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c. Visual systems not required to have accurate taxiway edge lighting are:

(1) Redifusion SP1.

(2) FlightSafety Vital IV.

(3) Link-Miles Image II and Image IIT

(4) XKD displays (even though the XKD image generator is capable of generating blue colored lights, the display cannot accommodate that color).

7. A copy of this Directive must be filed in the MQTG in the designated FSTD Directive Section, and its inclusion must be annotated on the Index of Effective FSTD Directives chart. See Attachment 4, Appendices A through D for a sample MQTG Index of Effective FSTD Directives chart.

[Doc. No. FAA–2002–12461, 73 FR 26490, May 9, 2008]

APPENDIX B TO PART 60—QUALIFICATION PERFORMANCE STANDARDS FOR AIRPLANE FLIGHT TRAINING DEVICES

BEGIN INFORMATION

This appendix establishes the standards for Airplane FTD evaluation and qualification at Level 4, Level 5, or Level 6. The Flight Standards Service, NSPM, is responsible for the development, application, and implementation of the standards contained within this appendix. The procedures and criteria specified in this appendix will be used by the NSPM, or a person or persons assigned by the NSPM when conducting airplane FTD evaluations.

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Attachment 1 to Appendix B to Part 60—General FTD Requirements.

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

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

Attachment 4 to Appendix B to Part 60—Sample Documents.

END INFORMATION

1. INTRODUCTION

BEGIN INFORMATION

a. This appendix contains background information as well as regulatory and informative material as described later in this section. To assist the reader in determining what areas are required and what areas are permissive, the text in this appendix is divided into two sections: ''QPS Requirements'' and ''Information.'' The QPS Requirements sections contain details regarding compliance with the part 60 rule language. These details are regulatory, but are found only in this appendix. The Information sections contain material that is advisory in nature, and designed to give the user general information about the regulation.

b. Questions regarding the contents of this publication should be sent to the U.S. Department of Transportation, Federal Aviation Administration, Flight Standards Service, National Simulator Program Staff, AFS–205, 100 Hartsfield Centre Parkway, Suite 400, Atlanta, Georgia, 30354. Telephone contact numbers for the NSP are: phone, 404–832–4700; fax, 404–761–8906. The general e-mail address for the NSP office is: *9-aso-avr-sim-team@faa.gov*. The NSP Internet Web Site address is: *http://www.faa.gov/safety/programs_initiatives/aircraft_aviation/nsp/*. On this Web Site you will find an NSP personnel list with telephone and e-mail contact information for each NSP staff member, a list of

qualified flight simulation devices, ACs, a description of the qualification process, NSP policy, and an NSP ''In-Works'' section. Also linked from this site are additional information sources, handbook bulletins, frequently asked questions, a listing and text of the Federal Aviation Regulations, Flight Standards Inspector's handbooks, and other FAA links.

c. The NSPM encourages the use of electronic media for all communication, including any record, report, request, test, or statement required by this appendix. The electronic media used must have adequate security provisions and be acceptable to the NSPM. The NSPM recommends inquiries on system compatibility, and minimum system requirements are also included on the NSP Web site.

d. Related Reading References.

(1) 14 CFR part 60.

(2) 14 CFR part 61.

(3) 14 CFR part 63.

(4) 14 CFR part 119.

(5) 14 CFR part 121.

(6) 14 CFR part 125.

(7) 14 CFR part 135.

(8) 14 CFR part 141.

(9) 14 CFR part 142.

(10) AC 120–28, as amended, Criteria for Approval of Category III Landing Weather Minima.

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

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

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

(14) AC 120–45, as amended, Airplane Flight Training Device Qualification.

(14) AC 120–57, as amended, Surface Movement Guidance and Control System (SMGCS).

(15) AC 150/5300–13, as amended, Airport Design.

(16) AC 150/5340–1, as amended, Standards for Airport Markings.

(17) AC 150/5340–4, as amended, Installation Details for Runway Centerline Touchdown Zone Lighting Systems.

(18) AC 150/5340–19, as amended, Taxiway Centerline Lighting System.

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

(20) AC 150/5345–28, as amended, Precision Approach Path Indicator (PAPI) Systems.

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

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

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

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

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

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

(27) The FAA Aeronautical Information Manual (AIM). An electronic version of the AIM is on the Internet at *http://www.faa.gov/atpubs*.

(28) Aeronautical Radio, Inc. (ARINC) document number 436, titled *Guidelines For Electronic Qualification Test Guide* (as amended).

(29) Aeronautical Radio, Inc. (ARINC) document 610, Guidance for *Design and Integration of Aircraft Avionics Equipment in Simulators* (as amended).

END INFORMATION

2. APPLICABILITY (§§ 60.1 AND 60.2)

BEGIN INFORMATION

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

3. DEFINITIONS (§ 60.3)

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

4. QUALIFICATION PERFORMANCE STANDARDS (§ 60.4)

No additional regulatory or informational material applies to § 60.4, Qualification Performance Standards.

5. QUALITY MANAGEMENT SYSTEM (§ 60.5)

Additional regulatory material and informational material regarding Quality Management Systems for FTDs may be found in Appendix E of this part.

END INFORMATION

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6. SPONSOR QUALIFICATION REQUIREMENTS. (§ 60.7).

BEGIN INFORMATION

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

b. The following examples describe acceptable operational practices:

(1) Example One.

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

(i) If the FTD was qualified prior to May 30, 2008, the 12-month period begins on the date of the first continuing qualification evaluation conducted in accordance with §60.19 after May 30, 2008, and continues for each subsequent 12-month period;

(ii) A device qualified on or after May 30, 2008, will be required to undergo an initial or upgrade evaluation in accordance with §60.15. Once the initial or upgrade evaluation is complete, the first continuing qualification evaluation will be conducted within 6 months. The 12 month continuing qualification evaluation cycle begins on that date and continues for each subsequent 12-month period.

(b) There is no minimum number of hours of FTD use required.

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

(2) Example Two.

(a) A sponsor sponsors an additional number of FTDs, in its facility or elsewhere. Each additionally sponsored FTD must be—

(i) Used by the sponsor in the sponsor's FAA-approved flight training program for the airplane simulated (as described in §60.7(d)(1)); or

(ii) Used by another FAA certificate holder in that other certificate holder's FAA-approved flight training program for the airplane simulated (as described in §60.7(d)(1)). This 12-month period is established in the same manner as in example one; or

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

(b) There is no minimum number of hours of FTD use required.

(3) Example Three.

(a) A sponsor in New York (in this example, a Part 142 certificate holder) establishes ''satellite'' training centers in Chicago and Moscow.

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

(c) All of the FTDs in the Chicago and Moscow centers could be dry-leased (i.e., the certificate holder does not have and use FAA-approved flight training programs for the FTDs in the Chicago and Moscow centers) because—

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

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

END INFORMATION

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7. ADDITIONAL RESPONSIBILITIES OF THE SPONSOR (§60.9)

BEGIN INFORMATION

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

8. FTD USE (§60.11)

No additional regulatory or informational material applies to §60.11, FTD use.

END INFORMATION

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9. FTD Objective Data Requirements (§60.13)

BEGIN QPS REQUIREMENTS

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

(1) A flight test plan consisting of:

(a) The maneuvers and procedures required for aircraft certification and simulation programming and validation.

(b) For each maneuver or procedure—

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

(ii) The atmospheric and environmental conditions.

(iii) The initial flight conditions.

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

(v) The data to be gathered.

(vi) All other information necessary to recreate the flight test conditions in the FTD.

(2) Appropriately qualified flight test personnel.

(3) An understanding of the accuracy of the data to be gathered using appropriate alternative data sources, procedures, and instrumentation that is traceable to a recognized standard as described in Attachment 2, Table B2F of this appendix.

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

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

(1) In a format that supports the FTD validation process;

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

(3) With resolution sufficient to determine compliance with the tolerances set forth in Attachment 2, Table B2A, Appendix B;

(4) With any necessary guidance information provided; and

(5) Without alteration, adjustments, or bias. Data may be corrected to address known data calibration errors provided that an explanation of the methods used to correct the errors appears in the QTG. The corrected data may be re-scaled, digitized, or otherwise manipulated to fit the desired presentation.

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

d. As required by §60.13(f), the sponsor must notify the NSPM when it becomes aware that an addition to or a revision of the flight related data or airplane systems related data is available if this data is used to program and operate a qualified FTD. The data referred to in this sub-section are those data that are used to validate the performance, handling qualities, or other characteristics of the aircraft, including data related to any relevant changes occurring after the type certification is issued. The sponsor must—

(1) Within 10 calendar days, notify the NSPM of the existence of this data; and

(2) Within 45 calendar days, notify the NSPM of—

(i) The schedule to incorporate this data into the FTD; or

(ii) The reason for not incorporating this data into the FTD.

e. In those cases where the objective test results authorize a ''snapshot test'' or a ''series of snapshot test results'' in lieu of a time-history result, the sponsor or other data provider must ensure that a steady state condition exists at the instant of time captured by the ''snapshot.'' The steady state condition must exist from 4 seconds prior to, through 1 second following, the instant of time captured by the snap shot.

END QPS REQUIREMENTS

BEGIN INFORMATION

f. The FTD sponsor is encouraged to maintain a liaison with the manufacturer of the aircraft being simulated (or with the holder of the aircraft type certificate for the aircraft being simulated if the manufacturer is no longer in business), and if appropriate, with the person having supplied the aircraft data package for the FTD in order to facilitate the notification described in this paragraph.

g. It is the intent of the NSPM that for new aircraft entering service, at a point well in advance of preparation of the QTG, the sponsor should submit to the NSPM for approval, a descriptive document (see Appendix A, Table A2C, Sample Validation Data Roadmap for Airplanes) containing the plan for acquiring the validation data, including data sources. This document should clearly identify sources of data for all required tests, a description of the validity of these data for a specific engine type and thrust rating configuration, and the revision levels of all avionics affecting the performance or flying qualities of the aircraft. Additionally, this document should provide other information such as the rationale or explanation for cases where data or data parameters are missing, instances where engineering simulation data are used, or where flight test methods require further explanations. It should also provide a brief narrative describing the cause and effect of any deviation from data requirements. The aircraft manufacturer may provide this document.

h. There is no requirement for any flight test data supplier to submit a flight test

plan or program prior to gathering flight test data. However, the NSPM notes that inexperienced data gatherers often provide data that is irrelevant, improperly marked, or lacking adequate justification for selection. Other problems include inadequate information regarding initial conditions or test maneuvers. The NSPM has been forced to refuse these data submissions as validation data for an FTD evaluation. It is for this reason that the NSPM recommends that any data supplier not previously experienced in this area review the data necessary for programming and for validating the performance of the FTD and discuss the flight test plan anticipated for acquiring such data with the NSPM well in advance of commencing the flight tests.

i. The NSPM will consider, on a case-by-case basis, whether to approve supplemental validation data derived from flight data recording systems such as a Quick Access Recorder or Flight Data Recorder.

END INFORMATION

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10. SPECIAL EQUIPMENT AND PERSONNEL REQUIREMENTS FOR QUALIFICATION OF THE FTD (§& 60.14).

BEGIN INFORMATION

a. In the event that the NSPM determines that special equipment or specifically qualified persons will be required to conduct an evaluation, the NSPM will make every attempt to notify the sponsor at least one (1) week, but in no case less than 72 hours, in advance of the evaluation. Examples of special equipment include flight control measurement devices, accelerometers, or oscilloscopes. Examples of specially qualified personnel include individuals specifically qualified to install or use any special equipment when its use is required.

b. Examples of a special evaluation include an evaluation conducted after: An FTD is moved; at the request of the TPAA; or as a result of comments received from users of the FTD that raise questions about the continued qualification or use of the FTD.

END INFORMATION

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11. INITIAL (AND UPGRADE) QUALIFICATION REQUIREMENTS (§ 60.15).

BEGIN QPS REQUIREMENT

a. In order to be qualified at a particular qualification level, the FTD must:

(1) Meet the general requirements listed in Attachment 1 of this appendix;

(2) Meet the objective testing requirements listed in Attachment 2 of this appendix (Level 4 FTDs do not require objective tests); and

(3) Satisfactorily accomplish the subjective tests listed in Attachment 3 of this appendix.

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

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

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

(3) Except for a Level 4 FTD, a QTG, acceptable to the NSPM, that includes all of the following:

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

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

(c) The result of FTD subjective tests prescribed in the appropriate QPS.

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

c. The QTG described in paragraph a(3) of this section, must provide the documented proof of compliance with the FTD objective tests in Attachment 2, Table B2A of this appendix.

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

(1) Parameters, tolerances, and flight conditions;

(2) Pertinent and complete instructions for conducting automatic and manual tests;

(3) A means of comparing the FTD test results to the objective data;

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

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

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

(1) A QTG cover page with sponsor and FAA approval signature blocks (see Attachment 4, Figure B4C, of this appendix, for a sample QTG cover page).

(2) A continuing qualification evaluation requirements page. This page will be used by the NSPM to establish and record the frequency with which continuing qualification evaluations must be conducted and any subsequent changes that may be determined by

the NSPM in accordance with §60.19. See Attachment 4, Figure B4G, of this appendix, for a sample Continuing Qualification Evaluation Requirements page.

(3) An FTD information page that provides the information listed in this paragraph, if applicable (see Attachment 4, Figure B4B, of this appendix, for a sample FTD information page). For convertible FTDs, the sponsor must submit a separate page for each configuration of the FTD.

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

(b) The airplane model and series being simulated.

(c) The aerodynamic data revision number or reference.

(d) The source of the basic aerodynamic model and the aerodynamic coefficient data used to modify the basic model.

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

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

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

(h) The FTD model and manufacturer.

(i) The date of FTD manufacture.

(j) The FTD computer identification.

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

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

(4) A Table of Contents.

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

(6) List of all relevant data references.

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

(8) Statements of compliance and capability (SOCs) with certain requirements.

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

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

(a) Name of the test.

(b) Objective of the test.

(c) Initial conditions.

(d) Manual test procedures.

(e) Automatic test procedures (if applicable).

(f) Method for evaluating FTD objective test results.

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

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

(i) Tolerances for relevant parameters.

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

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

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

f. A convertible FTD is addressed as a separate FTD for each model and series airplane to which it will be converted and for the FAA qualification level sought. The NSPM will conduct an evaluation for each configuration. If a sponsor seeks qualification for two or more models of an airplane type using a convertible FTD, the sponsor must provide a QTG for each airplane model, or a QTG for the first airplane model and a supplement to that QTG for each additional airplane model. The NSPM will conduct evaluations for each airplane model.

g. The form and manner of presentation of objective test results in the QTG must include the following:

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

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

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

(4) Scaling on graphical presentations must provide the resolution necessary to evaluate the parameters shown in Attachment 2, Table B2A of this appendix.

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

h. The sponsor may elect to complete the QTG objective and subjective tests at the manufacturer's facility or at the sponsor's training facility. If the tests are conducted at the manufacturer's facility, the sponsor must repeat at least one-third of the tests at the sponsor's training facility in order to substantiate FTD performance. The QTG must be clearly annotated to indicate when and where each test was accomplished. Tests conducted at the manufacturer's facility and at the sponsor's training facility must be conducted after the FTD is assembled with systems and sub-systems functional and operating in an interactive manner. The test results must be submitted to the NSPM.

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

j. All FTDs for which the initial qualification is conducted after May 30, 2014, must have an electronic MQTG (eMQTG) including all objective data obtained from airplane testing, or another approved source (reformatted or digitized), together with correlating objective test results obtained from the performance of the FTD (reformatted or digitized) as prescribed in this appendix. The eMQTG must also contain the general FTD performance or demonstration results (reformatted or digitized) prescribed in this appendix, and a description of the equipment necessary to perform the initial qualification evaluation and the continuing qualification evaluations. The eMQTG must include the original validation data used to validate FTD performance and handling qualities in either the original digitized format from the data supplier or an electronic scan of the original time-history plots that were provided by the data supplier. A copy of the eMQTG must be provided to the NSPM.

k. All other FTDs (not covered in subparagraph ''j'') must have an electronic copy of the MQTG by and after May 30, 2014. An electronic copy of the copy of the MQTG must be provided to the NSPM. This may be provided by an electronic scan presented in a Portable Document File (PDF), or similar format acceptable to the NSPM.

l. During the initial (or upgrade) qualification evaluation conducted by the NSPM, the sponsor must also provide a person knowledgeable about the operation of the aircraft and the operation of the FTD.

END QPS REQUIREMENTS

BEGIN INFORMATION

m. Only those FTDs that are sponsored by a certificate holder as defined in Appendix F will be evaluated by the NSPM. However, other FTD evaluations may be conducted on a case-by-case basis as the Administrator deems appropriate, but only in accordance with applicable agreements.

n. The NSPM will conduct an evaluation for each configuration, and each FTD must be evaluated as completely as possible. To ensure a thorough and uniform evaluation, each FTD is subjected to the general FTD requirements in Attachment 1 of this appendix, the objective tests listed in Attachment 2 of this appendix, and the subjective tests listed in Attachment 3 of this appendix. The evaluations described herein will include, but not necessarily be limited to the following:

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

(2) Performance in authorized portions of the simulated airplane's operating envelope, to include tasks evaluated by the NSPM in the areas of surface operations, takeoff, climb, cruise, descent, approach and landing, as well as abnormal and emergency operations (see Attachment 2 of this appendix);

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

(4) Flight deck configuration (see Attachment 1 of this appendix);

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

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

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

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

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

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

(2) Subjective tests provide a basis for:

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

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

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

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

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

q. In addition to the scheduled continuing qualification evaluation, each FTD is subject to evaluations conducted by the NSPM at any time without prior notification to the

sponsor. Such evaluations would be accomplished in a normal manner (i.e., requiring exclusive use of the FTD for the conduct of objective and subjective tests and an examination of functions) if the FTD is not being used for flight crewmember training, testing, or checking. However, if the FTD were being used, the evaluation would be conducted in a non-exclusive manner. This non-exclusive evaluation will be conducted by the FTD evaluator accompanying the check airman, instructor, Aircrew Program Designee (APD), or FAA inspector aboard the FTD along with the student(s) and observing the operation of the FTD during the training, testing, or checking activities.

r. Problems with objective test results are handled as follows:

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

(2) If it is determined that the results of an objective test do not support the qualification level requested but do support a lower level, the NSPM may qualify the FTD at a lower level. For example, if a Level 6 evaluation is requested, but the FTD fails to meet the spiral stability test tolerances, it could be qualified at Level 5.

s. After an FTD is successfully evaluated, the NSPM issues an SOQ to the sponsor, the NSPM recommends the FTD to the TPAA, who will approve the FTD for use in a flight training program. The SOQ will be issued at the satisfactory conclusion of the initial or continuing qualification evaluation and will list the tasks for which the FTD is qualified, referencing the tasks described in Table B1B in Attachment 1 of this appendix. However, it is the sponsor's responsibility to obtain TPAA approval prior to using the FTD in an FAA-approved flight training program.

t. Under normal circumstances, the NSPM establishes a date for the initial or upgrade evaluation within ten (10) working days after determining that a complete QTG is acceptable. Unusual circumstances may warrant establishing an evaluation date before this determination is made. A sponsor may schedule an evaluation date as early as 6 months in advance. However, there may be a delay of 45 days or more in rescheduling and completing the evaluation if the sponsor is unable to meet the scheduled date. See Attachment 4, Figure B4A, Sample Request for Initial, Upgrade, or Reinstatement Evaluation, of this appendix.

u. The numbering system used for objective test results in the QTG should closely follow the numbering system set out in Attachment 2, FTD Objective Tests, Table B2A, of this appendix.

v. Contact the NSPM or visit the NSPM Web site for additional information regarding the preferred qualifications of pilots used to meet the requirements of §60.15(d).

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

12. ADDITIONAL QUALIFICATIONS FOR CURRENTLY QUALIFIED FTDS (§60.16).

No additional regulatory or informational material applies to §60.16, Additional Qualifications for a Currently Qualified FTD.

END INFORMATION

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13. PREVIOUSLY QUALIFIED FTDS (§60.17).

BEGIN QPS REQUIREMENTS

a. In instances where a sponsor plans to remove an FTD from active status for a period of less than two years, the following procedures apply:

(1) The NSPM must be notified in writing and the notification must include an estimate of the period that the FTD will be inactive;

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

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

(4) Before the FTD is restored to qualified status, it must be evaluated by the NSPM. The evaluation content and the time required to accomplish the evaluation is based on the number of continuing qualification evaluations and sponsor-conducted quarterly inspections missed during the period of inactivity.

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

b. FTDs qualified prior to May 30, 2008, and replacement FTD systems, are not required to meet the general FTD requirements, the objective test requirements, and the subjective test requirements of Attachments 1, 2, and 3 of this appendix as long as the FTD continues to meet the test requirements contained in the MQTG developed under the original qualification basis.

c. [Reserved]

d. FTDs qualified prior to May 30, 2008, may be updated. If an evaluation is deemed appropriate or necessary by the NSPM after such an update, the evaluation will not require an evaluation to standards beyond those against which the FTD was originally qualified.

END QPS REQUIREMENTS

BEGIN INFORMATION

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

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

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

h. Downgrading of an FTD is a permanent change in qualification level and will necessitate the issuance of a revised SOQ to reflect the revised qualification level, as appropriate. If a temporary restriction is placed on an FTD because of a missing, malfunctioning, or inoperative component or ongoing repairs, the restriction is not a permanent change in qualification level. Instead, the restriction is temporary and is removed when the reason for the restriction has been resolved.

i. The NSPM will determine the evaluation criteria for an FTD that has been removed from active status for a prolonged period. The criteria will be based on the number of continuing qualification evaluations and quarterly inspections missed during the period of inactivity. For example, if the FTD were out of service for a 1 year period, it would be necessary to complete the entire QTG, since all of the quarterly evaluations would have been missed. The NSPM will also consider how the FTD was stored, whether parts were removed from the FTD and whether the FTD was disassembled.

j. The FTD will normally be requalified using the FAA-approved MQTG and the criteria that was in effect prior to its removal from qualification. However, inactive periods of 2 years or more will require re-qualification under the standards in effect and current at the time of requalification.

END INFORMATION

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14. INSPECTION, CONTINUING QUALIFICATION, EVALUATION, AND MAINTENANCE REQUIREMENTS (§60.19).

BEGIN QPS REQUIREMENT

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

b. The description of the functional preflight check must be contained in the sponsor's QMS.

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

d. During the continuing qualification evaluation conducted by the NSPM, the sponsor must also provide a person knowledgeable about the operation of the aircraft and the operation of the FTD.

END QPS REQUIREMENTS

BEGIN INFORMATION

e. The sponsor's test sequence and the content of each quarterly inspection required in §60.19(a)(1) should include a balance and a mix from the objective test requirement areas listed as follows:

(1) Performance.

(2) Handling qualities.

(3) Motion system (where appropriate).

(4) Visual system (where appropriate).

(5) Sound system (where appropriate).

(6) Other FTD systems.

f. If the NSP evaluator plans to accomplish specific tests during a normal continuing qualification evaluation that requires the use of special equipment or technicians, the sponsor will be notified as far in advance of the evaluation as practical; but not less than 72 hours. Examples of such tests include latencies, control sweeps, or motion or visual system tests.

g. The continuing qualification evaluations described in §60.19(b) will normally require 4 hours of FTD time. However, flexibility is necessary to address abnormal situations or situations involving aircraft with additional levels of complexity (e.g., computer controlled aircraft). The sponsor should anticipate that some tests may require additional time. The continuing qualification evaluations will consist of the following:

(1) Review of the results of the quarterly inspections conducted by the sponsor since the last scheduled continuing qualification evaluation.

(2) A selection of approximately 8 to 15 objective tests from the MQTG that provide an adequate opportunity to evaluate the performance of the FTD. The tests chosen will

be performed either automatically or manually and should be able to be conducted within approximately one-third (1/3) of the allotted FTD time.

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

(4) An examination of the functions of the FTD may include the motion system, visual system, sound system as applicable, instructor operating station, and the normal functions and simulated malfunctions of the airplane systems. This examination is normally accomplished simultaneously with the subjective evaluation requirements.

h. The requirement established in §60.19(b)(4) regarding the frequency of NSPM-conducted continuing qualification evaluations for each FTD is typically 12 months. However, the establishment and satisfactory implementation of an approved QMS for a sponsor will provide a basis for adjusting the frequency of evaluations to exceed 12-month intervals.

15. LOGGING FTD DISCREPANCIES (§60.20)

No additional regulatory or informational material applies to §60.20. Logging FTD Discrepancies.

16. INTERIM QUALIFICATION OF FTDS FOR NEW AIRPLANE TYPES OR MODELS (§60.21)

No additional regulatory or informational material applies to §60.21, Interim Qualification of FTDs for New Airplane Types or Models.

END INFORMATION

17. MODIFICATIONS TO FTDS (§60.23)

BEGIN QPS REQUIREMENTS

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

b. Prior to using the modified FTD:

(1) All the applicable objective tests completed with the modification incorporated, including any necessary updates to the MQTG (e.g., accomplishment of FSTD Directives) must be acceptable to the NSPM; and

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

END QPS REQUIREMENTS

BEGIN INFORMATION

c. FSTD Directives are considered modification of an FTD. See Attachment 4 of this appendix for a sample index of effective FSTD Directives.

END INFORMATION

18. OPERATION WITH MISSING, MALFUNCTIONING, OR INOPERATIVE COMPONENTS (§60.25)

BEGIN INFORMATION

a. The sponsor's responsibility with respect to §60.25(a) is satisfied when the sponsor fairly and accurately advises the user of the current status of an FTD, including any missing, malfunctioning, or inoperative (MMI) component(s).

b. It is the responsibility of the instructor, check airman, or representative of the administrator conducting training, testing, or checking to exercise reasonable and prudent judgment to determine if any MMI component is necessary for the satisfactory completion of a specific maneuver, procedure, or task.

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

d. In accordance with the authorization described in §60.25(b), the sponsor may develop a discrepancy prioritizing system to accomplish repairs based on the level of impact on the capability of the FTD. Repairs having a larger impact on the FTD's ability to provide the required training, evaluation, or flight experience will have a higher priority for repair or replacement.

END INFORMATION

19. AUTOMATIC LOSS OF QUALIFICATION AND PROCEDURES FOR RESTORATION OF QUALIFICATION (§60.27)

BEGIN INFORMATION

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

END INFORMATION

20. OTHER LOSSES OF QUALIFICATION AND PROCEDURES FOR RESTORATION OF QUALIFICATION (§ 60.29)

BEGIN INFORMATION

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

END INFORMATION

21. RECORDKEEPING AND REPORTING (§ 60.31)

BEGIN QPS REQUIREMENTS

a. FTD modifications can include hardware or software changes. For FTD modifications involving software programming changes, the record required by § 60.31(a)(2) must consist of the name of the aircraft system software, aerodynamic model, or engine model change, the date of the change, a summary of the change, and the reason for the change.

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

END QPS REQUIREMENTS

22. APPLICATIONS, LOGBOOKS, REPORTS, AND RECORDS: FRAUD, FALSIFICATION, OR INCORRECT STATEMENTS (§ 60.33)

BEGIN INFORMATION

No additional regulatory or informational material applies to § 60.33, Applications, Logbooks, Reports, and Records: Fraud, Falsification, or Incorrect Statements.

END INFORMATION

23. [RESERVED]

24. LEVELS OF FTD.

BEGIN INFORMATION

a. The following is a general description of each level of FTD. Detailed standards and tests for the various levels of FTDs are fully defined in Attachments 1 through 3 of this appendix.

(1) Level 4. A device that may have an open airplane-specific flight deck area, or an enclosed airplane-specific flight deck and at least one operating system. Air/ground logic is required (no aerodynamic programming required). All displays may be flat/LCD panel representations or actual representations of displays in the aircraft. All controls, switches, and knobs may be touch sensitive activation (not capable of manual manipulation of the flight controls) or may physically replicate the aircraft in control operation.

(2) Level 5. A device that may have an open airplane-specific flight deck area, or an enclosed airplane-specific flight deck; generic aerodynamic programming; at least one operating system; and control loading that is representative of the simulated airplane only at an approach speed and configuration. All displays may be flat/LCD panel representations or actual representations of displays in the aircraft. Primary and secondary flight controls (e.g., rudder, aileron, elevator, flaps, spoilers/speed brakes, engine controls, landing gear, nosewheel steering, trim, brakes) must be physical controls. All other controls, switches, and knobs may be touch sensitive activation.

(3) Level 6. A device that has an enclosed airplane-specific flight deck; airplane-specific aerodynamic programming; all applicable airplane systems operating; control loading that is representative of the simulated airplane throughout its ground and flight envelope; and significant sound representation. All displays may be flat/LCD panel representations or actual representations of displays in the aircraft, but all controls, switches, and knobs must physically replicate the aircraft in control operation.

END INFORMATION

25. FTD QUALIFICATION ON THE BASIS OF A BILATERAL AVIATION SAFETY AGREEMENT (BASA) (§ 60.37)

BEGIN INFORMATION

No additional regulatory or informational material applies to § 60.37, FTD Qualification on the Basis of a Bilateral Aviation Safety Agreement (BASA).

END INFORMATION

ATTACHMENT 1 TO APPENDIX B TO PART 60—GENERAL FTD REQUIREMENTS

BEGIN QPS REQUIREMENTS

1. REQUIREMENTS

a. Certain requirements included in this appendix must be supported with an SOC as defined in Appendix F, which may include objective and subjective tests. The requirements for SOCs are indicated in the ''General FTD Requirements'' column in Table B1A of this appendix.

b. Table B1A describes the requirements for the indicated level of FTD. Many devices include operational systems or functions that exceed the requirements outlined in this section. In any event, all systems will be tested and evaluated in accordance with this appendix to ensure proper operation.

END QPS REQUIREMENTS

BEGIN INFORMATION

2. DISCUSSION

a. This attachment describes the general requirements for qualifying Level 4 through Level 6 FTDs. The sponsor should also consult the objectives tests in Attachment 2 of this appendix and the examination of functions and subjective tests listed in Attachment 3 of this appendix to determine the complete requirements for a specific level FTD.

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

(1) General Flight deck Configuration.

(2) Programming.

(3) Equipment Operation.

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

(5) Motion System.

(6) Visual System.

(7) Sound System.

c. Table B1A provides the standards for the General FTD Requirements.

d. Table B1B provides the tasks that the sponsor will examine to determine whether the FTD satisfactorily meets the requirements for flight crew training, testing, and experience, and provides the tasks for which the simulator may be qualified.

e. Table B1C provides the functions that an instructor/check airman must be able to control in the simulator.

f. It is not required that all of the tasks that appear on the List of Qualified Tasks (part of the SOQ) be accomplished during the initial or continuing qualification evaluation.

END INFORMATION

TABLE B1A—MINIMUM FTD REQUIREMENTS

QPS Requirements					Information
Entry No.	General FTD requirements	FTD level			Notes
		4	5	6	
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 simulator, but may be relocated to a suitable location as near as practical to the original position. Fire axes, landing gear pins, and any similar purpose instruments need only be represented in silhouette.			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 extinguishers, spare light bulbs, aircraft documents pouches are not considered essential and may be omitted.

TABLE B1A—MINIMUM FTD REQUIREMENTS—Continued

QPS Requirements					Information
Entry No.	General FTD requirements	FTD level			Notes
		4	5	6	
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. 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.	X	X		
2. Programming					
2.a.	The FTD must provide the proper effect of aerodynamic changes for the combinations of drag and thrust normally encountered in flight. This must include the effect of change in airplane attitude, thrust, drag, altitude, temperature, and configuration. Level 6 additionally requires the effects of changes in gross weight and center of gravity. Level 5 requires only generic aerodynamic programming. An SOC is required.		X	X	
2.b.	The FTD must have the computer (analog or digital) capability (i.e., capacity, accuracy, resolution, and dynamic response) needed to meet the qualification level sought. An SOC is required.	X	X	X	
2.c.	Relative responses of the 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. • Latency: The FTD instrument and, if applicable, the motion system and the visual system response must not be prior to that time when the airplane responds and may respond up to 300 milliseconds after that time under the same conditions. • Transport Delay: As an alternative to the Latency requirement, a transport delay objective test may be used to demonstrate that the FTD system does not exceed the specified limit. The sponsor must measure all the delay encountered by a step signal migrating from the pilot's control through all the simulation software modules in the correct order, using a handshaking protocol, finally through the normal output interfaces to the instrument display and, if applicable, the motion system, and the visual system.		X	X	The intent is to verify that the FTD provides instrument cues that are, within the stated time delays, like the airplane responses. For airplane response, acceleration in the appropriate, corresponding rotational axis is preferred. Additional information regarding Latency and Transport Delay testing may be found in Appendix A, Attachment 2, paragraph 15.
3. Equipment Operation					

TABLE B1A—MINIMUM FTD REQUIREMENTS—Continued

QPS Requirements					Information
Entry No.	General FTD requirements	FTD level			Notes
		4	5	6	
3.a.	All relevant instrument indications involved in the simulation of the airplane must automatically respond to control movement or external disturbances to the simulated airplane; e.g., turbulence or winds.		X	X	
3.b.	Navigation equipment must be installed and operate within the tolerances applicable for the airplane.		X	X	
	Level 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.				
3.c.	Installed systems must simulate the applicable airplane system operation, both on the ground and in flight. Installed systems must be operative to the extent that applicable normal, abnormal, and emergency operating procedures included in the sponsor's training programs can be accomplished. Level 6 must simulate all applicable airplane flight, navigation, and systems operation. Level 5 must have at least functional flight and navigational controls, displays, and instrumentation. Level 4 must have at least one airplane system installed and functional.	X	X	X	
3.d.	The lighting environment for panels and instruments must be sufficient for the operation being conducted.	X	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 correspond to the airplane being simulated. Control forces must react in the same manner as in the airplane under the same flight conditions.			X	
3.f.	The FTD must provide control forces and control travel of sufficient precision to manually fly an instrument approach.		X		
4. Instructor or Evaluator Facilities					
4.a.	In addition to the flight crewmember stations, suitable seating arrangements for an instructor/check airman and FAA Inspector must be available. These seats must provide adequate view of crewmember's panel(s).	X	X	X	These seats need not be a replica of an aircraft seat and may be as simple as an office chair placed in an appropriate position.
4.b.	The FTD must have instructor controls that permit activation of normal, abnormal, and emergency conditions as appropriate. Once activated, proper system operation must result from system management by the crew and not require input from the instructor controls.	X	X	X	
5. Motion System (not required)					

TABLE B1A—MINIMUM FTD REQUIREMENTS—Continued

QPS Requirements					Information
Entry No.	General FTD requirements	FTD level			Notes
		4	5	6	
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	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	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.	X	X	X	
6.a.7.	The visual system must provide for a minimum resolution of 5 arc-minutes for both computed and displayed pixel size. An SOC is required.	X	X	X	

TABLE B1A—MINIMUM FTD REQUIREMENTS—Continued

QPS Requirements					Information
Entry No.	General FTD requirements	FTD level			Notes
		4	5	6	
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 installations where the visual system design ''eye point'' is appropriately adjusted for each pilot's position such that the parallax error is at or less than 10° simultaneously for each pilot. An SOC is required.			X	Directly projected, non-collimated visual displays may prove to be unacceptable for dual pilot applications.
7. Sound System					
7.a.	The FTD must simulate significant flight deck sounds resulting from pilot actions that correspond to those heard in the airplane.			X	

TABLE B1B—TABLE OF TASKS VS. FTD LEVEL

QPS requirements					Information
Entry No.	Subjective Requirements—In order to be qualified at the FTD qualification level indicated, the FTD must be able to perform at least the tasks associated with that level of qualification. See Notes 1 and 2 at the end of the Table	FTD level			Notes
		4	5	6	
1. Preflight Procedures.					
1.a.	Preflight Inspection (flight deck only)	A	A	X	
1.b.	Engine Start	A	A	X	
1.c.	Pre-takeoff Checks	A	A	X	
2. Takeoff and Departure Phase.					
2.a.	Rejected Takeoff (requires visual system)	....	....	A	
2.b.	Departure Procedure	....	X	X	
3. In-flight Maneuvers.					
3.a.	a. Steep Turns	....	X	X	
3.b.	b. Approaches to Stalls	....	A	X	
3.c.	c. Engine Failure (procedures only)—Multiengine Airplane.	....	A	X	
3.d.	d. Engine Failure (procedures only)—Single-Engine Airplane.	....	A	X	
3.e.	e. Specific Flight Characteristics incorporated into the user's FAA approved flight training program.	A	A	A	
4. Instrument Procedures.					
4.a.	Standard Terminal Arrival/Flight Management System Arrival.	....	A	X	
4.b.	Holding	....	A	X	

TABLE B1B—TABLE OF TASKS VS. FTD LEVEL—Continued

QPS requirements					Information
Entry No.	Subjective Requirements—In order to be qualified at the FTD qualification level indicated, the FTD must be able to perform at least the tasks associated with that level of qualification. See Notes 1 and 2 at the end of the Table	FTD level			Notes
		4	5	6	
4.c.	Precision Instrument, all engines operating	....	A	X	e.g., Autopilot, Manual (Flt. Dir. Assisted), Manual (Raw Data).
4.d.	Non-precision Instrument, all engines operating	....	A	X	e.g., NDB, VOR, VOR/DME, VOR/TAC, RNAV, LOC, LOC/BC, ADF, and SDF.
4.e.	Circling Approach (requires visual system)	....	....	A	
4.f.	Missed Approach	....	A	X	
5. Normal and Abnormal Procedures.					
5.a.	Engine (including shutdown and restart—procedures only).	A	A	X	
5.b.	Fuel System	A	A	X	
5.c.	Electrical System	A	A	X	
5.d.	Hydraulic System	A	A	X	
5.e.	Environmental and Pressurization Systems	A	A	X	
5.f.	Fire Detection and Extinguisher Systems	A	A	X	
5.g.	Navigation and Avionics Systems	A	A	X	
5.h.	Automatic Flight Control System, Electronic Flight Instrument System, and Related Subsystems.	A	A	X	
5.i.	Flight Control Systems	A	A	X	
5.j.	Anti-ice and Deice Systems	A	A	X	
5.k.	Aircraft and Personal Emergency Equipment	A	A	X	
6. Emergency Procedures.					
6.a.	Emergency Descent (maximum rate)	....	A	X	
6.b.	Inflight Fire and Smoke Removal	....	A	X	
6.c.	Rapid Decompression	....	A	X	
6.d.	Emergency Evacuation	A	A	X	
7. Postflight Procedures.					
7.a.	After-Landing Procedures	A	A	X	
7.b.	Parking and Securing	A	A	X	

Note 1: An ''A'' in the table indicates that the system, task, or procedure, although not required to be present, may be examined if the appropriate airplane system is simulated in the FTD and is working properly.

Note 2: Items not installed or not functional on the FTD and not appearing on the SOQ Configuration List, are not required to be listed as exceptions on the SOQ.

TABLE B1C—TABLE OF FTD SYSTEM TASKS QPS REQUIREMENTS

QPS Requirements					Information
Entry No.	Subjective Requirements In order to be qualified at the FTD qualification level indicated, the FTD must be able to perform at least the tasks associated with that level of qualification.	FTD level			Notes
		4	5	6	
1. Instructor Operating Station (IOS).					

TABLE B1C—TABLE OF FTD SYSTEM TASKS QPS REQUIREMENTS—Continued

QPS Requirements					Information
Entry No.	Subjective Requirements In order to be qualified at the FTD qualification level indicated, the FTD must be able to perform at least the tasks associated with that level of qualification.	FTD level			Notes
		4	5	6	
1.a.	Power switch(es)	X	X	X	
1.b.	Airplane conditions	A	X	X	e.g., GW, CG, Fuel loading, Systems, Ground Crew.
1.c.	Airports/Runways	X	X	X	e.g., Selection and Presets; Surface and Lighting controls if equipped with a visual system.
1.d.	Environmental controls	X	X	X	e.g., Temp, Wind.
1.e.	Airplane system malfunctions (Insertion/deletion)	A	X	X	
1.f.	Locks, Freezes, and Repositioning	X	X	X	
1.g.	Sound Controls. (On/off/adjustment)	X	X	X	
1.h.	Motion/Control Loading System, as appropriate. On/off/emergency stop.	A	A	A	
2. Observer Seats/Stations.					
2.a.	Position/Adjustment/Positive restraint system	X	X	X	

Note 1: An ''A'' in the table indicates that the system, task, or procedure, although not required to be present, may be examined if the appropriate system is in the FTD and is working properly.

ATTACHMENT 2 TO APPENDIX B TO PART 60—FLIGHT TRAINING DEVICE (FTD) OBJECTIVE TESTS

BEGIN INFORMATION

1. DISCUSSION

a. For the purposes of this attachment, the flight conditions specified in the Flight Conditions Column of Table B2A, are defined as follows:

(1) Ground—on ground, independent of airplane configuration;

(2) Take-off—gear down with flaps/slats in any certified takeoff position;

(3) First segment climb—gear down with flaps/slats in any certified takeoff position (normally not above 50 ft AGL);

(4) Second segment climb—gear up with flaps/slats in any certified takeoff position (normally between 50 ft and 400 ft AGL);

(5) Clean—flaps/slats retracted and gear up;

(6) Cruise—clean configuration at cruise altitude and airspeed;

(7) Approach—gear up or down with flaps/slats at any normal approach position as recommended by the airplane manufacturer; and

(8) Landing—gear down with flaps/slats in any certified landing position.

b. The format for numbering the objective tests in Appendix A, Attachment 2, Table A2A, and the objective tests in Appendix B, Attachment 2, Table B2A, is identical. However, each test required for FFSs is not necessarily required for FTDs. Also, each test required for FTDs is not necessarily required for FFSs. Therefore, when a test number (or series of numbers) is not required, the term ''Reserved'' is used in the table at that location. Following this numbering format provides a degree of commonality between the two tables and substantially reduces the potential for confusion when referring to objective test numbers for either FFSs or FTDs.

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

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

e. A Level 4 FTD does not require objective tests and therefore, Level 4 is not addressed in the following table.

END INFORMATION

BEGIN QPS REQUIREMENTS

2. TEST REQUIREMENTS

a. The ground and flight tests required for qualification are listed in Table B2A Objective Tests. Computer generated FTD test results must be provided for each test except where an alternate test is specifically authorized by the NSPM. If a flight condition or operating condition is required for the test but does not apply to the airplane being simulated or to the qualification level sought, it may be disregarded (e.g., an engine out missed approach for a single-engine airplane; a maneuver using reverse thrust for an airplane without reverse thrust capability). Each test result is compared against the validation data described in §60.13, and in Appendix B. The results must be produced on an appropriate recording device acceptable to the NSPM and must include FTD number, date, time, conditions, tolerances, and appropriate dependent variables portrayed in comparison to the validation data. Time histories are required unless otherwise indicated in Table B2A. All results must be labeled using the tolerances and units given.

b. Table B2A in this attachment sets out the test results required, including the parameters, tolerances, and flight conditions for FTD validation. Tolerances are provided for the listed tests because mathematical modeling and acquisition and development of reference data are often inexact. All tolerances listed in the following tables are applied to FTD performance. When two tolerance values are given for a parameter, the less restrictive may be used unless otherwise indicated. In those cases where a tolerance is expressed only as a percentage, the tolerance percentage applies to the maximum value of that parameter within its normal operating range as measured from the neutral or zero position unless otherwise indicated.

c. Certain tests included in this attachment must be supported with a SOC. In Table B2A, requirements for SOCs are indicated in the ''Test Details'' column.

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

e. It is not acceptable to program the FTD so that the mathematical modeling is correct only at the validation test points. Unless noted otherwise, tests must represent airplane performance and handling qualities at operating weights and centers of gravity (CG) typical of normal operation. If a test is supported by aircraft data at one extreme weight or CG, another test supported by aircraft data at mid-conditions or as close as possible to the other extreme is necessary. Certain tests that are relevant only at one extreme CG or weight condition need not be repeated at the other extreme. The results of the tests for Level 6 are expected to be indicative of the device's performance and handling qualities throughout all of the following:

(1) The airplane weight and CG envelope;

(2) The operational envelope; and

(3) Varying atmospheric ambient and environmental conditions—including the extremes authorized for the respective airplane or set of airplanes.

f. When comparing the parameters listed to those of the airplane, sufficient data must also be provided to verify the correct flight condition and airplane configuration changes. For example, to show that control force is within the parameters for a static stability test, data to show the correct airspeed, power, thrust or torque, airplane configuration, altitude, and other appropriate datum identification parameters must also be given. If comparing short period dynamics, normal acceleration may be used to establish a match to the airplane, but airspeed, altitude, control input, airplane configuration, and other appropriate data must also be given. If comparing landing gear change dynamics, pitch, airspeed, and altitude may be used to establish a match to the airplane, but landing gear position must also be provided. All airspeed values must be properly annotated (e.g., indicated versus calibrated). In addition, the same variables must be used for comparison (e.g., compare inches to inches rather than inches to centimeters).

g. The QTG provided by the sponsor must clearly describe how the FTD will be set up and operated for each test. Each FTD subsystem may be tested independently, but overall integrated testing of the FTD must be accomplished to assure that the total FTD system meets the prescribed standards. A manual test procedure with explicit and detailed steps for completing each test must also be provided.

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

i. FTDs are evaluated and qualified with an engine model simulating the airplane data supplier's flight test engine. For qualification of alternative engine models (either variations of the flight test engines or other manufacturer's engines) additional tests

with the alternative engine models may be required. This attachment contains guidelines for alternative engines.

j. Testing Computer Controlled Aircraft (CCA) simulators, or other highly augmented airplane simulators, flight test data is required for the Normal (N) and/or Non-normal (NN) control states, as indicated in this attachment. Where test results are independent of control state, Normal or Non-normal control data may be used. All tests in Table B2A require test results in the Normal control state unless specifically noted otherwise in the Test Details section following the CCA designation. The NSPM will determine what tests are appropriate for airplane simulation data. When making this determination, the NSPM may require other levels of control state degradation for specific airplane tests. Where Non-normal control states are required, test data must be provided for one or more Non-normal control states, and must include the least augmented state. Where applicable, flight test data must record Normal and Non-normal states for:

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

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

k. Tests of handling qualities must include validation of augmentation devices. FTDs for highly augmented airplanes will be validated both in the unaugmented configuration (or failure state with the maximum permitted degradation in handling qualities) and the augmented configuration. Where various levels of handling qualities result from failure states, validation of the effect of the failure is necessary. Requirements for testing will be mutually agreed to between the sponsor and the NSPM on a case-by-case basis.

l. Some tests will not be required for airplanes using airplane hardware in the FTD flight deck (e.g., ''side stick controller''). These exceptions are noted in Section 2 ''Handling Qualities'' in Table B2A of this attachment. However, in these cases, the sponsor must provide a statement that the airplane hardware meets the appropriate manufacturer's specifications and the sponsor must have supporting information to that fact available for NSPM review.

m. For objective test purposes, see Appendix F of this part for the definitions of ''Near maximum,'' ''Light,'' and ''Medium'' gross weight.

END QPS REQUIREMENTS

BEGIN INFORMATION

n. In those cases where the objective test results authorize a ''snapshot test'' or a ''series of snapshot test results'' in lieu of a time-history result, the sponsor or other data provider must ensure that a steady state condition exists at the instant of time captured by the ''snapshot.'' The steady state condition must exist from 4 seconds prior to, through 1 second following, the instant of time captured by the snap shot.

o. Refer to AC 120–27, ''Aircraft Weight and Balance'' and FAA–H–8083–1, ''Aircraft Weight and Balance Handbook'' for more information.

END INFORMATION

TABLE B2A—FLIGHT TRAINING DEVICE (FTD) OBJECTIVE TESTS

QPS requirements							
Test		Tolerances	Flight conditions	Test details	FTD level		Information
Entry No.	Title				5	6	Notes
1. Performance							
1.a.	(Reserved)						
1.b.	Takeoff						
1.b.1.	Ground Acceleration Time ..	±5% time or ±1 sec	Takeoff	Record acceleration time for a minimum of 80% of the segment from brake release to V_R. Preliminary aircraft certification data may be used.		X	This test is required only if RTO training credit is sought.
1.b.2. through 1.b.6.	(Reserved)						
1.b.7.	Rejected Takeoff	±5% time or ±1.5 sec	Dry Runway	Record time for at least 80% of the segment from initiation of the Rejected Takeoff to full stop.		X	This test is required only if RTO training credit is sought.
1.b.8.	(Reserved)						
1.c.	Climb						
1.c.1.	Normal Climb all engines operating.	±3 kt airspeed, ±5% or ±100 ft/min (0.5 m/sec) climb rate.	Clean	Flight test data or airplane performance manual data may be used. Record at nominal climb speed and at nominal altitude. May be a snapshot test result. FTD performance must be recorded over an interval of at least 1,000 ft (300 m).	X	X	
1.c.2. through 1.c.4.	(Reserved)						
1.d.	(Reserved)						
1.e.	(Reserved)						
1.f.	Engines						

TABLE B2A—FLIGHT TRAINING DEVICE (FTD) OBJECTIVE TESTS—Continued

QPS requirements							
Test		Tolerances	Flight conditions	Test details	FTD level		Information
Entry No.	Title				5	6	Notes
1.f.1.	Acceleration	Level 6: ±10% T_t, or ±0.25 sec. Level 5: ±1 sec	Approach or Landing	Record engine power (N_1, N_2, EPR, Torque, Manifold Pressure) from idle to maximum takeoff power for a rapid (slam) throttle movement.	X	X	See Appendix F of this part for definitions of T_i and T_t.
1.f.2.	Deceleration	Level 6: ±10% T_t, or ±0.25 sec. Level 5: ±1 sec	Ground	Record engine power (N_1, N_2, EPR, Torque, Manifold Pressure) from maximum takeoff power to idle for a rapid (slam) throttle movement.	X	X	See Appendix F of this part for definitions of T_i and T_t.
2. Handling Qualities							
	For FTDs requiring Static tests at the controls (i.e., column, wheel, rudder pedal), special test fixtures will not be required during initial or upgrade evaluations if the sponsor's QTG/MQTG shows both test fixture results and the results of an alternative approach, such as computer plots produced concurrently, that show satisfactory agreement. Repeat of the alternative method during the initial or upgrade evaluation would then satisfy this test requirement.						Testing of position versus force is not applicable if forces are generated solely by use of airplane hardware in the FTD.
2.a.	Static Control Tests						
2.a.1.a.	Pitch Controller Position vs. Force and Surface Position Calibration.	±2 lb (0.9 daN) breakout, ±10% or ±5 lb (2.2 daN) force, ±2° elevator.	Ground	Record results for an uninterrupted control sweep to the stops.		X	
2.a.1.b.	Pitch Controller Position vs. Force.	±2 lb (0.9 daN) breakout, ±10% or ±5 lb (2.2 daN) force.	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.2.a.	Roll Controller Position vs. Force and Surface Position Calibration.	±2 lb (0.9 daN) breakout, ±10% or ±3 lb (1.3 daN) force, ±2° aileron, ±3° spoiler angle.	Ground	Record results for an uninterrupted control sweep to the stops.		X	

2.a.2.b.	Roll Controller Position vs. Force.	±2 lb (0.9 daN) breakout, ±10% or ±3 lb (1.3 daN) force.	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 vs. Force and Surface Position Calibration.	±5 lb (2.2 daN) breakout, ±10% or ±5 lb (2.2 daN) force, ±2° rudder angle.	Ground	Record results for an uninterrupted control sweep to the stops.		X	
2.a.3.b.	Rudder Pedal Position vs. Force.	±5 lb (2.2 daN) breakout, ±10% or ±5 lb (2.2 daN) force.	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.	Nosewheel Steering Controller Force.	±2 lb (0.9 daN) breakout, ±10% or ±3 lb (1.3 daN) force.	Ground	Record results of an uninterrupted control sweep to the stops.		X	
2.a.5.	Rudder Pedal Steering Calibration.	±2° nosewheel angle	Ground	Record results of an uninterrupted control sweep to the stops.		X	
2.a.6.	Pitch Trim Indicator vs. Surface Position Calibration.	±0.5° of computed trim surface angle.	Ground			X	The purpose of the test is to compare the FTD against design data or equivalent.
2.a.7.	(Reserved)						
2.a.8.	Alignment of Flight deck Throttle Lever vs. Selected Engine Parameter.	±5° of throttle lever angle or ±0.8 in (2 cm) for power control without angular travel, or ±3% N1, or ±0.03 EPR, or ±3% maximum rated manifold pressure, or ±3% torque.	Ground	Requires simultaneous recording for all engines. The tolerances apply against airplane data and between engines. In the case of propeller powered airplanes, if a propeller lever is present, it must also be checked. For airplanes with throttle "detents," all detents must be presented. May be a series of snapshot test results.		X	

TABLE B2A—FLIGHT TRAINING DEVICE (FTD) OBJECTIVE TESTS—Continued

QPS requirements							
Test		Tolerances	Flight conditions	Test details	FTD level		Information
Entry No.	Title				5	6	Notes
2.a.9.	Brake Pedal Position vs. Force.	±5 lb (2.2 daN) or 10% force.	Ground	Two data points are required: Zero and maximum deflection. Computer output results may be used to show compliance.		X	Test not required unless RTO credit is sought.
2.b.	(Reserved)						
2.c.	Longitudinal Control Tests						
Power setting is that required for level flight unless otherwise specified.							
2.c.1.	Power Change Force	±5 lb (2.2 daN) or, ±20% pitch conrol force.	Approach	May be a series of snapshot test results. Power change dynamics test as described in test 2.c.1 of Table A2A of this part will be accepted. CCA: Test in Normal and Non-normal control states.	X	X	
2.c.2.	Flap/Slat Change Force	±5 lb (2.2 daN) or, ±20% pitch conrol force.	Takeoff through initial flap retraction, and approach to landing.	May be a series of snapshot test results. Flap/Slat change dynamics test as described in test 2.c.2 of Table A2A of this part will be accepted. CCA: Test in Normal and Non-normal control states.	X	X	
2.c.3.	(Reserved)						
2.c.4.	Gear Change Force	±5 lb (2.2 daN) or, ±20% pitch conrol force.	Takeoff (retraction) and Approach (extension).	May be a series of snapshot test results. Gear change dynamics test as described in test 2.c.4 of Table A2A of this part will be accepted. CCA: Test in Normal and Non-normal control states.	X	X	
2.c.5.	Longitudinal Trim	±0.5° trim surface angle ±1° elevator ±1° pitch angle ±5% net thrust or equivalent.	Cruise, Approach, and Landing.	Record steady-state condition with wings level and thrust set for level flight. May be a series of snapshot tests Level 5 may use equivalent stick and trim controllers in lieu of elevator and trim surface. CCA: Test in Normal and Non-normal control states.	X	X	

2.c.6.	Longitudinal Maneuvering Stability (Stick Force/g).	±5 lb (±2.2 daN) or ±10% pitch controller force Alternative method: ±1° or ±10% change of elevator.	Cruise, Approach, and Landing.	Continuous time history data or a series of snapshot tests may be used. Record results up to 30° of bank for approach and landing configurations. Record results for up to 45° of bank for the cruise configuration. The force tolerance is not applicable if forces are generated solely by the use of airplane hardware in the FTD. The alternative method applies to airplanes that do not exhibit "stick-force-per-g" characteristics. CCA: Test in Normal and Non-normal control states.		X	
2.c.7.	Longitudinal Static Stability	±5 lb (±2.2 daN) or ±10% pitch controller force. Alternative method: ±1° or ±10% change of elevator.	Approach	May be a series of snapshot test results. Record results for at least 2 speeds above and 2 speeds below trim speed. The force tolerance is not applicable if forces are generated solely by the use of airplane hardware in the FTD. The alternative method applies to airplanes that do not exhibit speed stability characteristics. Level 5 must exhibit positive static stability, but need not comply with the numerical tolerance. CCA: Test in Normal and Non-normal control states.	X	X	
2.c.8.	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% period, ±10% of time to ½ or double amplitude or ±.02 of damping ratio.	Cruise	The test must include whichever is less of the following: Three full cycles (six overshoots after the input is completed), or the number of cycles sufficient to determine time to ½ or double amplitude. CCA: Test in Non-normal control state.	X		
2.c.9.b.	Phugoid Dynamics	±10% period, Representative damping.	Cruise	The test must include whichever is less of the following: Three full cycles (six overshoots after the input is completed), or the number of cycles sufficient to determine representative damping. CCA: Test in Non-normal control state.	X		

TABLE B2A—FLIGHT TRAINING DEVICE (FTD) OBJECTIVE TESTS—Continued

QPS requirements							
Test		Tolerances	Flight conditions	Test details	FTD level		Information
Entry No.	Title				5	6	Notes
2.c.10.	Short Period Dynamics	±1.5° pitch angle or ±2°/sec pitch rate, ±0.10g acceleration..	Cruise	CCA: Test in Non-normal control state.		X	
2.d.	Lateral Directional Tests						
Power setting is that required for level flight unless otherwise specified.							
2.d.1.	(Reserved)						
2.d.2.	Roll Response (Rate)	±10% or ±2°/sec roll rate	Cruise, and Approach or Landing.	Record results for normal roll controller deflection (one-third of maximum roll controller travel). May be combined with step input of flight deck roll controller test (see 2.d.3.).	X	X	
2.d.3.	Roll Response to Flight deck Roll Controller Step Input.	±10% or ±2° bank angle	Approach or Landing	Record from initiation of roll through 10 seconds after control is returned to neutral and released. May be combined with roll response (rate) test (see 2.d.2.). CCA: Test in Non-normal control state.		X	
2.d.4.a.	Spiral Stability	Correct trend and ±3° or ±10% bank angle in 30 seconds.	Cruise	Record results for both directions. As an alternate test, demonstrate the lateral control required to maintain a steady turn with a bank angle of 30°. CCA: Test in Non-normal control state.		X	Airplane data averaged from multiple tests in same direction may be used.
2.d.4.b.	Spiral Stability	Correct trend	Cruise	CCA: Test in Non-normal control state.	X		Airplane data averaged from multiple tests in same direction may be used.
2.d.5.	(Reserved)						

2.d.6.a.	Rudder Response	±2°/sec or ±10% yaw rate ..	Approach or Landing	A rudder step input of 20%–30% rudder pedal throw must be used. 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 states.		X	
2.d.6.b.	Rudder Response	Roll rate ±2°/sec, bank angle ±3°.	Approach or Landing	May be roll response to a given rudder deflection. CCA: Test in Normal and Non-normal control 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 (Yaw Damper OFF).	±0.5 sec. or ±10% of period, ±10% of time to ½ or double amplitude or ±.02 of damping ratio.	Cruise, and Approach or Landing.	Record results for at least 6 complete cycles with stability augmentation OFF, or the number of cycles sufficient to determine time to ½ or double amplitude. CCA: Test in Non-normal control state.			
2.d.8.	Steady State Sideslip	For given rudder position ±2° bank angle, ±1° sideslip angle, ±10% or ±2° aileron, ±10% or ±5° spoiler or equivalent roll, controller position or force.	Approach or Landing	Use at least two rudder positions, one of which must be near maximum allowable rudder. Propeller driven airplanes must test in each direction. May be a series of snapshot test results. Sideslip angle is matched only for repeatability and only on continuing qualification evaluations.	X	X	
2.e. through 2.h.	(Reserved)						
3. (Reserved)							
4. (Reserved)							
5. (Reserved)							
6. FTD System Response Time							
6.a.	Latency.						
		300 ms (or less) after airplane response.	Take-off, cruise, and approach or landing.	One test is required in each axis (pitch, roll and yaw) for each of the three conditions (take-off, cruise, and approach or landing).	X	X	
	Transport Delay						

TABLE B2A—FLIGHT TRAINING DEVICE (FTD) OBJECTIVE TESTS—Continued

QPS requirements							
Test		Tolerances	Flight conditions	Test details	FTD level		Information
Entry No.	Title				5	6	Notes
		300 ms (or less) after controller movement.	N/A	A separate test is required in each axis (pitch, roll, and yaw).	X	X	If Transport Delay is the chosen method to demonstrate relative responses, the sponsor and the NSPM 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).

BEGIN INFORMATION

3. FOR ADDITIONAL INFORMATION ON THE FOLLOWING TOPICS, PLEASE REFER TO APPENDIX A, ATTACHMENT 2, AND THE INDICATED PARAGRAPH WITHIN THAT ATTACHMENT

- Control Dynamics, paragraph 4.
- Motion System, paragraph 6.
- Sound System, paragraph 7.
- Engineering Simulator Validation Data, paragraph 9.
- Validation Test Tolerances, paragraph 11.
- Validation Data Road Map, paragraph 12.
- Acceptance Guidelines for Alternative Engines Data, paragraph 13.
- Acceptance Guidelines for Alternative Avionics, paragraph 14.
- Transport Delay Testing, paragraph 15.
- Continuing Qualification Evaluation Validation Data Presentation, paragraph 16.

END INFORMATION

4. ALTERNATIVE OBJECTIVE DATA FOR FTD LEVEL 5

BEGIN QPS REQUIREMENTS

a. This paragraph (including the following tables) is relevant only to FTD Level 5. It is provided because this level is required to simulate the performance and handling characteristics of a set of airplanes with similar characteristics, such as normal airspeed/altitude operating envelope and the same number and type of propulsion systems (engines).

b. Tables B2B through B2E reflect FTD performance standards that are acceptable to the FAA. A sponsor must demonstrate that a device performs within these parameters, as applicable. If a device does not meet the established performance parameters for some or for all of the applicable tests listed in Tables B2B through B2E, the sponsor may use NSP accepted flight test data for comparison purposes for those tests.

c. Sponsors using the data from Tables B2B through B2E must comply with the following:

(1) Submit a complete QTG, including results from all of the objective tests appropriate for the level of qualification sought as set out in Table B2A. The QTG must highlight those results that demonstrate the performance of the FTD is within the allowable performance ranges indicated in Tables B2B through B2E, as appropriate.

(2) The QTG test results must include all relevant information concerning the conditions under which the test was conducted; *e.g.*, gross weight, center of gravity, airspeed, power setting, altitude (climbing, descending, or level), temperature, configuration, and any other parameter that impacts the conduct of the test.

(3) The test results become the validation data against which the initial and all subsequent continuing qualification evaluations are compared. These subsequent evaluations will use the tolerances listed in Table B2A.

(4) Subjective testing of the device must be performed to determine that the device performs and handles like an airplane within the appropriate set of airplanes.

END QPS REQUIREMENTS

BEGIN INFORMATION

d. The reader is encouraged to consult the Airplane Flight Simulator Evaluation Handbook, Volumes I and II, published by the Royal Aeronautical Society, London, UK, and AC 25–7, Flight Test Guide for Certification of Transport Category Airplanes, and AC 23–8A, Flight Test Guide for Certification of Part 23 Airplanes, as amended, for references and examples regarding flight testing requirements and techniques.

END INFORMATION

TABLE B2B—ALTERNATIVE DATA SOURCE FOR FTD LEVEL 5 SMALL, SINGLE ENGINE (RECIPROCATING) AIRPLANE

QPS requirement The performance parameters in this table must be used to program the FTD if flight test data is not used to program the FTD.		
Applicable test		Authorized performance range
Entry No.	Title and procedure	
1.	**Performance.**	
1.c	Climb	
1.c.1.	Normal climb with nominal gross weight, at best rate-of-climb airspeed.	Climb rate = 500–1200 fpm (2.5–6 m/sec).
1.f.	Engines.	

TABLE B2B—ALTERNATIVE DATA SOURCE FOR FTD LEVEL 5 SMALL, SINGLE ENGINE (RECIPROCATING) AIRPLANE—Continued

QPS requirement The performance parameters in this table must be used to program the FTD if flight test data is not used to program the FTD.		
Applicable test		Authorized performance range
Entry No.	Title and procedure	
1.f.1.	Acceleration; idle to takeoff power	2–4 Seconds.
1.f.2.	Deceleration; takeoff power to idle	2–4 Seconds.
2.	**Handling Qualities**	
2.c.	Longitudinal Tests	
2.c.1.	Power change force	
	(a) Trim for straight and level flight at 80% of normal cruise airspeed with necessary power. Reduce power to flight idle. Do not change trim or configuration. After stabilized, record column force necessary to maintain original airspeed.	5–15 lbs (2.2–6.6 daN) of force (Pull).
	OR	
	(b) Trim for straight and level flight at 80% of normal cruise airspeed with necessary power. Add power to maximum setting. Do not change trim or configuration. After stabilized, record column force necessary to maintain original airspeed..	5–15 lbs (2.2–6.6 daN) of force (Push).
2.c.2.	Flap/slat change force	
	(a) Trim for straight and level flight with flaps fully retracted at a constant airspeed within the flaps-extended airspeed range. Do not adjust trim or power. Extend the flaps to 50% of full flap travel. After stabilized, record stick force necessary to maintain original airspeed.	5–15 lbs (2.2–6.6 daN) of force (Pull).
	OR	
	(b) Trim for straight and level flight with flaps extended to 50% of full flap travel, at a constant airspeed within the flaps-extended airspeed range. Do not adjust trim or power. Retract the flaps to zero. After stabilized, record stick force necessary to maintain original airspeed.	5–15 lbs (2.2–6.6 daN) of force (Push).
2.c.4.	Gear change force	
	(a) Trim for straight and level flight with landing gear retracted at a constant airspeed within the landing gear-extended airspeed range. Do not adjust trim or power. Extend the landing gear. After stabilized, record stick force necessary to maintain original airspeed.	2–12 lbs (0.88–5.3 daN) of force (Pull).
	OR	
	(b) Trim for straight and level flight with landing gear extended, at a constant airspeed within the landing gear-extended airspeed range. Do not adjust trim or power. Retract the landing gear. After stabilized, record stick force necessary to maintain original airspeed.	2–12 lbs (0.88–5.3 daN) of force (Push).
2.c.5.	Longitudinal trim	Must be able to trim longitudinal stick force to ''zero'' in each of the following configurations: cruise; approach; and landing.
2.c.7.	Longitudinal static stability	Must exhibit positive static stability.

TABLE B2B—ALTERNATIVE DATA SOURCE FOR FTD LEVEL 5 SMALL, SINGLE ENGINE (RECIPROCATING) AIRPLANE—Continued

QPS requirement The performance parameters in this table must be used to program the FTD if flight test data is not used to program the FTD.		
Applicable test		Authorized performance range
Entry No.	Title and procedure	
2.c.8.	Stall warning (actuation of stall warning device) with nominal gross weight; wings level; and a deceleration rate of not more than three (3) knots per second.	
	(a) Landing configuration	40–60 knots; ± 5° of bank.
	(b) Clean configuration	Landing configuration speed + 10–20%.
2.c.9.b.	Phugoid dynamics	Must have a phugoid with a period of 30–60 seconds. May not reach ½ or double amplitude in less than 2 cycles.
2.d.	Lateral Directional Tests.	
2.d.2.	Roll response (rate). Roll rate must be measured through at least 30° of roll. Aileron control must be deflected ⅓ (33.3 percent) of maximum travel.	Must have a roll rate of 40°–25°/second.
2.d.4.b.	Spiral stability. Cruise configuration and normal cruise airspeed. Establish a 20°–30° bank. When stabilized, neutralize the aileron control and release. Must be completed in both directions of turn.	Initial bank angle (± 5°) after 20 seconds.
2.d.6.b.	Rudder response. Use 25 percent of maximum rudder deflection. (Applicable to approach or landing configuration.).	2°–6°/second yaw rate.
2.d.7.	Dutch roll, yaw damper off. (Applicable to cruise and approach configurations.).	A period of 2–5 seconds; and ½–2 cycles.
2.d.8.	Steady state sideslip. Use 50 percent rudder deflection. (Applicable to approach and landing configurations.).	2°–10° of bank; 4°–10° of sideslip; and 2°–10° of aileron.
6.	**FTD System Response Time**	
6.a.	Latency. Flight deck instrument systems response to an abrupt pilot controller input. One test is required in each axis (pitch, roll, yaw).	300 milliseconds or less.

TABLE B2C—ALTERNATIVE DATA SOURCE FOR FTD LEVEL 5 SMALL, MULTI-ENGINE (RECIPROCATING) AIRPLANE

QPS requirement The performance parameters in this table must be used to program the FTD if flight test data is not used to program the FTD.		
Applicable test		Authorized performance range
Entry No.	Title and procedure	
1. Performance		
1.c	Climb	
1.c.1.	Normal climb with nominal gross weight, at best rate-of-climb airspeed.	Climb airspeed = 95–115 knots. Climb rate = 500–1500 fpm (2.5–7.5 m/sec)
1.f.	Engines	
1.f.1.	Acceleration; idle to takeoff power	2–5 Seconds.
1.f.2.	Deceleration; takeoff power to idle	2–5 Seconds.
2. Handling Qualities		
2.c.	Longitudinal Tests.	

TABLE B2C—ALTERNATIVE DATA SOURCE FOR FTD LEVEL 5 SMALL, MULTI-ENGINE (RECIPROCATING) AIRPLANE—Continued

QPS requirement The performance parameters in this table must be used to program the FTD if flight test data is not used to program the FTD.		
Applicable test		Authorized performance range
Entry No.	Title and procedure	
2.c.1.	Power change force.	
	(a) Trim for straight and level flight at 80% of normal cruise airspeed with necessary power. Reduce power to flight idle. Do not change trim or configuration. After stabilized, record column force necessary to maintain original airspeed.	10–25 lbs (2.2–6.6 daN) of force (Pull).
	OR	
	(b) Trim for straight and level flight at 80% of normal cruise airspeed with necessary power. Add power to maximum setting. Do not change trim or configuration. After stabilized, record column force necessary to maintain original airspeed.	5–15 lbs (2.2–6.6 daN) of force (Push).
2.c.2.	Flap/slat change force.	
	(a) Trim for straight and level flight with flaps fully retracted at a constant airspeed within the flaps-extended airspeed range. Do not adjust trim or power. Extend the flaps to 50% of full flap travel. After stabilized, record stick force necessary to maintain original airspeed.	5–15 lbs (2.2–6.6 daN) of force (Pull).
	OR	
	(b) Trim for straight and level flight with flaps extended to 50% of full flap travel, at a constant airspeed within the flaps-extended airspeed range. Do not adjust trim or power. Retract the flaps to zero. After stabilized, record stick force necessary to maintain original airspeed.	5–15 lbs (2.2–6.6 daN) of force (Push).
2.c.4.	Gear change force.	
	(a) Trim for straight and level flight with landing gear retracted at a constant airspeed within the landing gear-extended airspeed range. Do not adjust trim or power. Extend the landing gear. After stabilized, record stick force necessary to maintain original airspeed.	2–12 lbs (0.88–5.3 daN) of force (Pull).
	OR	
	(b) Trim for straight and level flight with landing gear extended, at a constant airspeed within the landing gear-extended airspeed range. Do not adjust trim or power. Retract the landing gear. After stabilized, record stick force necessary to maintain original airspeed.	2–12 lbs (0.88–5.3 daN) of force (Push).
2.c.4.	Longitudinal trim	Must be able to trim longitudinal stick force to "zero" in each of the following configurations: cruise; approach; and landing.
2.c.7.	Longitudinal static stability	Must exhibit positive static stability.
2.c.8.	Stall warning (actuation of stall warning device) with nominal gross weight; wings level; and a deceleration rate of not more than three (3) knots per second. (a) Landing configuration	60–90 knots; ± 5° of bank.
	(b) Clean configuration	Landing configuration speed + 10–20%.

TABLE B2C—ALTERNATIVE DATA SOURCE FOR FTD LEVEL 5 SMALL, MULTI-ENGINE (RECIPROCATING) AIRPLANE—Continued

QPS requirement The performance parameters in this table must be used to program the FTD if flight test data is not used to program the FTD.		
Applicable test		Authorized performance range
Entry No.	Title and procedure	
2.c.9.b.	Phugoid dynamics	Must have a phugoid with a period of 30–60 seconds. May not reach ½ or double amplitude in less than 2 cycles.
2.d.	Lateral Directional Tests	
2.d.2.	Roll response ..... Roll rate must be measured through at least 30° of roll. Aileron control must be deflected ⅓ (33.3 percent) of maximum travel.	Must have a roll rate of 4½–25½/second.
2.d.4.b.	Spiral stability ..... Cruise configuration and normal cruise airspeed. Establish a 20°–30° bank. When stabilized, neutralize the aileron control and release. Must be completed in both directions of turn.	Initial bank angle (± 5°) after 20 seconds.
2.d.6.b.	Rudder response ..... Use 25 percent of maximum rudder deflection. (Applicable to approach landing configuration.)	3°–6°/second yaw rate.
2.d.7.	Dutch roll, yaw damper off. (Applicable to cruise and approach configurations.).	A period of 2–5 seconds; and ½–2 cycles.
2.d.8.	Steady state sideslip ..... Use 50 percent rudder deflection. (Applicable to approach and landing configurations.)	2°–10° of bank; 4–10 degrees of sideslip; and 2°–10° of aileron.
6. FTD System Response Time		
6.a.	Flight deck instrument systems response to an abrupt pilot controller input. One test is required in each axis (pitch, roll, yaw).	300 milliseconds or less.

TABLE B2D—ALTERNATIVE DATA SOURCE FOR FTD LEVEL 5 SMALL, SINGLE ENGINE (TURBO-PROPELLER) AIRPLANE

QPS requirement The performance parameters in this table must be used to program the FTD if flight test data is not used to program the FTD.		
Applicable Test		Authorized performance range
Entry No.	Title and procedure	
1. Performance		
1.c	Climb.	
1.c.1.	Normal climb with nominal gross weight, at best rate-of-climb airspeed.	Climb airspeed = 95–115 knots. Climb rate = 800–1800 fpm (4–9 m/sec).
1.f.	Engines	
1.f.1.	Acceleration; idle to takeoff power	4–8 Seconds.
1.f.2.	Deceleration; takeoff power to idle	3–7 Seconds.
2. Handling Qualities		
2.c.	Longitudinal Tests	
2.c.1.	Power change force	

TABLE B2D—ALTERNATIVE DATA SOURCE FOR FTD LEVEL 5 SMALL, SINGLE ENGINE (TURBO-PROPELLER) AIRPLANE—Continued

QPS requirement The performance parameters in this table must be used to program the FTD if flight test data is not used to program the FTD.		
Applicable Test		Authorized performance range
Entry No.	Title and procedure	
	(a) Trim for straight and level flight at 80% of normal cruise airspeed with necessary power. Reduce power to flight idle. Do not change trim or configuration. After stabilized, record column force necessary to maintain original airspeed.	8 lbs (3.5 daN) of Push force—8 lbs (3.5 daN) of Pull force.
	OR	
	(b) Trim for straight and level flight at 80% of normal cruise airspeed with necessary power. Add power to maximum setting. Do not change trim or configuration. After stabilized, record column force necessary to maintain original airspeed.	12–22 lbs (5.3–9.7 daN) of force (Push).
2.c.2.	Flap/slat change force	
	(a) Trim for straight and level flight with flaps fully retracted at a constant airspeed within the flaps-extended airspeed range. Do not adjust trim or power. Extend the flaps to 50% of full flap travel. After stabilized, record stick force necessary to maintain original airspeed.	5–15 lbs (2.2–6.6 daN) of force (Pull).
	OR	
	(b) Trim for straight and level flight with flaps extended to 50% of full flap travel, at a constant airspeed within the flaps-extended airspeed range. Do not adjust trim or power. Retract the flaps to zero. After stabilized, record stick force necessary to maintain original airspeed..	5–15 lbs (2.2–6.6 daN) of force (Push).
2.c.4.	Gear change force.	
	(a) Trim for straight and level flight with landing gear retracted at a constant airspeed within the landing gear-extended airspeed range. Do not adjust trim or power. Extend the landing gear. After stabilized, record stick force necessary to maintain original airspeed..	2–12 lbs (0.88–5.3 daN) of force (Pull).
	OR	
	(b) Trim for straight and level flight with landing gear extended, at a constant airspeed within the landing gear-extended airspeed range. Do not adjust trim or power. Retract the landing gear. After stabilized, record stick force necessary to maintain original airspeed.	2–12 lbs (0.88–5.3 daN) of force (Push).
2.b.5.	Longitudinal trim	Must be able to trim longitudinal stick force to ''zero'' in each of the following configurations: cruise; approach; and landing.
2.c.7.	Longitudinal static stability	Must exhibit positive static stability.
2.c.8.	Stall warning (actuation of stall warning device) with nominal gross weight; wings level; and a deceleration rate of not more than three (3) knots per second.	
	(a) Landing configuration	60–90 knots; ± 5° of bank.
	(b) Clean configuration.	Landing configuration speed + 10–20%.

TABLE B2D—ALTERNATIVE DATA SOURCE FOR FTD LEVEL 5 SMALL, SINGLE ENGINE (TURBO-PROPELLER) AIRPLANE—Continued

QPS requirement The performance parameters in this table must be used to program the FTD if flight test data is not used to program the FTD.		
Applicable Test		Authorized performance range
Entry No.	Title and procedure	
2.c.8.b.	Phugoid dynamics	Must have a phugoid with a period of 30–60 seconds. May not reach ½ or double amplitude in less than 2 cycles.
2.d.	Lateral Directional Tests	
2.d.2.	Roll response ..... Roll rate must be measured through at least 30° of roll. Aileron control must be deflected ⅓ (33.3 percent) of maximum travel.	Must have a roll rate of 4°–25°/second.
2.d.4.b.	Spiral stability ..... Cruise configuration and normal cruise airspeed. Establish a 20°–30° bank. When stabilized, neutralize the aileron control and release. Must be completed in both directions of turn.	Initial bank angle (±5°) after 20 seconds.
2.d.6.b.	Rudder response ..... Use 25 percent of maximum rudder deflection. (Applicable to approach or landing configuration.).	3°–6°/second yaw rate.
2.d.7.	Dutch roll, yaw damper off ..... (Applicable to cruise and approach configurations.)	A period of 2–5 seconds; and ½–3 cycles.
2.d.8.	Steady state sideslip ..... Use 50 percent rudder deflection. (Applicable to approach and landing configurations.)	2°–10° of bank; 4°–10° of sideslip; and 2°–10° of aileron.
6. FTD System Response Time		
6.a.	Flight deck instrument systems response to an abrupt pilot controller input. One test is required in each axis (pitch, roll, yaw).	300 milliseconds or less.

TABLE B2E—ALTERNATIVE DATA SOURCE FOR FTD LEVEL 5 MULTI-ENGINE (TURBO-PROPELLER) AIRPLANE

QPS Requirement The performance parameters in this table must be used to program the FTD if flight test data is not used to program the FTD.		
Applicable test		Authorized performance range
Entry No.	Title and procedure	
1. Performance		
1.c	Climb.	
1.b.1.	Normal climb with nominal gross weight, at best rate-of-climb airspeed.	Climb airspeed = 120–140 knots. Climb rate = 1000–3000 fpm (5–15 m/sec).
1.f.	Engines	
1.f.1.	Acceleration; idle to takeoff power	2–6 Seconds.
1.f.2.	Deceleration; takeoff power to idle	1–5 Seconds.
2. Handling Qualities		
2.c.	Longitudinal Tests	
2.c.1.	Power change force	

TABLE B2E—ALTERNATIVE DATA SOURCE FOR FTD LEVEL 5 MULTI-ENGINE (TURBO-PROPELLER) AIRPLANE—Continued

QPS Requirement The performance parameters in this table must be used to program the FTD if flight test data is not used to program the FTD.		
Applicable test		Authorized performance range
Entry No.	Title and procedure	
	(a) Trim for straight and level flight at 80% of normal cruise airspeed with necessary power. Reduce power to flight idle. Do not change trim or configuration. After stabilized, record column force necessary to maintain original airspeed.	8 lbs (3.5 daN) of Push force to 8 lbs (3.5 daN) of Pull force.
	OR	
	(b) Trim for straight and level flight at 80% of normal cruise airspeed with necessary power. Add power to maximum setting. Do not change trim or configuration. After stabilized, record column force necessary to maintain original airspeed.	12–22 lbs (5.3–9.7 daN) of force (Push).
2.c.2.	Flap/slat change force	
	(a) Trim for straight and level flight with flaps fully retracted at a constant airspeed within the flaps-extended airspeed range. Do not adjust trim or power. Extend the flaps to 50% of full flap travel. After stabilized, record stick force necessary to maintain original airspeed.	5–15 lbs (2.2–6.6 daN) of force (Pull).
	OR	
	(b) Trim for straight and level flight with flaps extended to 50% of full flap travel, at a constant airspeed within the flaps-extended airspeed range. Do not adjust trim or power. Retract the flaps to zero. After stabilized, record stick force necessary to maintain original airspeed.	5–15 lbs (2.2–6.6 daN) of force (Push).
2.c.4.	Gear change force	
	(a) Trim for straight and level flight with landing gear retracted at a constant airspeed within the landing gear-extended airspeed range. Do not adjust trim or power. Extend the landing gear. After stabilized, record stick force necessary to maintain original airspeed.	2–12 lbs (0.88–5.3 daN) of force (Pull).
	OR	
	(b) Trim for straight and level flight with landing gear extended, at a constant airspeed within the landing gear-extended airspeed range. Do not adjust trim or power. Retract the landing gear. After stabilized, record stick force necessary to maintain original airspeed.	2–12 lbs (0.88–5.3 daN) of force (Push).
2.b.5.	Longitudinal trim	Must be able to trim longitudinal stick force to ''zero'' in each of the following configurations: cruise; approach; and landing.
2.c.7.	Longitudinal static stability	Must exhibit positive static stability.
2.c.8.	Stall warning (actuation of stall warning device) with nominal gross weight; wings level; and a deceleration rate of not more than three (3) knots per second.	
	(a) Landing configuration	80–100 knots; # 5° of bank.
	(b) Clean configuration	Landing configuration speed + 10–20%.

TABLE B2E—ALTERNATIVE DATA SOURCE FOR FTD LEVEL 5 MULTI-ENGINE (TURBO-PROPELLER) AIRPLANE—Continued

QPS Requirement The performance parameters in this table must be used to program the FTD if flight test data is not used to program the FTD.		
Applicable test		Authorized performance range
Entry No.	Title and procedure	
2.c.8.b.	Phugoid dynamics	Must have a phugoid with a period of 30–60 seconds. May not reach ½ or double amplitude in less than 2 cycles.
2.d.	Lateral Directional Tests	
2.d.2.	Roll response ..... Roll rate must be measured through at least 30° of roll. Aileron control must be deflected 1/3 (33.3 percent) of maximum travel.	Must have a roll rate of 4–25 degrees/second.
2.d.4.b.	Spiral stability ..... Cruise configuration and normal cruise airspeed. Establish a 20°–30° bank. When stabilized, neutralize the aileron control and release. Must be completed in both directions of turn.	Initial bank angle (± 5°) after 20 seconds.
2.d.6.b.	Rudder response ..... Use 25 percent of maximum rudder deflection. (Applicable to approach or landing configuration.)	3°–6° /second yaw rate.
2.d.7.	Dutch roll, yaw damper off ..... (Applicable to cruise and approach configurations.)	A period of 2–5 seconds; and ½–2 cycles.
2.d.8.	Steady state sideslip ..... Use 50 percent rudder deflection. (Applicable to approach and landing configurations.)	2°–10° of bank; 4°–10° of sideslip; and 2°–10° of aileron.
6. FTD System Response Time		
6.a.	Flight deck instrument systems response to an abrupt pilot controller input. One test is required in each axis (pitch, roll, yaw).	300 milliseconds or less.

END QPS REQUIREMENTS

BEGIN QPS REQUIREMENTS

5. ALTERNATIVE DATA SOURCES, PROCEDURES, AND INSTRUMENTATION: LEVEL 6 FTD ONLY

a. Sponsors are not required to use the alternative data sources, procedures, and instrumentation. However, a sponsor may choose to use one or more of the alternative sources, procedures, and instrumentation described in Table B2F.

END QPS REQUIREMENTS

BEGIN INFORMATION

b. It has become standard practice for experienced FTD manufacturers to use such techniques as a means of establishing data bases for new FTD configurations while awaiting the availability of actual flight test data; and then comparing this new data with the newly available flight test data. The results of such comparisons have, as reported by some recognized and experienced simulation experts, become increasingly consistent and indicate that these techniques, applied with appropriate experience, are becoming dependably accurate for the development of aerodynamic models for use in Level 6 FTDs.

c. In reviewing this history, the NSPM has concluded that, with proper care, those who are experienced in the development of aerodynamic models for FTD application can successfully use these modeling techniques to acceptably alter the method by which flight test data may be acquired and, when applied to Level 6 FTDs, does not compromise the quality of that simulation.

d. The information in the table that follows (Table of Alternative Data Sources, Procedures, and Information: Level 6 FTD Only) is presented to describe an acceptable alternative to data sources for Level 6 FTD modeling and validation, and an acceptable alternative to the procedures and instrumentation found in the flight test methods traditionally accepted for gathering modeling and validation data.

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

(2) The NSPM recommends that use of the alternative instrumentation noted in Table B2F be coordinated with the NSPM prior to employment in a flight test or data gathering effort.

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

(1) Data gathered through the alternative means does not require angle of attack (AOA) measurements or control surface position measurements for any flight test. AOA can be sufficiently derived if the flight test program insures the collection of acceptable level, unaccelerated, trimmed flight data. Angle of attack may be validated by conducting the three basic ''fly-by'' trim tests. The FTD time history tests should begin in level, unaccelerated, and trimmed flight, and the results should be compared with the flight test pitch angle.

(2) A simulation controls system model should be rigorously defined and fully mature. It should also include accurate gearing and cable stretch characteristics (where applicable) that are determined from actual aircraft measurements. Such a model does not require control surface position measurements in the flight test objective data for Level 6 FTD applications.

f. Table B2F is not applicable to Computer Controlled Aircraft FTDs.

g. Utilization of these alternate data sources, procedures, and instrumentation does not relieve the sponsor from compliance with the balance of the information contained in this document relative to Level 6 FTDs.

h. The term ''inertial measurement system'' allows the use of a functional global positioning system (GPS).

END INFORMATION

TABLE B2F—ALTERNATIVE DATA SOURCES, PROCEDURES, AND INSTRUMENTATION LEVEL 6 FTD

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
1.b.1. ..... Performance. Takeoff. Ground acceleration time.	Data may be acquired through a synchronized video recording of a stop watch and the calibrated airplane airspeed indicator. Hand-record the flight conditions and airplane configuration.	This test is required only if RTO is sought.
1.b.7. ..... Performance. Takeoff. Rejected takeoff.	Data may be acquired through a synchronized video recording of a stop watch and the calibrated airplane airspeed indicator. Hand-record the flight conditions and airplane configuration.	This test is required only if RTO is sought.
1.c.1. ..... Performance. Climb. Normal climb all engines operating.	Data may be acquired with a synchronized video of calibrated airplane instruments and engine power throughout the climb range.	
1.f.1. ..... Performance. Engines. Acceleration	Data may be acquired with a synchronized video recording of engine instruments and throttle position.	
1.f.2. ..... Performance. Engines. Deceleration	Data may be acquired with a synchronized video recording of engine instruments and throttle position.	

TABLE B2F—ALTERNATIVE DATA SOURCES, PROCEDURES, AND INSTRUMENTATION LEVEL 6 FTD—Continued

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 NSPM, 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 NSPM, 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 NSPM, 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.
2.a.4. ..... Handling qualities. Static control tests. Nosewheel steering force.	Breakout data may be acquired with a hand held force gauge. The remainder of the force to the stops may be calculated if the force gauge and a protractor are used to measure force after breakout for at least 25% of the total displacement capability.	
2.a.5. ..... Handling qualities. Static control tests. Rudder pedal steering calibration.	Data may be acquired through the use of force pads on the rudder pedals and a pedal position measurement device, together with design data for nosewheel position.	
2.a.6. ..... Handling qualities. Static control tests. Pitch trim indicator vs. surface position calibration.	Data may be acquired through calculations.	
2.a.8. ..... Handling qualities. Static control tests. Alignment of power lever angle vs. selected engine parameter (e.g., EPR, N_1, Torque, Manifold pressure).	Data may be acquired through the use of a temporary throttle quadrant scale to document throttle position. Use a synchronized video to record steady state instrument readings or hand-record steady state engine performance readings.	
2.a.9. ..... Handling qualities. Static control tests. Brake pedal position vs. force.	Use of design or predicted data is acceptable. Data may be acquired by measuring deflection at ''zero'' and at ''maximum.''	

TABLE B2F—ALTERNATIVE DATA SOURCES, PROCEDURES, AND INSTRUMENTATION LEVEL 6 FTD—Continued

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.c.1. ..... Handling qualities. Longitudinal control tests. Power change force.	Data may be acquired by using an inertial measurement system and a synchronized video of the calibrated airplane instruments, throttle position, and the force/position measurements of flight deck controls.	Power change dynamics test is acceptable using the same data acquisition methodology.
2.c.2. ..... Handling qualities. Longitudinal control tests. Flap/slat change force.	Data may be acquired by using an inertial measurement system and a synchronized video of calibrated airplane instruments, flap/slat position, and the force/position measurements of flight deck controls.	Flap/slat change dynamics test is acceptable using the same data acquisition methodology.
2.c.4. ..... Handling qualities. Longitudinal control tests. Gear change force.	Data may be acquired by using an inertial measurement system and a synchronized video of the calibrated airplane instruments, gear position, and the force/position measurements of flight deck controls.	Gear change dynamics test is acceptable using the same data acquisition methodology.
2.c.5. ..... Handling qualities. Longitudinal control tests. Longitudinal trim.	Data may be acquired through use of an inertial measurement system and a synchronized video of flight deck controls position (previously calibrated to show related surface position) and engine instrument readings.	
2.c.6. ..... Handling qualities. Longitudinal control tests. Longitudinal maneuvering stability (stick force/g).	Data may be acquired through the use of an inertial measurement system and a synchronized video of the calibrated airplane instruments; a temporary, high resolution bank angle scale affixed to the attitude indicator; and a wheel and column force measurement indication.	
2.c.7. ..... Handling qualities. Longitudinal control tests. Longitudinal static stability	Data may be acquired through the use of a synchronized video of the airplane flight instruments and a hand held force gauge.	
2.c.8. ..... Handling qualities. Longitudinal control tests. Stall Warning (activation of stall warning device).	Data may be acquired through a synchronized video recording of a stop watch and the calibrated airplane airspeed indicator. Hand-record the flight conditions and airplane configuration.	Airspeeds may be cross checked with those in the TIR and AFM.
2.c.9.a. ..... Handling qualities. Longitudinal control tests. Phugoid dynamics.	Data may be acquired by using an inertial measurement system and a synchronized video of the calibrated airplane instruments and the force/position measurements of flight deck controls.	
2.c.10. ..... Handling qualities. Longitudinal control tests. Short period dynamics.	Data may be acquired by using an inertial measurement system and a synchronized video of the calibrated airplane instruments and the force/position measurements of flight deck controls.	
2.c.11. ..... Handling qualities. Longitudinal control tests. Gear and flap/slat operating times.	May use design data, production flight test schedule, or maintenance specification, together with an SOC.	
2.d.2. ..... Handling qualities. Lateral directional tests. Roll response (rate).	Data may be acquired by using an inertial measurement system and a synchronized video of the calibrated airplane instruments and the force/position measurements of flight deck lateral controls.	

TABLE B2F—ALTERNATIVE DATA SOURCES, PROCEDURES, AND INSTRUMENTATION LEVEL 6 FTD—Continued

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.d.3. ..... Handling qualities. Lateral directional tests. (a) Roll overshoot. OR (b) Roll response to flight deck roll controller step input.	Data may be acquired by using an inertial measurement system and a synchronized video of the calibrated airplane instruments and the force/position measurements of flight deck lateral controls.	
2.d.4. ..... Handling qualities. Lateral directional tests. Spiral stability.	Data may be acquired by using an inertial measurement system and a synchronized video of the calibrated airplane instruments; the force/position measurements of flight deck controls; and a stop watch.	
2.d.6.a. ..... Handling qualities. Lateral directional tests. Rudder response.	Data may be acquired by using an inertial measurement system and a synchronized video of the calibrated airplane instruments; the force/position measurements of rudder pedals.	
2.d.7. ..... Handling qualities. Lateral directional tests. Dutch roll, (yaw damper OFF).	Data may be acquired by using an inertial measurement system and a synchronized video of the calibrated airplane instruments and the force/position measurements of flight deck controls.	
2.d.8. ..... Handling qualities. Lateral directional tests. Steady state sideslip.	Data may be acquired by using an inertial measurement system and a synchronized video of the calibrated airplane instruments and the force/position measurements of flight deck controls.	

ATTACHMENT 3 TO APPENDIX B TO PART 60—FLIGHT TRAINING DEVICE (FTD) SUBJECTIVE EVALUATION

BEGIN INFORMATION

1. DISCUSSION

a. The subjective tests provide a basis for evaluating the capability of the FTD to perform over a typical utilization period. The items listed in the Table of Functions and Subjective Tests are used to determine whether the FTD competently simulates each required maneuver, procedure, or task; and verifying correct operation of the FTD controls, instruments, and systems. The tasks do not limit or exceed the authorizations for use of a given level of FTD as described on the SOQ or as approved by the TPAA. All items in the following paragraphs are subject to examination.

b. All simulated airplane systems functions will be assessed for normal and, where appropriate, alternate operations. Simulated airplane systems are listed separately under ''Any Flight Phase'' to ensure appropriate attention to systems checks. Operational navigation systems (including inertial navigation systems, global positioning systems, or other long-range systems) and the associated electronic display systems will be evaluated if installed. The NSP pilot will include in his report to the TPAA, the effect of the system operation and any system limitation.

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

END INFORMATION

TABLE B3A—TABLE OF FUNCTIONS AND SUBJECTIVE TESTS LEVEL 6 FTD

QPS requirements	
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. Preflight	
	Accomplish a functions check of all installed switches, indicators, systems, 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.
2. Surface Operations (pre-takeoff)	
2.a.	Engine start:
2.a.1.	Normal start.
2.a.2.	Alternative procedures start.
2.a.3.	Abnormal procedures start/shut down.
2.b.	Pushback/Powerback (powerback requires visual system).
3. Takeoff (requires appropriate visual system as set out in Table B1A, item 6; Appendix B, Attachment 1.)	
3.a.	Instrument takeoff:
3.a.1.	Engine checks (e.g., engine parameter relationships, propeller/mixture controls).
3.a.2.	Acceleration characteristics.
3.a.3.	Nosewheel/rudder steering.
3.a.4.	Landing gear, wing flap, leading edge device operation.
3.b.	Rejected takeoff:
3.b.1.	Deceleration characteristics.
3.b.2.	Brakes/engine reverser/ground spoiler operation.
3.b.3.	Nosewheel/rudder steering.
4. In-Flight Operations	
4.a.	Normal climb.
4.b.	Cruise:
4.b.1.	Demonstration of performance characteristics (speed vs. power).
4.b.2.	Normal turns.
4.b.3.	Demonstration of high altitude handling.
4.b.4.	Demonstration of high airspeed handling/overspeed warning.
4.b.5.	Demonstration of Mach effects on control and trim.
4.b.6.	Steep turns.
4.b.7.	In-Flight engine shutdown (procedures only).
4.b.8.	In-Flight engine restart (procedures only).
4.b.9.	Specific flight characteristics.
4.b.10.	Response to loss of flight control power.
4.b.11.	Response to other flight control system failure modes.
4.b.12.	Operations during icing conditions.

TABLE B3A—TABLE OF FUNCTIONS AND SUBJECTIVE TESTS LEVEL 6 FTD—Continued

QPS requirements	
Entry No.	Operations tasks
4.b.13.	Effects of airframe/engine icing.
4.c.	Other flight phase:
4.c.1.	Approach to stalls in the following configurations:
4.c.1.a.	Cruise.
4.c.1.b.	Takeoff or approach.
4.c.1.c.	Landing.
4.c.2.	High angle of attack maneuvers in the following configurations:
4.c.2.a.	Cruise.
4.c.2.b.	Takeoff or approach.
4.c.2.c.	Landing.
4.c.3.	Slow flight.
4.c.4.	Holding.
5. Approaches	
5.a.	Non-precision Instrument Approaches:
5.a.1.	With use of autopilot and autothrottle, as applicable.
5.a.2.	Without use of autopilot and autothrottle, as applicable.
5.a.3.	With 10 knot tail wind.
5.a.4.	With 10 knot crosswind.
5.b.	Precision Instrument Approaches:
5.b.1.	With use of autopilot, autothrottle, and autoland, as applicable.
5.b.2.	Without use of autopilot, autothrottle, and autoland, as applicable.
5.b.3.	With 10 knot tail wind.
5.b.4.	With 10 knot crosswind.
6. Missed Approach	
6.a.	Manually controlled.
6.b.	Automatically controlled (if applicable).
7. Any Flight Phase, as appropriate	
7.a.	Normal system operation (installed systems).
7.b.	Abnormal/Emergency system operation (installed systems).
7.c.	Flap operation.
7.d.	Landing gear operation.
7.e.	Engine Shutdown and Parking.
7.e.1.	Systems operation.
7.e.2.	Parking brake operation.
8. Instructor Operating Station (IOS), as appropriate. Functions in this section are subject to evaluation only if appropriate for the airplane and/or installed on the specific FTD involved	

TABLE B3A—TABLE OF FUNCTIONS AND SUBJECTIVE TESTS LEVEL 6 FTD—Continued

QPS requirements	
Entry No.	Operations tasks
8.a.	Power Switch(es).
8.b.	Airplane conditions.
8.b.1.	Gross weight, center of gravity, and fuel loading and allocation.
8.b.2.	Airplane systems status.
8.b.3.	Ground crew functions (e.g., external power, push back).
8.c.	Airports.
8.c.1.	Selection.
8.c.2.	Runway selection.
8.c.3.	Preset positions (e.g., ramp, over FAF).
8.d.	Environmental controls.
8.d.1.	Temperature.
8.d.2.	Climate conditions (e.g., ice, rain).
8.d.3.	Wind speed and direction.
8.e.	Airplane system malfunctions.
8.e.1.	Insertion/deletion.
8.e.2.	Problem clear.
8.f.	Locks, Freezes, and Repositioning.
8.f.1.	Problem (all) freeze/release.
8.f.2.	Position (geographic) freeze/release.
8.f.3.	Repositioning (locations, freezes, and releases).
8.f.4.	Ground speed control.
8.f.5.	Remote IOS, if installed.
9. Sound Controls. On/off/adjustment	
10. Control Loading System (as applicable) On/off/emergency stop.	
11. Observer Stations.	
11.a.	Position.
11.b.	Adjustments.
End QPS Requirements	

TABLE B3B—TABLE OF FUNCTIONS AND SUBJECTIVE TESTS LEVEL 5 FTD

QPS requirements	
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. Preflight	
	Accomplish a functions check of all installed switches, indicators, systems, 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.
2. Surface Operations (pre-takeoff)	

TABLE B3B—TABLE OF FUNCTIONS AND SUBJECTIVE TESTS LEVEL 5 FTD—Continued

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.
2.a.	Engine start (if installed):
2.a.1.	Normal start.
2.a.2.	Alternative procedures start.
2.a.3.	Abnormal/Emergency procedures start/shut down.
3. In-Flight Operations	
3.a.	Normal climb.
3.b.	Cruise:
3.b.1.	Performance characteristics (speed vs. power).
3.b.2.	Normal turns.
3.c.	Normal descent.
4. Approaches	
4.a.	Coupled instrument approach maneuvers (as applicable for the systems installed).
5. Any Flight Phase	
5.a.	Normal system operation (Installed systems).
5.b.	Abnormal/Emergency system operation (Installed systems).
5.c.	Flap operation.
5.d.	Landing gear operation
5.e.	Engine Shutdown and Parking (if installed).
5.e.1.	Systems operation.
5.e.2.	Parking brake operation.
6. Instructor Operating Station (IOS)	
6.a.	Power Switch(es).
6.b.	Preset positions—ground, air.
6.c.	Airplane system malfunctions (Installed systems).
6.c.1.	Insertion/deletion.
6.c.2.	Problem clear.

TABLE B3C—TABLE OF FUNCTIONS AND SUBJECTIVE TESTS LEVEL 4 FTD

QPS requirements	
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 NSPM 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

BEGIN INFORMATION

TABLE OF CONTENTS

Title of Sample

Figure B4A Sample Letter, Request for Initial, Upgrade, or Reinstatement Evaluation
Figure B4B Attachment: FTD Information Form
Figure B4C Sample Letter of Compliance
Figure B4D Sample Qualification Test Guide Cover Page
Figure B4E Sample Statement of Qualification—Certificate
Figure B4F Sample Statement of Qualification—Configuration List
Figure B4G Sample Statement of Qualification—List of Qualified Tasks
Figure B4H Sample Continuing Qualification Evaluation Requirements Page
Figure B4I Sample MQTG Index of Effective FTD Directives

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

Date _____

Edward D. Cook, Ph.D.
Manager, National Simulator Program
Federal Aviation Administration
100 Hartsfield Centre Parkway. Suite 400
Atlanta, GA 30354

Dear Dr. Cook:

RE: Request for Initial/Upgrade Evaluation Date

This is to advise you of our intent to request an (initial or upgrade) evaluation of our (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:

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

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

(The sponsor should add additional comments as necessary).

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

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

Sincerely,

Attachment: FTD Information and Characteristics Form
cc: POI/TCPM

Attachment 4 to Appendix B to Part 60—
Figure B4B – Sample Letter , Request for Initial, Upgrade, or Reinstatement Evaluation
Attachment: FSTD Information Form
INFORMATION

Date: ____			
Section 1. FSTD Information and Characteristics			
Sponsor Name:	____	**FSTD Location:**	
Address:	____ ____	**Physical Address:**	____ ____
City:	____	**City:**	____
State:	____	**State:**	____
Country:	____	**Country:**	____
ZIP:	____	**ZIP:**	____
Manager	____		
Sponsor ID No: (Four Letter FAA Designator)	____	**Nearest Airport:** (Airport Designator)	____
Type of Evaluation Requested:	☐ **Initial** ☐ **Upgrade** ☐ **Continuing Qualification** ☐ **Special** ☐ **Reinstatement**		
Aircraft Make/model/series:	____		
Initial Qualification: (If Applicable)	**Date:** ____ **Level** ____ MM/DD/YYYY	**Manufacturer's Identification or Serial Number**	_____
Upgrade Qualification: (If Applicable)	**Date:** ____ **Level** ____ MM/DD/YYYY	☐ **eMQTG**	
Qualification Basis:_____	☐ **A** ☐ **B** ☐ **Interim C** ☐ **C** ☐ **D** ☐ **6** ☐ **7** ☐ **Provisional Status**		
Other Technical Information:			
FAA FSTD ID No: (If Applicable)	____	**FSTD Manufacturer:**	____
Convertible FSTD:	☐**Yes**:	**Date of Manufacture**:	____ MM/DD/YYYY
Related FAA ID No. (If Applicable)	____ ____ ____	**Sponsor FSTD ID No:** _____	
Engine model(s) and data revision: _____		**Source of aerodynamic model:** _____	
FMS identification and revision level: _____		**Source of aerodynamic coefficient data:** _____	
Visual system manufacturer/model: _____		**Aerodynamic data revision number:** _____	
Flight control data revision: _____		**Visual system display:** _____	
Mot ion system manufacturer/type: _____		**FSTD computer(s) identification:** _____	
National Aviation Authority (NAA): (If Applicable)	_____		
NAA FSTD ID No:	_____	**Last NAA Evaluation Date:**	_____
NAA Qualification Level:	_____		
NAA Qualification Basis:	____		
Visual System Manufacturer and Type:	_____	**FSTD Seats Available:** _____	**Motion System Manufacturer and Type:** _____:

Attachment 4 to Appendix B to Part 60—
Figure B4B – Sample Letter , Request for Initial, Upgrade, or Reinstatement Evaluation
Attachment: FSTD Information Form
INFORMATION

Aircraft Equipment:	Engine Type(s):	Flight Instrumentation:	Engine Instrumentation:
	_____ _____	☐ EFIS ☐ HUD ☐ HGS ☐ EFVS ☐ TCAS ☐ GPWS ☐ Plain View ☐ GPS ☐ FMS Type: __ ☐ WX Radar ☐ Other: __	☐ EICAS ☐ FADEC ☐ Other: __

Airport Models:	3.6.1 _____ Airport Designator	3.6.2_____ Airport Designator	3.6.3 _____ Airport Designator
Circle to Land:	3. 7.1 _____ Airport Designator	3. 7.2_____ Approach	3. 7.3 _____ Landing Runway
Visual Ground Segment	3.8.1 _____ Airport Designator	3.8 .2_____ Approach	3. 8.3 _____ Landing Runway

Section 2. Supplementary Information			
FAA Training Program Approval Authority:		☐ POI ☐ TCPM ☐ Other: _____	
Name:	_____	**Office:**	_____
Tel:	_____	**Fax:**	_____
Email:	_____		
FSTD Scheduling Person:			
Name:	_____		
Address 1:	_____	**Address 2**	_____
City:	_____	**State:**	_____
ZIP:	_____	**Email:**	_____
Tel:	_____	**Fax:**	_____
FSTD Technical Contact:			
Name:	_____		
Address 1:	_____	**Address 2**	_____
City:	_____	**State:**	_____
ZIP:	_____	**Email:**	_____
Tel:	_____	**Fax:**	_____

Section 3. Training, Testing and Checking Considerations		
Area/Function/Maneuver	**Requested**	**Remarks**
Private Pilot - Training / Checks: (142)	☐	_____
Commercial Pilot - Training /Checks:(142)	☐	_____
Multi-Engine Rating - Training / Checks (142)	☐	_____
Instrument Rating -Training / Checks (142)	☐	_____
Type Rating - Training / Checks (135/121/142)	☐	_____
Proficiency Checks (135/121/142)	☐	_____
CAT I: (RVR 2400/1800 ft. DH200 ft)	☐	_____

Attachment 4 to Appendix B to Part 60—
Figure B4B – Sample Letter , Request for Initial, Upgrade, or Reinstatement Evaluation
Attachment: FSTD Information Form
INFORMATION

CAT II: (RVR 1200 ft. DH 100 ft)	☐	_____
CAT III * (lowest minimum) _____ RVR _____ ft. * State CAT III (≤ 700 ft.), CAT IIIb (≤ 150 ft.), or CAT IIIc (0 ft.)	☐	_____
Circling Approach	☐	_____
Windshear Training:	☐	_____
Windshear Training IAW 121.409(d) (121 Turbojets Only)	☐	_____
Generic Unusual Attitudes and Recoveries within the Normal Flight Envelope	☐	_____
Specific Unusual Attitudes Recoveries	☐	_____
Auto-coupled Approach/Auto Go Around	☐	_____
Auto-land / Roll Out Guidance	☐	_____
TCAS/ACAS I / II	☐	_____
WX-Radar	☐	_____
HUD	☐	_____
HGS	☐	_____
EFVS	☐	_____
Future Air Navigation Systems	☐	_____
GPWS / EGPWS	☐	_____
ETOPS Capability	☐	_____
GPS	☐	_____
SMGCS	☐	_____
Helicopter Slope Landings	☐	_____
Helicopter External Load Operations	☐	_____
Helicopter Pinnacle Approach to Landings	☐	_____
Helicopter Night Vision Maneuvers	☐	_____
Helicopter Category A Takeoffs	☐	_____

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

(Date)

Mr. (Name of Training Program Approval Authority):
(Name of FAA FSDO)
(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)

cc:
FAA, National Simulator Program

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: _____
Manager, National
Simulator Program, FAA

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

Federal Aviation Administration
National Simulator Program

Certificate of Qualification

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

Go-Fast Airlines
Farnsworth Z-100 Flight Training Device
FAA Identification Number 998

And 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 National Simulator Program Manager

February 15, *2009* — *B. Williamson*

(date) — (for the NSPM)

Attachment 4 to Appendix B to Part 60—
Figure B4F – Sample Statement of Qualification; Configuration List
INFORMATION

CERTIFICATE OF QUALIFICATION CONFIGURATION LIST

Date: ____			
Section 1. FSTD Information and Characteristics			
Sponsor Name:	____	**FSTD Location:**	
Address:	____	**Physical Address:**	____
City:	____	**City:**	____
State:	____	**State:**	____
Country:	____	**Country:**	____
ZIP:	____	**ZIP:**	____
Manager	____		
Sponsor ID No: (Four Letter FAA Designator)	____	**Nearest Airport:** (Airport Designator)	____
Type of Evaluation Requested:	☐ **Initial** ☐ **Upgrade** ☐ **Continuing Qualification** ☐ **Special** ☐ **Reinstatement**		
Aircraft Make/model/series:	____		
Initial Qualification: (If Applicable)	**Date:** ____ **Level** ____ MM/DD/YYYY	**Manufacturer's Identification or Serial Number**	_____
Upgrade Qualification: (If Applicable)	**Date:** ____ **Level** ____ MM/DD/YYYY	☐ **eMQTG**	
Qualification Basis:_____	☐ **A** ☐ **B** ☐ **Interim C** ☐ **C** ☐ **D** ☐ **6** ☐ **7** ☐ **Provisional Status**		
Other Technical Information:			
FAA FSTD ID No: (If Applicable)	____	**FSTD Manufacturer:**	____
Convertible FSTD:	☐**Yes**:	**Date of Manufacture**:	____ MM/DD/YYYY
Related FAA ID No. (If Applicable)	____ ____ ____	**Sponsor FSTD ID No:** _____	
Engine model(s) and data revision: _____		**Source of aerodynamic model:** _____	
FMS identification and revision level: _____		**Source of aerodynamic coefficient data:** _____	
Visual system manufacturer/model: _____		**Aerodynamic data revision number:** _____	
Flight control data revision: _____		**Visual system display:** _____	
Mot ion system manufacturer/type: _____		**FSTD computer(s) identification:** _____	
National Aviation Authority (NAA): (If Applicable)	_____		
NAA FSTD ID No:	_____	**Last NAA Evaluation Date:**	_____
NAA Qualification Level:	_____		
NAA Qualification Basis:	____		

Attachment 4 to Appendix B to Part 60—
Figure B4F – Sample Statement of Qualification; Configuration List
INFORMATION

Visual System Manufacturer and Type:	_____	**FSTD Seats Available:** _____	**Motion System Manufacturer and Type:**	_____:
Aircraft Equipment:	**Engine Type(s):** ____ ____	**Flight Instrumentation:** ☐ EFIS ☐ HUD ☐ HGS ☐ EFVS ☐ TCAS ☐ GPWS ☐ Plain View ☐ GPS ☐ FMS Type: __ ☐ WX Radar ☐ Other: __		**Engine Instrumentation:** ☐ EICAS ☐ FADEC ☐ Other: __

Airport Models:	3.6.1 ____ Airport Designator	3.6.2____ Airport Designator	3.6.3 ____ Airport Designator
Circle to Land:	3. 7.1 ____ Airport Designator	3. 7.2____ Approach	3. 7.3 ____ Landing Runway
Visual Ground Segment	3.8.1 ____ Airport Designator	3.8 .2____ Approach	3. 8.3 ____ Landing Runway

Section 2. Supplementary Information			
FAA Training Program Approval Authority:		☐ POI ☐ TCPM ☐ Other: _____	
Name:	_____	**Office:**	_____
Tel:	_____	**Fax:**	_____
Email:	_____		
FSTD Scheduling Person:			
Name:	_____		
Address 1:	_____	**Address 2**	_____
City:	_____	**State:**	_____
ZIP:	_____	**Email:**	_____
Tel:	_____	**Fax:**	_____
FSTD Technical Contact:			
Name:	_____		
Address 1:	_____	**Address 2**	_____
City:	_____	**State:**	_____
ZIP:	_____	**Email:**	_____
Tel:	_____	**Fax:**	_____

Section 3. Training, Testing and Checking Considerations		
Area/Function/Maneuver	**Requested**	**Remarks**
Private Pilot - Training / Checks: (142)	☐	_____
Commercial Pilot - Training /Checks:(142)	☐	_____
Multi-Engine Rating - Training / Checks (142)	☐	_____
Instrument Rating -Training / Checks (142)	☐	_____
Type Rating - Training / Checks (135/121/142)	☐	_____

Attachment 4 to Appendix B to Part 60—
Figure B4F – Sample Statement of Qualification; Configuration List
INFORMATION

Proficiency Checks (135/121/142)	☐	_____
CAT I: (RVR 2400/1800 ft. DH200 ft)	☐	_____
CAT II: (RVR 1200 ft. DH 100 ft)	☐	_____
CAT III * (lowest minimum) _____ RVR _____ ft. * State CAT III (≤ 700 ft.), CAT IIIb (≤ 150 ft.), or CAT IIIc (0 ft.)	☐	_____
Circling Approach	☐	_____
Windshear Training:	☐	_____
Windshear Training IAW 121.409(d) (121 Turbojets Only)	☐	_____
Generic Unusual Attitudes and Recoveries within the Normal Flight Envelope	☐	_____
Specific Unusual Attitudes Recoveries	☐	_____
Auto-coupled Approach/Auto Go Around	☐	_____
Auto-land / Roll Out Guidance	☐	_____
TCAS/ACAS I / II	☐	_____
WX-Radar	☐	_____
HUD	☐	_____
HGS	☐	_____
EFVS	☐	_____
Future Air Navigation Systems	☐	_____
GPWS / EGPWS	☐	_____
ETOPS Capability	☐	_____
GPS	☐	_____
SMGCS	☐	_____
Helicopter Slope Landings	☐	_____
Helicopter External Load Operations	☐	_____
Helicopter Pinnacle Approach to Landings	☐	_____
Helicopter Night Vision Maneuvers	☐	_____
Helicopter Category A Takeoffs	☐	_____

Attachment 4 to Appendix B to Part 60—
Figure B4G – Sample Statement of Qualification;– List of Qualified Tasks
INFORMATION

CERTIFICATE OF QUALIFICATION
List of Qualified Tasks

Go Fast Airline Training -- Farnsworth Z-100 -- Level D -- FAA ID# 999

The FTD is qualified to perform all of the tasks listed in Appendix 1, Table B1B for its assigned level of qualification *except* for the following listed tasks.

Qualified for all tasks in Table B1B, for which the sponsor has requested qualification, except for the following:

4.e.	Circling Approach
6. (a)	Emergency Descent (maximum rate)
6. (b)	Inflight Fire and Smoke Removal
6. (c)	Rapid Decompression
6. (d)	Emergency Evacuation

Additional tasks for which this FTD is qualified (i.e., in addition to the list in Table B1B):

NONE

Attachment 4 to Appendix B to Part 60—
Figure B4H – Sample Continuing Qualification Evaluation Requirements Page
INFORMATION

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

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

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

(Repeat as Necessary)

Attachment 4 to Appendix B to Part 60—
Figure B4I – Sample MQTG Index of Effective FSTD Directives
INFORMATION

Index of Effective FSTD Directives Filed in this Section			
Number	Effective Date	Date of Notification	Details

Continue as Necessary....

[Doc. No. FAA–2002–12461, 73 FR 26490, May 9, 2008]

APPENDIX C TO PART 60—QUALIFICATION PERFORMANCE STANDARDS FOR HELICOPTER FULL FLIGHT SIMULATORS

BEGIN INFORMATION

This appendix establishes the standards for Helicopter FFS evaluation and qualification. The NSPM is responsible for the development, application, and implementation of the standards contained within this appendix. The procedures and criteria specified in this appendix will be used by the NSPM, or a person assigned by the NSPM, when conducting helicopter FFS evaluations.

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1. Introduction.
2. Applicability (§ 60.1) and (§ 60.2).
3. Definitions (§ 60.3).
4. Qualification Performance Standards (§ 60.4).
5. Quality Management System (§ 60.5).
6. Sponsor Qualification Requirements (§ 60.7).
7. Additional Responsibilities of the Sponsor (§ 60.9).
8. FFS Use (§ 60.11).
9. FFS Objective Data Requirements (§ 60.13).
10. Special Equipment and Personnel Requirements for Qualification of the FFS (§ 60.14).
11. Initial (and Upgrade) Qualification Requirements (§ 60.15).
12. Additional Qualifications for a Currently Qualified FFS (§ 60.16).
13. Previously Qualified FFSs (§ 60.17).
14. Inspection, Continuing Qualification Evaluation, and Maintenance Requirements (§ 60.19).
15. Logging FFS Discrepancies (§ 60.20).
16. Interim Qualification of FFSs for New Helicopter Types or Models (§ 60.21).
17. Modifications to FFSs (§ 60.23).
18. Operations with Missing, Malfunctioning, or Inoperative Components (§ 60.25).
19. Automatic Loss of Qualification and Procedures for Restoration of Qualification (§ 60.27).
20. Other Losses of Qualification and Procedures for Restoration of Qualification (§ 60.29).
21. Record Keeping and Reporting (§ 60.31).
22. Applications, Logbooks, Reports, and Records: Fraud, Falsification, or Incorrect Statements (§ 60.33).
23. [Reserved]
24. [Reserved]
25. FFS Qualification on the Basis of a Bilateral Aviation Safety Agreement (BASA) (§ 60.37).

Attachment 1 to Appendix C to Part 60—General Simulator Requirements.
Attachment 2 to Appendix C to Part 60—FFS Objective Tests.