practical tests necessary for issuing control tower operator certificates under part 65 of this chapter; and

(2) In the discretion of the Associate Administrator for Aviation Safety issue temporary control tower operator certificates to qualified applicants.

* * * * *

PART 440—FINANCIAL RESPONSIBILITY

■ 89. The authority citation for part 440 continues to read as follows:

Authority: 51 U.S.C. 50901–50923.

■ 90. Amend § 440.19 by adding paragraphs (a)(1) and (2) to read as follows:

§ 440.19 United States payment of excess third-party liability claims.

(a) * * *

(1) Exceeds the amount of insurance required under § 440.9(b); and

(2) Is not more than $1,500,000,000 (as adjusted for inflation occurring after January 1, 1989) above that amount.

* * * * *

Issued under authority provided by 49 U.S.C. 106(f), 44701(a), and 44703 in Washington, DC, on October 21, 2022.

Brandon Roberts,

Executive Director, Office of Rulemaking.

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