

3. To prevent this from occurring in the future, by May 30, 2009, except for the airport model(s) used to qualify the simulator at the designated level, each certificate holder must assure that each airport model used for training, testing, or checking under this chapter in a qualified FFS meets the definition of a Class II or Class III airport model as defined in Appendix F of this part.

4. These references describe the requirements for visual scene management and the minimum distances from which runway or landing area features must be visible for all levels of simulator. The visual scene or airport model must provide, for each “in-use runway” or “in-use landing area,” runway or landing area surface and markings, runway or landing area lighting, taxiway surface and markings, and taxiway lighting. Additional requirements include correlation of the visual scenes or airport models with other aspects of the airport environment, correlation of the aircraft and associated equipment, scene quality assessment features, and the extent to which the instructor is able to exercise control of these scenes or models.

5. For circling approaches, all requirements of this section apply to the runway used for the initial approach and to the runway of intended landing.

6. The details in these scenes or models must be developed using airport pictures, construction drawings and maps, or other similar data, or be developed in accordance with published regulatory material. However, FSTD Directive 1 does not require that airport models contain details that are beyond the initially designed capability of the visual system, as currently qualified. The recognized limitations to visual systems are as follows:

a. Visual systems not required to have runway numbers as a part of the specific runway marking requirements are:

- (1) Link NVS and DNVS.
- (2) Novoview 2500 and 6000.
- (3) FlightSafety VITAL series up to, and including, VITAL III, but not beyond.
- (4) Redifusion SP1, SP1T, and SP2.

b. Visual systems required to display runway numbers only for LOFT scenes are:

- (1) FlightSafety VITAL IV.
- (2) Redifusion SP3 and SP3T.
- (3) Link-Miles Image II.

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 of this part for a sample MQTG Index of Effective FSTD Directives chart.

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

#### APPENDIX D TO PART 60—QUALIFICATION PERFORMANCE STANDARDS FOR HELICOPTER FLIGHT TRAINING DEVICES

##### BEGIN INFORMATION

This appendix establishes the standards for Helicopter Flight Training Device (FTD) evaluation and qualification at Level 4, Level 5, Level 6, or Level 7. 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 or persons assigned by the NSPM when conducting helicopter FTD evaluations.

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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. Recordkeeping and Reporting (§60.31).
22. Applications, Logbooks, Reports, and Records: Fraud, Falsification, or Incorrect Statements (§60.33).

23. [Reserved]

24. Levels of FTD.

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

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

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

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

Attachment 4 to Appendix D 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](mailto:9-aso-avr-sim-team@faa.gov). The NSP Internet Web Site address is: [http://www.faa.gov/safety/programs\\_initiatives/aircraft\\_aviation/nspl/](http://www.faa.gov/safety/programs_initiatives/aircraft_aviation/nspl/). 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 120-57, as amended, Surface Movement Guidance and Control System (SMGCS).

(15) AC 120-63, as amended, Helicopter Simulator Qualification.

(16) AC 150/5300-13, as amended, Airport Design.

(17) AC 150/5340-1, as amended, Standards for Airport Markings.

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

(19) AC 150/5390-2, as amended, Heliport Design.

(20) AC 150/5340-19, as amended, Taxiway Centerline Lighting System.

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

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

(23) International Air Transport Association document, “Flight Simulator Design and Performance Data Requirements,” as amended.

(24) AC 29-2, as amended, Flight Test Guide for Certification of Transport Category Rotorcraft.

(25) AC 27-1, as amended, Flight Test Guide for Certification of Normal Category Rotorcraft.

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

**Pt. 60, App. D**

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

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

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

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

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

END INFORMATION

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**2. APPLICABILITY (§ 60.1 AND 60.2)**

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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.

END INFORMATION

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**3. DEFINITIONS (§ 60.3)**

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BEGIN INFORMATION

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

END INFORMATION

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**4. QUALIFICATION PERFORMANCE STANDARDS (§ 60.4)**

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BEGIN INFORMATION

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

END INFORMATION

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**5. QUALITY MANAGEMENT SYSTEM (§ 60.5)**

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BEGIN INFORMATION

Additional regulatory material and informational material regarding Quality Man-

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agement Systems for FTDs may be found in Appendix E of this part.

END INFORMATION

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**6. SPONSOR QUALIFICATION REQUIREMENTS (§ 60.7)**

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BEGIN INFORMATION

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

b. The following examples describe acceptable operational practices:

(1) Example One.

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

(i) If the FTD was qualified prior to 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 helicopter simulated (as described in § 60.7(d)(1)); or

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

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

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

(3) Example Three.

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

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

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

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

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

END INFORMATION

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#### 7. ADDITIONAL RESPONSIBILITIES OF THE SPONSOR (§60.9)

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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.

END INFORMATION

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#### 8. FTD Use (§60.11).

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BEGIN INFORMATION

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)

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BEGIN QPS REQUIREMENTS

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

(1) A flight test plan consisting of:

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

(b) For each maneuver or procedure—

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

(ii) The atmospheric and environmental conditions.

(iii) The initial flight conditions.

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

(v) The data to be gathered.

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

(2) Appropriately qualified flight test personnel.

(3) 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 D2A Appendix D;

(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 helicopter systems related data is available if this data is used to program and operate a qualified FTD. The data referred to in this sub-section is data 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

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

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

(c) 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 tests” results in lieu of a time-history result, the sponsor or other data provider must ensure that a steady state condition exists at the instant of time captured by the “snapshot.” 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

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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 C of this part, Table C2D, Sample Validation Data Roadmap for Helicopters) 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. Addi-

tionally, 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. For this reason 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).

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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

## 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).

(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 D2A of this appendix.

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

(1) Parameters, tolerances, and flight conditions.

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

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

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

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

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

(1) A QTG cover page with sponsor and FAA approval signature blocks (see Attachment 4, Figure D4C, 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 D4G, 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 D4B, 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 helicopter 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 (SOC) 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 helicopter to which it will be converted and for the FAA qualification level sought. The NSPM will conduct an evaluation for each configuration. If a sponsor seeks qualification for two or more models of a helicopter type using a convertible FTD, the sponsor must provide a QTG for each helicopter model, or a QTG for the first helicopter model and a supplement to that QTG for each additional helicopter model. The NSPM will conduct evaluations for each helicopter model.

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

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

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

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

(4) Scaling on graphical presentations must provide the resolution necessary to evaluate the parameters shown in Attachment 2, Table D2A of this appendix.

(5) Tests involving time histories, data sheets (or transparencies thereof) and FTD test results must be clearly marked with appropriate reference points to ensure an accurate comparison between FTD and helicopter with respect to time. Time histories recorded via a line printer are to be clearly identified for cross-plotting on the helicopter data. Over-plots 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 helicopter testing, or another approved source (reformatted or digitized), together with correlating objective test results obtained from the performance of the FTD (reformatted or digitized) as prescribed in this appendix. The eMQTG must also contain the general FTD performance or demonstration results (reformatted or digitized) prescribed in this appendix, and a description of the equipment necessary to perform the initial qualification evaluation and the continuing qualification evaluations. The eMQTG must include the original validation data used to validate FTD performance and handling qualities in either the original digitized format from the data supplier or an electronic scan of the original time-history plots that were provided by the data supplier. A copy of the eMQTG must be provided to the NSPM.

k. All other FTDs (not covered in subparagraph "j") must have an electronic copy of the MQTG by and after May 30, 2014. An electronic 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

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#### BEGIN INFORMATION

m. Only those FTDs that are sponsored by a certificate holder as defined in Appendix F of this part 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) Helicopter responses, including longitudinal and lateral-directional control responses (see Attachment 2 of this appendix).

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

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

(4) 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) Helicopter systems and sub-systems (as appropriate) as compared to the helicopter simulated (see attachment 1 and attachment 3 of this appendix).

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

(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 include 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.

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 D1B 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, of this appendix, Figure D4A,



Sample Request for Initial, Upgrade, or Reinstatement Evaluation.

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 D2A 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 approaches to and departures from slopes and pinnacles.

END INFORMATION

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#### 12. ADDITIONAL QUALIFICATIONS FOR CURRENTLY QUALIFIED FTDs (§60.16)

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BEGIN INFORMATION

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)

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

c. After (1 year after date of publication of the final rule in the FEDERAL REGISTER) each visual scene and airport model installed in and available for use in a qualified FTD must meet the requirements described in Attachment 3 of this appendix.

d. Simulators 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 simulator 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 a helicopter type and approved for use within an FAA-approved flight training program. Such FTDs are not required to undergo an additional qualification process, except as described in §60.16.

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. It is not the intent of the NSPM to discourage the improvement of existing simulation (e.g., the “updating” of a control loading system, or the replacement of the IOS with a more capable unit) by requiring the

“updated” device to meet the qualification standards current at the time of the update. Depending on the extent of the update, the NSPM may require that the updated device be evaluated and may require that an evaluation include all or a portion of the elements of an initial evaluation. However, the standards against which the device would be evaluated are those that are found in the MQTG for that device.

j. 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.

k. 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)

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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

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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 and control sweeps.

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 simulated helicopter 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.

END INFORMATION

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**15. LOGGING FTD DISCREPANCIES (§ 60.20)**

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**BEGIN INFORMATION**

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

**END INFORMATION**

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**16. INTERIM QUALIFICATION OF FTDs FOR NEW HELICOPTER TYPES OR MODELS (§ 60.21)**

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**BEGIN INFORMATION**

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

**END INFORMATION**

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**17. MODIFICATIONS TO FTDs (§ 60.23)**

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**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**

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**BEGIN INFORMATION**

c. FSTD Directives are considered modification of an FTD. See Attachment 4 of this appendix, Figure D4H for a sample index of effective FSTD Directives. See Attachment 6 of this appendix for a list of all effective FSTD Directives applicable to Helicopter FTDs.

**END INFORMATION**

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

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**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**

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

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**BEGIN INFORMATION**

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

**END INFORMATION**

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

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**BEGIN INFORMATION**

If the sponsor provides a plan for how the FTD will be maintained during its out-of-

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

END INFORMATION

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## 21. RECORD KEEPING AND REPORTING (§ 60.31)

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### 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 INFORMATION

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

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### BEGIN INFORMATION

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

23. [RESERVED]

END INFORMATION

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## 24. LEVELS OF FTD

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### 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 Level 4 device is one that may have an open helicopter-specific flight deck area, or an enclosed helicopter-specific flight deck and at least one operating system. Air/ground logic is required (no aerodynamic programming required). All dis-

plays 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 Level 5 device is one that may have an open helicopter-specific flight deck area, or an enclosed helicopter-specific flight deck and a generic aerodynamic program with at least one operating system and control loading representative of the simulated helicopter. The control loading need only represent the helicopter 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 Level 6 device is one that has an enclosed helicopter-specific flight deck and aerodynamic program with all applicable helicopter systems operating and control loading that is representative of the simulated helicopter throughout its ground and flight envelope and significant sound representation. 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.

(4) Level 7. A Level 7 device is one that has an enclosed helicopter-specific flight deck and aerodynamic program with all applicable helicopter systems operating and control loading that is representative of the simulated helicopter throughout its ground and flight envelope and significant sound representation. 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. It also has a visual system that provides an out-of-the-flight deck view, providing cross-flight deck viewing (for both pilots simultaneously) of a field-of-view of at least 146° horizontally and 36° vertically as well as a vibration cueing system for characteristic helicopter vibrations noted at the pilot station(s).

END INFORMATION

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

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**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 D 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 SOC's are indicated in the "General FTD Requirements" column in Table D1A of this appendix.

b. Table D1A describes the requirements for the indicated level of FTD. Many devices include operational systems or functions that exceed the requirements outlined in this section. In any event, all systems will be tested and evaluated in accordance with this appendix to ensure proper operation.

**END QPS REQUIREMENTS**

**BEGIN INFORMATION**

**2. DISCUSSION**

a. This attachment describes the general requirements for qualifying Level 4 through

Level 7 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 D1A provides the standards for the General FTD Requirements.

d. Table D1B provides the tasks that the sponsor will examine to determine whether the FTD satisfactorily meets the requirements for flight crew training, testing, and experience.

e. Table D1C 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 D1A—MINIMUM FTD REQUIREMENTS**

| QPS requirements |                          |           |   |   | Information |       |
|------------------|--------------------------|-----------|---|---|-------------|-------|
| Entry No.        | General FTD requirements | FTD level |   |   |             | Notes |
|                  |                          | 4         | 5 | 6 | 7           |       |

**1. General Flight Deck Configuration.**

TABLE D1A—MINIMUM FTD REQUIREMENTS—Continued

| QPS requirements       |   |           |   |   | Information |  |
|------------------------|---|-----------|---|---|-------------|--|
| Entry No.              | General FTD requirements  | FTD level |   |   |             | Notes  |
|                        |   | 4         | 5 | 6 | 7           |  |
| 1.a. ....              | The FTD must have a flight deck that is a replica of the helicopter, or set of helicopters simulated with controls, equipment, observable flight deck indicators, circuit breakers, and bulkheads properly located, functionally accurate and replicating the helicopter or set of helicopters. The direction of movement of controls and switches must be identical to that in the helicopter or set of helicopters. Crewmember seats 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. Those circuit breakers that affect procedures or result in observable flight deck indications must be properly located and functionally accurate. Fire axes, extinguishers, landing gear pins, and spare light bulbs must be available, and may be represented in silhouette, in the flight simulator. This equipment must be present as near as practical to the original position |           |   | X | X           | For FTD purposes, the flight deck consists of all that space forward of a cross section of the flight deck at the most extreme aft setting of the pilots' seats including additional, required crewmember duty stations and those required bulkheads aft of the pilot seats. Bulkheads containing only items such as landing gear pin storage compartments, fire axes and extinguishers, spare light bulbs, and aircraft documents pouches are not considered essential and may be omitted. If omitted, these items, or the silhouettes of these items, may be placed on the wall of the simulator, or in any other location as near as practical to the original position of these items. |
| 1.b. ....              | The FTD must have equipment (i.e., 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 configuration, and may be in a flight deck or an open flight deck area. Those circuit breakers that affect procedures or result in observable flight deck indications must be properly located and functionally accurate. Additional equipment required for the authorized training and 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 this equipment must replicate the appropriate function in the helicopter. Fire axes, landing gear pins, and any similar purpose instruments need only be represented in silhouette  | X         | X |   |             |  |
| <b>2. Programming.</b> |   |           |   |   |             |  |
| 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 helicopter attitude, thrust, drag, altitude, temperature, and configuration. Levels 6 and 7 additionally require the effects of changes in gross weight and center of gravity. Level 5 requires only generic aerodynamic programming.<br>An SOC is required .....   |           | X | 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.<br>An SOC is required .....   | X         | X | X | X           |  |

TABLE D1A—MINIMUM FTD REQUIREMENTS—Continued

| QPS requirements               |   |           |   |   | Information |   |
|--------------------------------|---|-----------|---|---|-------------|---|
| Entry No.                      | General FTD requirements  | FTD level |   |   |             | Notes   |
|                                |   | 4         | 5 | 6 | 7           |   |
| 2.c. ....                      | <p>Relative responses of the flight deck instruments must be measured by latency tests or transport delay tests, and may not exceed 150 milliseconds. The instruments must respond to abrupt input at the pilot's position within the allotted time, but not before the time that the helicopter or set of helicopters respond under the same conditions</p> <ul style="list-style-type: none"><li>• Latency: The FTD instrument and, if applicable, the motion system and the visual system response must not be prior to that time when the helicopter responds and may respond up to 150 milliseconds after that time under the same conditions.</li><li>• 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.</li></ul> |           | X | X | X           | The intent is to verify that the FTD provides instrument cues that are, within the stated time delays, like the helicopter responses. For helicopter response, acceleration in the appropriate, corresponding rotational axis is preferred. |
| <b>3. Equipment Operation.</b> |   |           |   |   |             |   |
| 3.a. ....                      | All relevant instrument indications involved in the simulation of the helicopter must automatically respond to control movement or external disturbances to the simulated helicopter or set of helicopters; e.g., turbulence or winds   | A         | X | X | X           |   |
| 3.b. ....                      | Navigation equipment must be installed and operate within the tolerances applicable for the helicopter or set of helicopters. Levels 6 and 7 must also include communication equipment (inter-phone and air/ground) like that in the helicopter. Level 5 only needs that navigation equipment necessary to fly an instrument approach   | A         | X | X | X           |   |
| 3.c. ....                      | Installed systems must simulate the applicable helicopter system operation both on the ground and in flight. At least one helicopter system must be represented. Systems must be operative to the extent that applicable normal, abnormal, and emergency operating procedures included in the sponsor's training programs can be accomplished. Levels 6 and 7 must simulate all applicable helicopter flight, navigation, and systems operation. Level 5 must have functional flight and navigational controls, displays, and instrumentation   | A         | X | X | X           |   |
| 3.d. ....                      | The lighting environment for panels and instruments must be sufficient for the operation being conducted  | X         | X | X | X           | Back-lighted panels and instruments may be installed but are not required.  |

TABLE D1A—MINIMUM FTD REQUIREMENTS—Continued

| QPS requirements                              |  |           |   |   | Information |  |
|---|--|-----------|---|---|-------------|--|
| Entry No.                                     | General FTD requirements   | FTD level |   |   |             | Notes  |
|   |  | 4         | 5 | 6 | 7           |  |
| 3.e. ....                                     | The FTD must provide control forces and control travel that correspond to the replicated helicopter or set of helicopters. Control forces must react in the same manner as in the helicopter or set of helicopters under the same flight conditions  |           |   | X | X           |  |
| 3.f. ....                                     | The FTD must provide control forces and control travel of sufficient precision to manually fly an instrument approach. The control forces must react in the same manner as in the helicopter or set of helicopters under the same flight conditions  |           | X |   |             |  |
| <b>4. Instructor or Evaluator Facilities.</b> |  |           |   |   |             |  |
| 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 | 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 | X           |  |
| <b>5. Motion System</b>                       |  |           |   |   |             |  |
| 5.a. ....                                     | A motion system may be installed in an FTD. If installed, the motion system operation must not be distracting. If a motion system is installed and additional training, testing, or checking credits are being sought, sensory cues must also be integrated. The motion system must respond to abrupt input at the pilot's position within the allotted time, but not before the time when the helicopter responds under the same conditions. The motion system must be measured by latency tests or transport delay tests and may not exceed 150 milliseconds. Instrument response must not occur prior to motion onset | X         | X | X | X           |  |
| 5.b. ....                                     | The FTD must have at least a vibration cueing system for characteristic helicopter vibrations noted at the pilot station(s)  |           |   |   | X           | May be accomplished by a "seat shaker" or a bass speaker sufficient to provide the necessary cueing.                             |
| <b>6. Visual System</b>                       |  |           |   |   |             |  |
| 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:   |           |   |   |             |  |
| 6.a.1. ....                                   | The visual system must respond to abrupt input at the pilot's position.<br>An SOC is required .....  | X         | X | X |             |  |
| 6.a.2. ....                                   | The visual system must be at least a single channel, non-collimated display.<br>An SOC is required .....   | X         | X | X |             |  |



TABLE D1A—MINIMUM FTD REQUIREMENTS—Continued

| QPS requirements |  |           |   |   | Information |   |
|------------------|--|-----------|---|---|-------------|---|
| Entry No.        | General FTD requirements   | FTD level |   |   |             | Notes   |
|                  |  | 4         | 5 | 6 | 7           |   |
| 6.a.3. ....      | The visual system must provide at least a field-of-view of 18° vertical/24° horizontal for the pilot flying.<br>An SOC is required .....   | X         | X | X |             |   |
| 6.a.4. ....      | The visual system must provide for a maximum parallax of 10° per pilot.<br>An SOC is required .....  | X         | X | X |             |   |
| 6.a.5. ....      | The visual scene content may not be distracting.<br>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.<br>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.<br>An SOC is required .....   | X         | X | X |             |   |
| 6.b. ....        | If a visual system is installed and additional training, testing, or checking credits are being sought on the basis of having a visual system, a visual system meeting the standards set out for at least a Level A FFS (see Appendix A of this part) will be required. A "direct-view," non-collimated visual system (with the other requirements for a Level A visual system met) may be considered satisfactory for those 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.<br>An SOC is required .....   | X         | X | X |             |   |
| 6.c. ....        | The FTD must provide a continuous visual field-of-view of at least 146° horizontally and 36° vertically for both pilot seats, simultaneously. The minimum horizontal field-of-view coverage must be plus and minus one-half (½) of the minimum continuous field-of-view requirement, centered on the zero degree azimuth line relative to the aircraft fuselage. Additional horizontal field-of-view capability may be added at the sponsor's discretion provided the minimum field-of-view is retained. Capability for a field-of-view in excess of these minima is not required for qualification at Level 7. However, where specific tasks require extended fields of view beyond the 146° by 36° (e.g., to accommodate the use of "chin windows" where the accommodation is either integral with or separate from the primary visual system display), then such extended fields of view must be provided.<br>An SOC is required and must explain the geometry of the installation. |           |   |   | X           | Optimization of the vertical field-of-view may be considered with respect to the specific helicopter flight deck cut-off angle. When considering the installation/use of augmented fields of view, as described here, it will be the responsibility of the sponsor to meet with the NSPM to determine the training, testing, checking, or experience tasks for which the augmented field-of-view capability may be critical to that approval. |

## 7. Sound System

TABLE D1A—MINIMUM FTD REQUIREMENTS—Continued

| QPS requirements |  |           |   |   |   | Information |
|------------------|--|-----------|---|---|---|-------------|
| Entry No.        | General FTD requirements   | FTD level |   |   |   | Notes       |
|                  |  | 4         | 5 | 6 | 7 |             |
| 7.a. ....        | The FTD must simulate significant flight deck sounds resulting from pilot actions that correspond to those heard in the helicopter |           |   | X | X |             |

Note: An "A" in the table indicates that the system, task, or procedure may be examined if the appropriate helicopter system or control is simulated in the FTD and is working properly.

TABLE D1B—MINIMUM FTD REQUIREMENTS

| QPS requirements               |   |           |   |   |   | Information |
|--------------------------------|---|-----------|---|---|---|-------------|
| Entry No.                      | Subjective requirements<br>The FTD must be able to perform the tasks associated with the level of qualification sought. | FTD level |   |   |   | Notes       |
|                                |   | 4         | 5 | 6 | 7 |             |
| 1. Preflight Procedures        |   |           |   |   |   |             |
| 1.a. ....                      | Preflight Inspection (Flight Deck Only) switches, indicators, systems, and equipment.                                   | A         | A | X | X |             |
| 1.b. ....                      | APU/Engine start and run-up.  |           |   |   |   |             |
| 1.b.1. ....                    | Normal start procedures .....   | A         | A | X | X |             |
| 1.b.2. ....                    | Alternate start procedures .....  | A         | A | X | X |             |
| 1.b.3. ....                    | Abnormal starts and shutdowns (hot start, hung start).  | A         | A | X | X |             |
| 1.c. ....                      | Taxiing—Ground .....  |           |   |   | X |             |
| 1.d. ....                      | Taxiing—Hover .....   |           |   |   | X |             |
| 1.e. ....                      | Pre-takeoff Checks .....  | A         | A | X | X |             |
| 2. Takeoff and Departure Phase |   |           |   |   |   |             |
| 2.a. ....                      | Normal takeoff.   |           |   |   |   |             |
| 2.a.1. ....                    | From ground .....   |           |   |   | X |             |
| 2.a.2. ....                    | From hover .....  |           |   |   | X |             |
| 2.a.3. ....                    | Running .....   |           |   |   | X |             |
| 2.b. ....                      | Instrument .....  |           |   | X | X |             |
| 2.c. ....                      | Powerplant Failure During Takeoff .....   |           |   | X | X |             |
| 2.d. ....                      | Rejected Takeoff .....  |           |   |   | X |             |
| 2.e. ....                      | Instrument Departure .....  |           |   | X | X |             |
| 3. Climb                       |   |           |   |   |   |             |
| 3.a. ....                      | Normal .....  |           |   | X | X |             |
| 3.b. ....                      | Obstacle clearance .....  |           |   |   | X |             |
| 3.c. ....                      | Vertical .....  |           |   | X | X |             |
| 3.d. ....                      | One engine inoperative .....  |           |   | X | X |             |
| 4. In-flight Maneuvers         |   |           |   |   |   |             |
| 4.a. ....                      | Turns (timed, normal, steep) .....  |           | X | X | X |             |
| 4.b. ....                      | Powerplant Failure—Multiengine Helicopters ..   |           |   | X | X |             |

TABLE D1B—MINIMUM FTD REQUIREMENTS—Continued

| QPS requirements                              |   |           |   |   | Information |       |
|---|---|-----------|---|---|-------------|-------|
| Entry No.                                     | Subjective requirements<br>The FTD must be able to perform the tasks associated with the level of qualification sought. | FTD level |   |   |             | Notes |
|   |   | 4         | 5 | 6 | 7           |       |
| 4.c. ....                                     | Powerplant Failure—Single-Engine Helicopters.   |           |   | X | X           |       |
| 4.d. ....                                     | Recovery From Unusual Attitudes .....   |           |   |   | X           |       |
| 4.e. ....                                     | Settling with Power .....   |           |   |   | X           |       |
| <b>5. Instrument Procedures</b>               |   |           |   |   |             |       |
| 5.a. ....                                     | Instrument Arrival .....  |           |   | X | X           |       |
| 5.b. ....                                     | Holding .....   |           |   | X | X           |       |
| 5.c. ....                                     | Precision Instrument Approach   |           |   |   |             |       |
| 5.c.1. ....                                   | Normal—All engines operating .....  |           | X | X | X           |       |
| 5.c.2. ....                                   | Manually controlled—One or more engines inoperative.  |           |   | X | X           |       |
| 5.d. ....                                     | Non-precision Instrument Approach .....   |           | X | X | X           |       |
| 5.e. ....                                     | Missed Approach.  |           |   |   |             |       |
| 5.e.1. ....                                   | All engines operating .....   |           |   | X | X           |       |
| 5.e.2. ....                                   | One or more engines inoperative .....   |           |   | X | X           |       |
| 5.e.3. ....                                   | Stability augmentation system failure .....   |           |   | X | X           |       |
| <b>6. Landings and Approaches to Landings</b> |   |           |   |   |             |       |
| 6.a. ....                                     | Visual Approaches (normal, steep, shallow) ...  |           | X | X | X           |       |
| 6.b. ....                                     | Landings.   |           |   |   |             |       |
| 6.b.1. ....                                   | Normal/crosswind.   |           |   |   |             |       |
| 6.b.1.a. ....                                 | Running .....   |           |   |   | X           |       |
| 6.b.1.b. ....                                 | From Hover .....  |           |   |   | X           |       |
| 6.b.2. ....                                   | One or more engines inoperative .....   |           |   |   | X           |       |
| 6.b.3. ....                                   | Rejected Landing .....  |           |   |   | X           |       |
| <b>7. Normal and Abnormal Procedures</b>      |   |           |   |   |             |       |
| 7.a. ....                                     | Powerplant .....  | A         | A | X | X           |       |
| 7.b. ....                                     | Fuel System .....   | A         | A | X | X           |       |
| 7.c. ....                                     | Electrical System .....   | A         | A | X | X           |       |
| 7.d. ....                                     | Hydraulic System .....  | A         | A | X | X           |       |
| 7.e. ....                                     | Environmental System(s) .....   | A         | A | X | X           |       |
| 7.f. ....                                     | Fire Detection and Extinguisher Systems .....   | A         | A | X | X           |       |
| 7.g. ....                                     | Navigation and Aviation Systems .....   | A         | A | X | X           |       |
| 7.h. ....                                     | Automatic Flight Control System, Electronic Flight Instrument System, and Related Subsystems.                           | A         | A | X | X           |       |
| 7.i. ....                                     | Flight Control Systems .....  | A         | A | X | X           |       |
| 7.j. ....                                     | Anti-ice and Deice Systems .....  | A         | A | X | X           |       |

TABLE D1B—MINIMUM FTD REQUIREMENTS—Continued

| QPS requirements |   |           |   |   |   | Information |  |
|------------------|---|-----------|---|---|---|-------------|--|
| Entry No.        | Subjective requirements<br>The FTD must be able to perform the tasks associated with the level of qualification sought.         | FTD level |   |   |   | Notes       |  |
|                  |   | 4         | 5 | 6 | 7 |             |  |
| 7.k. ....        | Aircraft and Personal Emergency Equipment   | A         | A | X | X |             |  |
| 7.l. ....        | Special Missions tasks (e.g., Night Vision goggles, Forward Looking Infrared System, External Loads and as listed on the SOQ.). |           |   |   | X |             |  |

**8. Emergency procedures (as applicable)**

|           |  |  |  |   |   |  |
|-----------|--|--|--|---|---|--|
| 8.a. .... | Emergency Descent .....                |  |  | X | X |  |
| 8.b. .... | Inflight Fire and Smoke Removal .....  |  |  | X | X |  |
| 8.c. .... | Emergency Evacuation .....             |  |  | X | X |  |
| 8.d. .... | Ditching .....                         |  |  |   | X |  |
| 8.e. .... | Autorotative Landing .....             |  |  |   | X |  |
| 8.f. .... | Retreating blade stall recovery .....  |  |  |   | X |  |
| 8.g. .... | Mast bumping .....                     |  |  |   | X |  |
| 8.h. .... | Loss of tail rotor effectiveness ..... |  |  | X | X |  |

**9. Postflight Procedures**

|             |                                     |   |   |   |   |  |
|-------------|-------------------------------------|---|---|---|---|--|
| 9.a. ....   | After-Landing Procedures .....      | A | A | X | X |  |
| 9.b. ....   | Parking and Securing                |   |   |   |   |  |
| 9.b.1. .... | Rotor brake operation .....         | A | A | X | X |  |
| 9.b.2. .... | Abnormal/emergency procedures ..... | A | A | X | X |  |

**Note:** An "A" in the table indicates that the system, task, or procedure may be examined if the appropriate aircraft system or control is simulated in the FTD and is working properly.

TABLE D1C—TABLE OF FTD SYSTEM TASKS

| QPS requirements |  |           |   |   | Information |       |
|------------------|--|-----------|---|---|-------------|-------|
| Entry No.        | Subjective requirements<br>In order to be qualified at the FTD qualification level indicated, the FTD must be able to perform at least the tasks associate with that level of qualification. | FTD level |   |   |             | Notes |
|                  |  | 4         | 5 | 6 | 7           |       |

**1. Instructor Operating Station (IOS)**

|           |   |   |   |   |   |   |
|-----------|---|---|---|---|---|---|
| 1.a. .... | Power switch(es) .....  | A | X | X | X |   |
| 1.b. .... | Helicopter conditions .....   | A | A | X | X | e.g., GW, CG, Fuel loading, Systems, Ground. Crew.    |
| 1.c. .... | Airports/Heliports/Helicopter Landing Areas .....                     | A | X | X | X | e.g., Selection, Surface, Presets, Lighting controls. |
| 1.d. .... | Environmental controls .....  | A | X | X | X | e.g., Temp and Wind.                                  |
| 1.e. .... | Helicopter system malfunctions (Insertion/deletion) .....             | A | A | X | X |   |
| 1.f. .... | Locks, Freezes, and Repositioning (as appropriate) .....              | A | 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 | X | X |   |

**2. Observer Seats/Stations**

TABLE D1C—TABLE OF FTD SYSTEM TASKS—Continued

| QPS requirements |  |           |   |   | Information |       |
|------------------|--|-----------|---|---|-------------|-------|
| Entry No.        | Subjective requirements<br>In order to be qualified at the FTD qualification level indicated, the FTD must be able to perform at least the tasks associate with that level of qualification. | FTD level |   |   |             | Notes |
|                  |  | 4         | 5 | 6 | 7           |       |
| 2.a. ....        | Position/Adjustment/Positive restraint system .....  | A         | X | X | X           |       |

**Note:** An “A” in the table indicates that the system, task, or procedure may be examined if the appropriate simulator system or control is in the FTD and is working properly.

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

##### BEGIN INFORMATION

##### 1. DISCUSSION

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

b. The format for numbering the objective tests in Appendix C of this part, Attachment 2, Table C2A, and the objective tests in Appendix D of this part, Attachment 2, Table D2A, is identical. However, each test required for FFSSs is not necessarily required for FTDs, and each test required for FTDs is not necessarily required for FFSSs. 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 FFSSs or FTDs.

c. A Level 4 FTD does not require objective tests and 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 D2A Objective Evaluation 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 helicopter being simulated or to the qualification level sought, it may be disregarded (e.g., engine out climb capability for a single-engine helicopter). Each test result is compared against the validation data described

in §60.13, and in Appendix B of this part. The results must be produced on an appropriate recording device acceptable to the NSPM and must include FTD number, date, time, conditions, tolerances, and appropriate dependent variables portrayed in comparison to the validation data. Time histories are required unless otherwise indicated in Table D2A. All results must be labeled using the tolerances and units given.

b. Table D2A in this attachment sets out the test results required, including the parameters, tolerances, and flight conditions for FTD validation. Tolerances are provided for the listed tests because mathematical modeling and acquisition and development of reference data are often inexact. All tolerances listed in the following tables are applied to FTD performance. When two tolerance values are given for a parameter, the less restrictive may be used unless otherwise indicated. 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 an SOC. In Table D2A, requirements for SOCs are indicated in the “Test Details” column.

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

e. The FTD may not be programmed so that the mathematical modeling is correct only at the validation test points. Unless noted otherwise, tests must represent helicopter performance and handling qualities at operating weights and centers of gravity (CG) typical of normal operation. If a test is

supported by aircraft data at one extreme weight or CG, another test supported by aircraft data at mid-conditions or as close as possible to the other extreme is necessary. Certain tests that are relevant only at one extreme CG or weight condition need not be repeated at the other extreme. The results of the tests for Level 6 are expected to be indicative of the device's performance and handling qualities throughout all of the following:

- (1) The helicopter weight and CG envelope.
- (2) The operational envelope.
- (3) Varying atmospheric ambient and environmental conditions—including the extremes authorized for the respective helicopter or set of helicopters.

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

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

h. 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. Tests of handling qualities must include validation of augmentation devices. FTDs

for highly augmented helicopters will be validated both in the unaugmented configuration (or failure state with the maximum permitted degradation in handling qualities) and the augmented configuration. Where various levels of handling qualities result from failure states, validation of the effect of the failure is necessary. For those performance and static handling qualities tests where the primary concern is control position in the unaugmented configuration, unaugmented data are not required if the design of the system precludes any affect on control position. In those instances where the unaugmented helicopter response is divergent and non-repeatable, it may not be feasible to meet the specified tolerances. Alternative requirements for testing will be mutually agreed upon by the sponsor and the NSPM on a case-by-case basis.

j. Some tests will not be required for helicopters using helicopter hardware in the FTD flight deck (e.g., "helicopter modular controller"). These exceptions are noted in Section 2 "Handling Qualities" in Table D2A of this attachment. However, in these cases, the sponsor must provide a statement that the helicopter hardware meets the appropriate manufacturer's specifications and the sponsor must have supporting information to that fact available for NSPM review.

k. In cases where light-class helicopters are being simulated, prior coordination with the NSPM on acceptable weight ranges is required. The terms "light," "medium," and "near maximum," may not be appropriate for the simulation of light-class helicopters.

#### END QPS REQUIREMENTS

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#### BEGIN INFORMATION

l. 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 snapshot.

m. Refer to AC 120-27, Aircraft Weight and Balance; and FAA-H-8083-1, Aircraft Weight and Balance Handbook, for more information.

#### END INFORMATION

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TABLE D2A—FLIGHT TRAINING DEVICE (FTD) OBJECTIVE TESTS

| Test      |  | QPS requirements                                |   |  |  | Information |   |   |
|-----------|--|---|---|--|--|-------------|---|---|
|           |  | Title   | Tolerances  | Flight conditions                              | Test details   | FTD level   |   |   |
| Entry No. |  |   |   |  |  | 5           | 6 | 7 |
| <b>1.</b> |  | <b>Performance</b>                              |   |  |  |             |   |   |
| 1.a.      |  | Engine Assessment.                              |   |  |  |             |   |   |
| 1.a.1.    |  | Start Operations.                               |   |  |  |             |   |   |
| 1.a.1.a.  |  | Engine start and acceleration (transient).      | Light Off Time— $\pm 10\%$ or $\pm 1$ sec.<br>Torque— $\pm 5\%$ Rotor Speed— $\pm 3\%$ Fuel Flow— $\pm 10\%$ Gas Generator Speed— $\pm 5\%$ Power Turbine Speed— $\pm 5\%$ Gas Turbine Temp— $\pm 30$ °C. | Ground with the Rotor Brake Used and Not Used. | Record each engine start from the initiation of the start sequence to steady state idle and from steady state idle to operating RPM. | X           | X |   |
| 1.a.1.b.  |  | Steady State Idle and Operating RPM conditions. | Torque— $\pm 3\%$ Rotor Speed— $\pm 1.5\%$ Fuel Flow— $\pm 5\%$ Gas Generator Speed— $\pm 2\%$ Power Turbine Speed— $\pm 2\%$ Turbine Gas Temp— $\pm 20$ °C.  | Ground   | Record both steady state idle and operating RPM conditions. May be a series of snapshot tests.                                       | X           | X |   |
| 1.a.2.    |  | Power Turbine Speed Trim.                       | $\pm 10\%$ of total change of power turbine speed; or $\pm 0.5\%$ change of rotor speed.  | Ground   | Record engine response to trim system actuation in both directions.  | X           | X |   |
| 1.a.3.    |  | Engine and Rotor Speed Governing.               | Torque— $\pm 5\%$ Rotor Speed— $\pm 1.5\%$ .  | Climb Descent                                  | Record results using a step input to the collective. May be conducted concurrently with climb and descent performance tests.         | X           | X |   |
| 1.b.      |  | Reserved.                                       |   |  |  |             |   |   |
| 1.c.      |  | Takeoff.  |   |  |  |             |   |   |

|                      |   |  |   |   |   |   |   |
|----------------------|---|--|---|---|---|---|---|
| 1.c.1. ....          | All Engines .....                                 | Airspeed— $\pm 3$ kt, Altitude— $\pm 20$ ft (6.1 m) Torque— $\pm 3\%$ , Rotor Speed— $\pm 1.5\%$ , Vertical Velocity— $\pm 100$ fpm (0.50 m/sec) or $\pm 10\%$ , Pitch Attitude— $\pm 1.5^\circ$ , Bank Attitude— $\pm 2^\circ$ , Heading— $\pm 2^\circ$ , Longitudinal Control Position— $\pm 10\%$ , Lateral Control Position— $\pm 10\%$ , Directional Control Position— $\pm 10\%$ , Collective Control Position— $\pm 10\%$ . | Ground/Takeoff and Initial Segment of Climb.            | Record results of takeoff flight path (running takeoff and takeoff from a hover). The criteria apply only to those segments at airspeeds above effective translational lift. Results must be recorded from the initiation of the takeoff to at least 200 ft (61 m) AGL. |   |   | X |
| 1.c.2. through 1.c.3 | Reserved.   |  |   |   |   |   |   |
| 1.d. ....            | Hover.  |  |   |   |   |   |   |
|                      | Performance .....                                 | Torque— $\pm 3\%$ , Pitch Attitude— $\pm 1.5^\circ$ , Bank Attitude— $\pm 1.5^\circ$ , Longitudinal Control Position— $\pm 5\%$ , Lateral Control Position— $\pm 5\%$ , Directional Control Position— $\pm 5\%$ , Collective Control Position— $\pm 5\%$ .   | In Ground Effect (IGE); and Out of Ground Effect (OGE). | Record results for light and heavy gross weights. May be a series of snapshot tests.  |   |   | X |
| 1.e. ....            | Vertical Climb.                                   |  |   |   |   |   |   |
|                      | Performance .....                                 | Vertical Velocity— $\pm 100$ fpm (0.50 m/sec) or $\pm 10\%$ , Directional Control Position— $\pm 5\%$ , Collective Control Position— $\pm 5\%$ .   | From OGE Hover ....                                     | Record results for light and heavy gross weights. May be a series of snapshot tests.  |   |   | X |
| 1.f. ....            | Level Flight.                                     |  |   |   |   |   |   |
|                      | Performance and Trimmed Flight Control Positions. | Torque— $\pm 3\%$ , Pitch Attitude— $\pm 1.5^\circ$ Sideslip Angle— $\pm 2^\circ$ , Longitudinal Control Position— $\pm 5\%$ , Lateral Control position— $\pm 5\%$ , Directional Control Position— $\pm 5\%$ , Collective Control Position— $\pm 5\%$ .  | Cruise (Augmentation On and Off).                       | Record results for two gross weight and CG combinations with varying trim speeds throughout the airspeed envelope. May be a series of snapshot tests.   | X | X | X |
| 1.g. ....            | Climb.  |  |   |   |   |   |   |
|                      |   |  |   |   |   |   |   |



TABLE D2A—FLIGHT TRAINING DEVICE (FTD) OBJECTIVE TESTS—Continued

| QPS requirements |  |   |  |  |           |   | Information |
|------------------|--|---|--|--|-----------|---|-------------|
| Test             |  | Tolerances  | Flight conditions  | Test details   | FTD level |   |             |
| Entry No.        | Title  |   |  |  | 5         | 6 | 7           |
|                  | Performance and Trimmed Flight Control Positions.              | Vertical Velocity— $\pm 100$ fpm (61 m/sec) or $\pm 10\%$ Pitch Attitude— $\pm 1.5^\circ$ Sideslip Angle— $\pm 2^\circ$ Longitudinal Control Position— $\pm 5\%$ Lateral Control Position— $\pm 5\%$ Directional Control Position— $\pm 5\%$ Collective Control Position— $\pm 5\%$ . | All engines operating<br>One engine inoperative.<br>Augmentation System(s) On and Off.                               | Record results for two gross weight and CG combinations. The data presented must be for normal climb power conditions. May be a series of snapshot tests.  | X         | X | X           |
| 1.h. ....        | Descent.   |   |  |  |           |   |             |
| 1.h.1. ....      | Descent Performance and Trimmed Flight Control Positions.      | Torque— $\pm 3\%$ Pitch Attitude— $\pm 1.5^\circ$ Sideslip Angle— $\pm 2^\circ$ Longitudinal Control Position— $\pm 5\%$ Lateral Control Position— $\pm 5\%$ Directional Control Position— $\pm 5\%$ Collective Control Position— $\pm 5\%$ .   | At or near 1,000 fpm (5 m/sec) rate of descent (RoD) at normal approach speed.<br>Augmentation System(s) On and Off. | Record results for two gross weight and CG combinations. May be a series of snapshot tests.  | X         | X | X           |
| 1.h.2. ....      | Autorotation Performance and Trimmed Flight Control Positions. | Pitch Attitude— $\pm 1.5^\circ$ Sideslip Angle— $\pm 2^\circ$ Longitudinal Control Position— $\pm 5\%$ Lateral Control Position— $\pm 5\%$ Directional Control Position— $\pm 5\%$ Collective Control Position— $\pm 5\%$ .   | Steady descents.<br>Augmentation System(s) On and Off.   | Record results for two gross weight conditions. Data must be recorded for normal operating RPM. (Rotor speed tolerance applies only if collective control position is full down.) Data must be recorded for speeds from 50 kts. $\pm 5$ kts through at least maximum glide distance airspeed. May be a series of snapshot tests. | X         | X | X           |
| 1.i. ....        | Autorotation.  |   |  |  |           |   |             |

| Entry .....          | Rotor Speed— $\pm 3\%$ Pitch Attitude— $\pm 2^\circ$ Roll Attitude— $\pm 3^\circ$ Yaw Attitude— $\pm 5^\circ$ Airspeed— $\pm 5$ kts. Vertical Velocity— $\pm 200$ fpm (1.00 m/sec) or 10%. | Cruise, or Climb ..... | Record results of a rapid throttle reduction to idle. If accomplished in cruise, results must be for the maximum range airspeed. If accomplished in climb, results must be for the maximum rate of climb airspeed at or near maximum continuous power.  | X | X |
|----------------------|--|------------------------|---|---|---|
| 1.j. ....            |  |                        |   |   |   |
| Landing.             |  |                        |   |   |   |
| 1.j.1. ....          | All Engines .....  | Approach .....         | Record results of the approach and landing profile (running or approach to a hover). The criteria apply only to those segments at airspeeds above effective translational lift. Record the results from 200 ft AGL (61 m) to the landing or to where the hover is established prior to landing. | X |   |
| 1.j.2. through 1.j.3 | Reserved.  |                        |   |   |   |

TABLE D2A—FLIGHT TRAINING DEVICE (FTD) OBJECTIVE TESTS—Continued

| QPS requirements |       |  |   |  |  |           | Information |   |   |
|------------------|-------|--|---|--|--|-----------|-------------|---|---|
| Test             |       | Title                                      | Tolerances  | Flight conditions  | Test details   | FTD level |             |   | Notes   |
| Entry No.        |       |  |   |  |  | 5         | 6           | 7 |   |
| 1.j.4.           | ..... | Autorotational Landing ..                  | Torque— $\pm 3\%$ , Rotor Speed— $\pm 3\%$ , Vertical Velocity— $\pm 100$ fpm (0.50 msec) or 10%, Pitch Attitude— $\pm 2^\circ$ , Bank Attitude— $\pm 2^\circ$ , Heading— $\pm 5^\circ$ , Longitudinal Control Position— $\pm 10\%$ , Lateral Control Position— $\pm 10\%$ , Directional Control Position— $\pm 10\%$ , Collective Control Position— $\pm 10\%$ . | Landing .....  | Record the results of an autorotational deceleration and landing from a stabilized autorotational descent, to touch down.                      |           |             | X | If flight test data containing all required parameters for a complete power-off landing is not available from the aircraft manufacturer for this test, and other qualified flight test personnel are not available to acquire this data, the sponsor must coordinate with the NSPM to determine if it would be appropriate to accept alternative testing means. Alternative approaches to this data acquisition that may be acceptable are:<br>(1) A simulated autorotational flare and reduction of rate of descent (ROD) at altitude; or (2) a power-on termination following an autorotational approach and flare. |
| 2.               |       | Handling Qualities                         |   |  |  |           |             |   |   |
| 2.a.             | ..... | Control System Mechanical Characteristics. | Contact the NSPM for clarification of any issue regarding helicopters with reversible controls.   |  |  |           |             |   |   |
| 2.a.1.           | ..... | Cyclic .....                               | Breakout— $\pm 0.25$ lbs (0.112 daN) or 25%, Force— $\pm 1.0$ lb (0.224 daN) or 10%.  | Ground; Static conditions. Trim On and Off. Friction Off. Augmentation On and Off. | Record results for an uninterrupted control sweep to the stops. (This test does not apply if aircraft hardware modular controllers are used.). | X         | X           | X |   |

|             |  |   |   |  |   |   |   |
|-------------|--|---|---|--|---|---|---|
| 2.a.2. .... | Collective and Pedals ...                  | Breakout— $\pm 0.5$ lb (0.224 daN) or 25%. Force— $\pm 1.0$ lb (0.224 daN) or 10%.  | Ground; Static conditions. Trim On and Off. Friction Off. Augmentation On and Off.        | Record results for an uninterrupted control sweep to the stops.  | X | X | X   |
| 2.a.3. .... | Brake Pedal Force vs. Position.            | $\pm 5$ lbs (2.224 daN) or 10% .....  | Ground; Static conditions.  | .....  | X | X | X   |
| 2.a.4. .... | Trim System Rate (all applicable systems). | Rate— $\pm 10\%$ .....  | Ground; Static conditions. Trim On. Friction Off.   | The tolerance applies to the recorded value of the trim rate.  | X | X | X   |
| 2.a.5. .... | Control Dynamics (all axes).               | $\pm 10\%$ of time for first zero crossing and $\pm 10$ (N + 1)% of period thereafter. $\pm 10\%$ of amplitude of first overshoot. $\pm 20\%$ of amplitude of 2nd and subsequent overshoots greater than 5% of initial displacement. $\pm 1$ overshoot. | Hover/Cruise Trim On Friction Off.  | Results must be recorded for a normal control displacement in both directions in each axis, using 25% to 50% of full throw.                              |   | X | Control Dynamics for irreversible control systems may be evaluated in a ground/static condition. Refer to paragraph 3 of this attachment for additional information. "N" is the sequential period of a full cycle of oscillation. |
| 2.a.6. .... | Freeplay .....                             | $\pm 0.10$ in. ( $\pm 2.5$ mm) .....  | Ground; Static conditions.  | Record and compare results for all controls.   | X | X | X   |
| 2.b. ....   | Low Airspeed Handling Qualities.           |   |   |  |   |   |   |
| 2.b.1. .... | Trimmed Flight Control Positions.          | Torque $\pm 3\%$ Pitch Attitude $\pm 1.5^\circ$ Bank Attitude $\pm 2^\circ$ Longitudinal Control Position $\pm 5\%$ Lateral Control Position $\pm 5\%$ Directional Control Position $\pm 5\%$ Collective Control Position $\pm 5\%$ .                   | Translational Flight IGE—Sideward, rearward, and forward flight. Augmentation On and Off. | Record results for several airspeed increments to the translational airspeed limits and for 45 kts. forward airspeed. May be a series of snapshot tests. |   | X |   |
| 2.b.2. .... | Critical Azimuth .....                     | Torque $\pm 3\%$ Pitch Attitude $\pm 1.5^\circ$ Bank Attitude $\pm 2^\circ$ Longitudinal Control Position $\pm 5\%$ Lateral Control Position $\pm 5\%$ Directional Control Position $\pm 5\%$ Collective Control Position $\pm 5\%$ .                   | Stationary Hover. Augmentation On and Off.  | Record results for three relative wind directions (including the most critical case) in the critical quadrant. May be a series of snapshot tests.        |   | X |   |
| 2.b.3. .... | Control Response.                          |   |   |  |   |   |   |

TABLE D2A—FLIGHT TRAINING DEVICE (FTD) OBJECTIVE TESTS—Continued

| QPS requirements                      |                        |   |                                    |   | Information |   |   |  |
|---------------------------------------|------------------------|---|------------------------------------|---|-------------|---|---|--|
| Test                                  |                        | Tolerances  | Flight conditions                  | Test details  | FTD level   |   |   | Notes  |
| Entry No.                             | Title                  |   |                                    |   | 5           | 6 | 7 |  |
| 2.b.3.a.                              | Longitudinal .....     | Pitch Rate— $\pm 10^\circ/\text{sec}$ .<br>Pitch Attitude Change— $\pm 10^\circ$<br>or $\pm 1.5^\circ$ .        | Hover, Augmentation<br>On and Off. | Record results for a step control input. The Off-axis response must show correct trend for un-augmented cases. This test must be conducted in a hover, in ground effect, without entering translational flight. |             |   | X | This is a "short time" test.   |
| 2.b.3.b.                              | Lateral .....          | Roll Rate— $\pm 10^\circ$ or $\pm 3^\circ/\text{sec}$ . Roll Attitude Change— $\pm 10^\circ$ or $\pm 3^\circ$ . | Hover Augmentation<br>On and Off.  | Record results for a step control input. The Off-axis response must show correct trend for un-augmented cases.  |             |   | X | This is a "short time" test conducted in a hover, in ground effect, without entering translational flight, to provide better visual reference. |
| 2.b.3.c.                              | Directional .....      | Yaw Rate— $\pm 10^\circ/\text{sec}$ .<br>Heading Change— $\pm 10^\circ$ or $\pm 2^\circ$ .                      | Hover Augmentation<br>On and Off.  | Record results for a step control input. The Off-axis response must show correct trend for un-augmented cases. This test must be conducted in a hover, in ground effect, without entering translational flight. |             |   | X | This is a "short time" test.   |
| 2.b.3.d.                              | Vertical .....         | Normal Acceleration $\pm 0.1g$ .....  | Hover Augmentation<br>On and Off.  | Record results for a step control input. The Off-axis response must show correct trend for un-augmented cases.  |             |   | X |  |
| 2.c. Longitudinal Handling Qualities. |                        |   |                                    |   |             |   |   |  |
| 2.c.1.                                | Control Response ..... | Pitch Rate— $\pm 10^\circ/\text{sec}$ .<br>Pitch Attitude Change— $\pm 10^\circ$<br>or $\pm 1.5^\circ$ .        | Cruise Augmentation<br>On and Off. | Results must be recorded for two cruise airspeeds to include minimum power required speed. Record data for a step control input. The Off-axis response must show correct trend for un-augmented cases.          | X           |   | X |  |

|               |                         |   |   |  |   |   |   |
|---------------|-------------------------|---|---|--|---|---|---|
| 2.c.2. ....   | Static Stability .....  | Longitudinal Control Position: $\pm 10\%$ of change from trim or $\pm 0.25$ in. (6.3 mm) or Longitudinal Control Force: $\pm 0.5$ lb. (0.223 daN) or $\pm 10\%$ .   | Cruise or Climb, Autorotation, Augmentation On and Off. | Record results for a minimum of two speeds on each side of the trim speed. May be a series of snapshot tests.  | X | X | X |
| 2.c.3. ....   | Dynamic Stability.      |   |   |  |   |   |   |
| 2.c.3.a. .... | Long Term Response ...  | $\pm 10\%$ of calculated period, $\pm 10\%$ of time to $1/2$ or double amplitude, or $\pm 0.02$ of damping ratio. For non-periodic responses, the time history must be matched within $\pm 3^\circ$ pitch; and $\pm 5$ kts airspeed over a 20 sec period following release of the controls. | Cruise Augmentation On and Off.                         | Record results for three full cycles (6 overshoots after input completed) or that sufficient to determine time to $1/2$ or double amplitude, whichever is less. For non-periodic responses, the test may be terminated prior to 20 sec if the test pilot determines that the results are becoming uncontrollably divergent. Displace the cyclic for one second or less to excite the test. The result will be either convergent or divergent and must be recorded. If this method fails to excite the test, displace the cyclic to the predetermined maximum desired pitch attitude and return to the original position. If this method is used, record the results. | X | X | X |
| 2.c.3.b. .... | Short Term Response ... | $\pm 1.5^\circ$ Pitch or $\pm 2^\circ/\text{sec}$ Pitch Rate, $\pm 0.1$ g Normal Acceleration.  | Cruise or Climb, Augmentation On and Off.               | Record results for at least two airspeeds.   | X | X | X |
|               |                         |   |   |  |   |   |   |

The response for certain helicopters may be unrepeatable throughout the stated time. In these cases, the test should show at least that a divergence is identifiable. For example: Displacing the cyclic for a given time normally excites this test or until a given pitch attitude is achieved and then return the cyclic to the original position. For non-periodic responses, results should show the same convergent or divergent character as the flight test data.

A control doublet inserted at the natural frequency of the aircraft normally excites this test. However, while input doublets are preferred over pulse inputs for Augmentation-Off tests, for Augmentation-On cases, when the short term response exhibits 1st-order or dead-beat characteristics, longitudinal pulse inputs may produce a more coherent response.

TABLE D2A—FLIGHT TRAINING DEVICE (FTD) OBJECTIVE TESTS—Continued

| Test      |       | QPS requirements                            |  |   |  |           | Information |   |
|-----------|-------|---|--|---|--|-----------|-------------|---|
|           |       | Title                                       | Tolerances   | Flight conditions                         | Test details   | FTD level |             |   |
| Entry No. |       |   |  |   |  | 5         | 6           | 7 |
| 2.c.4.    | ..... | Maneuvering Stability ...                   | Longitudinal Control Position— $\pm 10\%$ of change from trim or $\pm 0.25$ in. (6.3 mm) or Longitudinal Control Forces— $\pm 0.5$ lb. (0.223 daN) or $\pm 10\%$ . | Cruise or Climb. Augmentation On and Off. | Record results for at least two airspeeds at $30^\circ$ – $45^\circ$ bank angle. The force may be shown as a cross plot for irreversible systems. May be a series of snapshot tests.   | X         | X           | X |
| 2.d.      | ..... | Lateral and Directional Handling Qualities. |  |   |  |           |             |   |
| 2.d.1.    | ..... | Control Response.                           |  |   |  |           |             |   |
| 2.d.1.a.  | ..... | Lateral .....                               | Roll Rate— $\pm 10\%$ or $\pm 3^\circ/\text{sec}$ . Roll Attitude Change— $\pm 10\%$ or $\pm 3^\circ$ .  | Cruise Augmentation On and Off.           | Record results for at least two airspeeds, including the speed at or near the minimum power required airspeed. Record results for a step control input. The Off-axis response must show correct trend for unaugmented cases. | X         | X           | X |
| 2.d.1.b.  | ..... | Directional .....                           | Yaw Rate— $\pm 10\%$ or $\pm 2^\circ/\text{sec}$ . Yaw Attitude Change— $\pm 10\%$ or $\pm 2^\circ$ .  | Cruise Augmentation On and Off.           | Record data for at least two Airspeeds, including the speed at or near the minimum power required airspeed. Record results for a step control input. The Off-axis response must show correct trend for unaugmented cases.    | X         | X           | X |

|               |  |  |   |  |   |   |   |  |
|---------------|--|--|---|--|---|---|---|--|
| 2.d.2. ....   | Directional Static Stability.              | Lateral Control Position— $\pm 10\%$ of change from trim or $\pm 0.25$ in. (6.3 mm) or Lateral Control Force— $\pm 0.5$ lb. (0.223 daN) or 10%. Roll Attitude— $\pm 1.5$ Directional Control Position— $\pm 10\%$ of change from trim or $\pm 0.25$ in. (6.3 mm) or Directional Control Force— $\pm 1$ lb. (0.448 daN) or 10%. Longitudinal Control Position— $\pm 10\%$ of change from trim or $\pm 0.25$ in. (6.3 mm). Vertical Velocity— $\pm 100$ fpm (0.50m/sec) or 10%.                    | Cruise; or Climb (may use Descent instead of Climb if desired) Augmentation On and Off. | Record results for at least two sideslip angles on either side of the trim point. The force may be shown as a cross plot for irreversible systems. May be a series of snapshot tests.  | X | X | X | This is a steady heading sideslip test at a fixed collective position. |
| 2.d.3. ....   | Dynamic Lateral and Directional Stability. |  |   |  |   |   |   |  |
| 2.d.3.a. .... | Lateral-Directional Oscillations.          | $\pm 0.5$ sec. or $\pm 10\%$ of period. $\pm 10\%$ of time to $\frac{1}{2}$ or double amplitude or $\pm 0.02$ of damping ratio. $\pm 20\%$ or $\pm 1$ sec of time difference between peaks of bank and sideslip. For non-periodic responses, the time history must be matched within $\pm 10$ knots Airspeed; $\pm 5^\circ$ /s Roll Rate or $\pm 5^\circ$ Roll Attitude; $\pm 4^\circ$ /s Yaw Rate or $\pm 4^\circ$ Yaw Angle over a 20 sec period roll angle following release of the controls. | Cruise or Climb Augmentation On and Off.  | Record results for at least two airspeeds. The test must be initiated with a cyclic or a pedal doublet input. Record results for six full cycles (12 overshoots after input completed) or that sufficient to determine time to $\frac{1}{2}$ or double amplitude, whichever is less. The test may be terminated prior to 20 sec if the test pilot determines that the results are becoming uncontrollably divergent. | X | X | X |  |
| 2.d.3.b. .... | Spiral Stability .....                     | $\pm 2^\circ$ or $\pm 10\%$ roll angle .....   | Cruise or Climb Augmentation On and Off.  | Record the results of a release from pedal only or cyclic only turns for 20 sec. Results must be recorded from turns in both directions. Terminate check at zero roll angle or when the test pilot determines that the attitude is becoming uncontrollably divergent.  | X | X | X |  |
| 2.d.3.c. .... | Adverse/Proverse Yaw ..                    | Correct Trend, $\pm 2^\circ$ transient sideslip angle.   | Cruise or Climb Augmentation On and Off.  | Record the time history of initial entry into cyclic only turns, using only a moderate rate for cyclic input. Results must be recorded for turns in both directions.   | X | X | X |  |
| 3. ....       | Reserved                                   |  |   |  |   |   |   |  |



TABLE D2A—FLIGHT TRAINING DEVICE (FTD) OBJECTIVE TESTS—Continued

| Test        |   | QPS requirements   |                              |   |           | Information |   |
|-------------|---|--|------------------------------|---|-----------|-------------|---|
|             |   | Tolerances   | Flight conditions            | Test details  | FTD level |             |   |
| Entry No.   | Title   |  |                              |   | 5         | 6           | 7 |
| <b>4.</b>   | <b>Visual System</b>  |  |                              |   |           |             |   |
| 4.a. ....   | Visual System Response Time: (Choose either test 4.a.1. or 4.a.2. to satisfy test 4.a., Visual System Response Time Test. This test is also sufficient for flight deck instrument response timing.) |  |                              |   | ...       | ...         |   |
| 4.a.1. .... | Latency.  |  |                              |   |           |             |   |
|             |   | 150 ms (or less) after helicopter response.  | Takeoff, climb, and descent. | 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 |
| 4.a.2. .... | Transport Delay.  |  |                              |   |           |             |   |
|             |   | 150 ms (or less) after controller movement.  | N/A                          | A separate test is required in each axis (pitch, roll, and yaw).  |           |             | X |
| 4.b. ....   | Field-of-view.  |  |                              |   |           |             |   |
| 4.b.1. .... | Reserved.   |  |                              |   |           |             |   |
| 4.b.2. .... | Continuous visual field-of-view.  | Minimum continuous field-of-view providing 146° horizontal and 36° vertical field-of-view for each pilot simultaneously and any geometric error between the Image Generator eye point and the pilot eye point is 8° or less. | N/A                          | An SOC is required and must explain the geometry of the installation. Horizontal field-of-view must not be less than a total of 146° (including not less than 73° measured either side of the center of the design eye point). Additional horizontal field-of-view capability may be added at the sponsor's discretion provided the minimum field-of-view is retained. Vertical field-of-view: Not less than a total of 36° measured from the pilot's and co-pilot's eye point. |           |             | X |
| 4.b.3. .... | Reserved.   |  |                              |   |           |             |   |

|           |                             |  |           |  |   |   |
|-----------|-----------------------------|--|-----------|--|---|---|
| 4.c. .... | Surface contrast ratio .... | Not less than 5:1 .....  | N/A ..... | The ratio is calculated by dividing the brightness level of the center, bright square (providing at least 2 foot-lamberts or 7 cd/m <sup>2</sup> ) by the brightness level of any adjacent dark square.                                    | X | Measurements may be made using a 1° spot photometer and a raster drawn test pattern filling the entire visual scene (all channels) with a test pattern of black and white squares, 5 per square, with a white square in the center of each channel. During contrast ratio testing, simulator aft-cab and flight deck ambient light levels should be zero.   |
| 4.d. .... | Highlight brightness .....  | Not less than three (3) foot-lamberts (10 cd/m <sup>2</sup> ). | N/A ..... | Measure the brightness of the center white square while superimposing a highlight on that white square. The use of calligraphic capabilities to enhance the raster brightness is acceptable, but measuring light points is not acceptable. | X | Measurements may be made using a 1° spot photometer and a raster drawn test pattern filling the entire visual scene (all channels) with a test pattern of black and white squares, 5 per square, with a white square in the center of each channel.   |
| 4.e. .... | Surface resolution .....    | Not greater than two (2) arc minutes.                          | N/A ..... | An SOC is required and must include the relevant calculations.   | X | When the eye is positioned on a 3° glide slope at the slant range distances indicated with white runway markings on a black runway surface, the eye will subtend two (2) arc minutes: (1) A slant range of 6,876 ft with stripes 150 ft long and 16 ft wide, spaced 4 ft apart. (2) For Configuration A, a slant range of 5,157 feet with stripes 150 ft long and 12 ft wide, spaced 3 ft apart. (3) For Configuration B: a slant range of 9,884 feet, with stripes 150 ft long and 5.75 ft wide, spaced 5.75 ft apart. |

TABLE D2A—FLIGHT TRAINING DEVICE (FTD) OBJECTIVE TESTS—Continued

| QPS requirements |                            |  |  |  |                   |  |           |   |   | Information  |  |
|------------------|----------------------------|--|--|--|-------------------|--|-----------|---|---|--|--|
| Test             |                            | Tolerances                             |  |  | Flight conditions | Test details   | FTD level |   |   | Notes  |  |
| Entry No.        | Title                      |  |  |  |                   |  | 5         | 6 | 7 |  |  |
| 4.f. ....        | Light point size .....     | Not greater than five (5) arc-minutes. |  |  | N/A .....         | An SOC is required and must include the relevant calculations. |           |   | X | Light point size may be measured using a test pattern consisting of a centrally located single row of light points reduced in length until modulation is just discernible in each visual channel. A row of 48 lights will form a 4° angle or less.   |  |
| 4.g. ....        | Light point contrast ratio | .....                                  |  |  | .....             | .....  |           |   |   | A 1° spot photometer may be used to measure a square of at least 1° filled with light points (where light point modulation is just discernible) and compare the results to the measured adjacent background. During contrast ratio testing, simulator aft-cab and flight deck ambient light levels should be zero. |  |
| 4.g.1. ....      | Reserved.                  |  |  |  |                   |  |           |   |   |  |  |
| 4.g.2. ....      | .....                      | Not less than 25:1 .....               |  |  | N/A .....         | An SOC is required and must include the relevant calculations. |           |   | X |  |  |
| 4.h. ....        | Visual ground segment.     |  |  |  |                   |  |           |   |   |  |  |

|  |  |  |   |
|--|--|--|---|
| <p>The visible segment in the simulator must be within 20% of the segment computed to be visible from the helicopter flight deck. The tolerance(s) may be applied at either end or at both ends of the displayed segment. However, lights and ground objects computed to be visible from the helicopter flight deck at the near end of the visible segment must be visible in the simulator.</p> | <p>Landing configuration, trimmed for appropriate airspeed, at 100 ft (30m) above the touchdown zone, on glide slope with an RVR value set at 1,200 ft (350m).</p> | <p>The QTG must contain relevant calculations and a drawing showing the data used to establish the helicopter location and the segment of the ground that is visible considering design eyepoint, helicopter attitude, flight deck cut-off angle, and a visibility of 1200 ft (350 m) RVR. Simulator performance must be measured against the QTG calculations. The data submitted must include at least the following: (1) Static helicopter dimensions as follows: (i) Horizontal and vertical distance from main landing gear (MLG) to glideslope reception antenna. (ii) Horizontal and vertical distance from MLG to pilot's eyepoint. (iii) Static flight deck cutoff angle. (2) Approach data as follows: (i) Identification of runway. (ii) Horizontal distance from runway threshold to glideslope intercept with runway. (iii) Glideslope angle. (iv) Helicopter pitch angle on approach. (3) Helicopter data for manual testing: (i) Gross weight. (ii) Helicopter configuration. (iii) Approach airspeed. If non-homogenous fog is used to obscure visibility, the vertical variation in horizontal visibility must be described and be included in the slant range visibility calculation used in the computations.</p> | <p>Pre-position for this test is encouraged, but may be achieved via manual or autopilot control to the desired position.</p> |
| X  |  |  |   |
|  |  | Reserved   |   |

## BEGIN INFORMATION

## 3. CONTROL DYNAMICS

a. The characteristics of a helicopter flight control system have a major effect on the handling qualities. A significant consideration in pilot acceptability of a helicopter is the “feel” provided through the flight deck controls. Considerable effort is expended on helicopter feel system design in order to deliver a system with which pilots will be comfortable and consider the helicopter desirable to fly. In order for an FTD to be representative, it too must present the pilot with the proper feel; that of the respective helicopter. Compliance with this requirement is determined by comparing a recording of the control feel dynamics of the FFS to actual helicopter measurements in the hover and cruise configurations.

(1) Recordings such as free response to an impulse or step function are classically used to estimate the dynamic properties of electromechanical systems. It is only possible to estimate the dynamic properties as a result of only being able to estimate true inputs and responses. Therefore, it is imperative that the best possible data be collected since close matching of the FTD control loading system to the helicopter systems is essential. Control feel dynamic tests are described in the Table of Objective Tests in this appendix. Where accomplished, the free response is measured after a step or pulse input is used to excite the system.

(2) For initial and upgrade evaluations, it is required that control dynamic characteristics be measured at and recorded directly from the flight deck controls. This procedure is usually accomplished by measuring the free response of the controls using a step or pulse input to excite the system. The procedure must be accomplished in hover, climb, cruise, and autorotation. For helicopters with irreversible control systems, measurements may be obtained on the ground. The procedure should be accomplished in the hover and cruise flight conditions and configurations. Proper pitot-static inputs (if appropriate) must be provided to represent airspeeds typical of those encountered in flight.

(3) It may be shown that for some helicopters, climb, cruise, and autorotation have like effects. Thus, some tests for one may suffice for some tests for another. If either or both considerations apply, engineering validation or helicopter manufacturer rationale must be submitted as justification for ground tests or for eliminating a configuration. For FTDs requiring static and dynamic tests at the controls, special test fixtures will not be required during initial and upgrade evaluations if the sponsor's QTG shows both test fixture results and the results of an alternative approach, such as computer plots

which were produced concurrently and show satisfactory agreement. Repeat of the alternative method during the initial evaluation satisfies this test requirement.

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

(1) Tests to verify that control feel dynamics represent the helicopter must show that the dynamic damping cycles (free response of the control) match that of the helicopter within specified tolerances. The method of evaluating the response and the tolerance to be applied are described below for the underdamped and critically damped cases.

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

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

the helicopter data. The procedure for evaluating the response is illustrated in Figure 1 of this attachment.

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

(d) Special considerations. Control systems that exhibit characteristics other than classical overdamped or underdamped responses should meet specified tolerances. In addition, special consideration should be given to ensure that significant trends are maintained.

(2) Tolerances.

(a) The following summarizes the tolerances, "T" for underdamped systems, and "n" is the sequential period of a full cycle of oscillation. See Figure D2A of this attachment for an illustration of the referenced measurements.

$T(P_0) \pm 10\%$  of  $P_0$

$T(P_1) \pm 20\%$  of  $P_1$

$T(P_2) \pm 30\%$  of  $P_2$

$T(P_n) \pm 10(n + 1)\%$  of  $P_n$

$T(A_n) \pm 10\%$  of  $A_1$

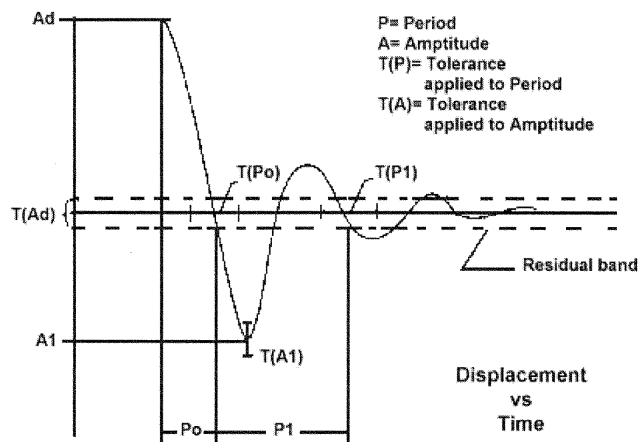
$T(A_d) \pm 5\%$  of  $A_d$  = residual band

Significant overshoots First overshoot and  $\pm 1$  subsequent overshoots

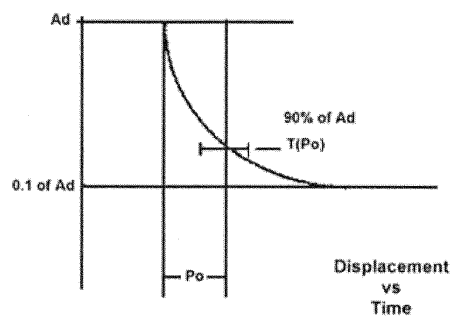
(b) The following tolerance applies to critically damped and overdamped systems only. See Figure D2B for an illustration of the reference measurements:

$T(P_0) \pm 10\%$  of  $P_0$

Attachment 2 to Appendix D to Part 60—  
Figure D2A. Under-Damped Step Response



Attachment 2 to Appendix D to Part 60—  
Figure D2B. Critically-Damped Step Response



End Information

---

Begin QPS Requirement

c. Alternative method for control dynamics evaluation.

(1) An alternative means for validating control dynamics for aircraft with hydraulically powered flight controls and artificial feel systems is by the measurement of con-

trol force and rate of movement. For each axis of pitch, roll, and yaw, the control must be forced to its maximum extreme position for the following distinct rates. These tests are conducted under normal flight and ground conditions.

(a) Static test—Slowly move the control so that a full sweep is achieved within 95-105 seconds. A full sweep is defined as movement of the controller from neutral to the stop, usually aft or right stop, then to the opposite stop, then to the neutral position.

(b) Slow dynamic test—Achieve a full sweep within 8-12 seconds.

(c) Fast dynamic test—Achieve a full sweep within 3-5 seconds.

NOTE: Dynamic sweeps may be limited to forces not exceeding 100 lbs. (44.5 daN).

(d) Tolerances.

(i) Static test; see Table D2A, Flight Training Device (FTD) Objective Tests, Entries 2.a.1., 2.a.2., and 2.a.3.

(ii) Dynamic test— $\pm 2$  lbs (0.9 daN) or  $\pm 10\%$  on dynamic increment above static test.

#### END QPS REQUIREMENT

#### BEGIN INFORMATION

d. The FAA is open to alternative means that are justified and appropriate to the application. For example, the method described here may not apply to all manufacturers' systems and certainly not to aircraft with reversible control systems. Each case is considered on its own merit on an ad hoc basis. If the FAA finds that alternative methods do not result in satisfactory performance, more conventionally accepted methods will have to be used.

#### 4. FOR ADDITIONAL INFORMATION ON THE FOLLOWING TOPICS, PLEASE REFER TO APPENDIX C OF THIS PART, ATTACHMENT 2, AND THE INDICATED PARAGRAPH WITHIN THAT ATTACHMENT

- Additional Information About Flight Simulator Qualification for New or Derivative Helicopters, paragraph 8.
- Engineering Simulator Validation Data, paragraph 9.
- Validation Test Tolerances, paragraph 11.
- Validation Data Road Map, paragraph 12.
- Acceptance Guidelines for Alternative Avionics, paragraph 13.
- Transport Delay Testing, paragraph 15.
- Continuing Qualification Evaluation Validation Data Presentation, paragraph 16.

#### END INFORMATION

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

#### BEGIN QPS REQUIREMENTS

##### 1. REQUIREMENTS

a. Except for special use airport models, all airport models required by this part must be representations of real-world, operational airports or representations of fictional airports and must meet the requirements set out in Tables D3B or D3C of this attachment, as appropriate.

b. If fictional airports are used, the sponsor must ensure that navigational aids and all appropriate maps, charts, and other navigational reference material for the fictional airports (and surrounding areas as necessary) are compatible, complete, and accurate with respect to the visual presentation and the airport model of this fictional airport. An SOC must be submitted that addresses navigation aid installation and performance and other criteria (including obstruction clearance protection) for all instrument approaches to the fictional airports that are available in the simulator. The SOC must reference and account for information in the terminal instrument procedures manual and the construction and availability of the required maps, charts, and other navigational material. This material must be clearly marked "for training purposes only."

c. When the simulator is being used by an instructor or evaluator for purposes of training, checking, or testing under this chapter, only airport models classified as Class I, Class II, or Class III may be used by the instructor or evaluator. Detailed descriptions/definitions of these classifications are found in Appendix F of this part.

d. When a person sponsors an FTD maintained by a person other than a U.S. certificate holder, the sponsor is accountable for that FTD originally meeting, and continuing to meet, the criteria under which it was originally qualified and the appropriate Part 60 criteria, including the visual scenes and airport models that may be used by instructors or evaluators for purposes of training, checking, or testing under this chapter.

e. Neither Class II nor Class III airport visual models are required to appear on the SOQ, and the method used for keeping instructors and evaluators apprised of the airport models that meet Class II or Class III requirements on any given simulator is at the option of the sponsor, but the method used must be available for review by the TPAA.

f. When an airport model represents a real world airport and a permanent change is made to that real world airport (e.g., a new runway, an extended taxiway, a new lighting system, a runway closure) without a written extension grant from the NSPM (described in paragraph 1.g., of this section), an update to that airport model must be made in accordance with the following time limits:



(1) For a new airport runway, a runway extension, a new airport taxiway, a taxiway extension, or a runway/taxiway closure—within 90 days of the opening for use of the new airport runway, runway extension, new airport taxiway, or taxiway extension; or within 90 days of the closure of the runway or taxiway.

(2) For a new or modified approach light system—within 45 days of the activation of the new or modified approach light system.

(3) For other facility or structural changes on the airport (e.g., new terminal, relocation of Air Traffic Control Tower)—within 180 days of the opening of the new or changed facility or structure.

g. If a sponsor desires an extension to the time limit for an update to a visual scene or airport model or has an objection to what must be updated in the specific airport model requirement, the sponsor must provide a written extension request to the NSPM stating the reason for the update delay and a proposed completion date or provide an explanation for the objection, explaining why the identified airport change will not have an impact on flight training, testing, or checking. A copy of this request or objection must also be sent to the POI/TCPM. The NSPM will send the official response to the sponsor and a copy to the POI/TCPM; however, if there is an objection, after consultation with the appropriate POI/TCPM regarding the training, testing, or checking impact, the NSPM will send the official response to the sponsor and a copy to the POI/TCPM.

h. Examples of situations that may warrant Class III model designation by the TPAA include the following:

(a) Training, testing, or checking on very low visibility operations, including SMGCS operations.

(b) Instrument operations training (including instrument takeoff, departure, arrival, approach, and missed approach training, testing, or checking) using—

(i) A specific model that has been geographically “moved” to a different location and aligned with an instrument procedure for another airport.

(ii) A model that does not match changes made at the real-world airport (or landing area for helicopters) being modeled.

(iii) A model generated with an “off-board” or an “on-board” model development tool (by providing proper latitude/longitude reference; correct runway or landing area orientation, length, width, marking, and lighting information; and appropriate adjacent taxiway location) to generate a facsimile of a real world airport or landing area.

These airport models may be accepted by the TPAA without individual observation provided the sponsor provides the TPAA with an acceptable description of the process for determining the acceptability of a spe-

cific airport model, outlines the conditions under which such an airport model may be used, and adequately describes what restrictions will be applied to each resulting airport or landing area model.

#### END QPS REQUIREMENTS

#### BEGIN INFORMATION

#### 2. DISCUSSION

a. The subjective tests and the examination of functions provide a basis for evaluating the capability of the FTD to perform over a typical utilization period; determining that the FTD satisfactorily meets the appropriate training/testing/checking objectives and competently simulates each required maneuver, procedure, or task; and verifying correct operation of the FTD controls, instruments, and systems. The items in the list of operations tasks are for FTD evaluation purposes only. They must not be used to limit or exceed the authorizations for use of a given level of FTD as found in the Practical Test Standards or as approved by the TPAA. All items in the following paragraphs are subject to an examination of function.

b. The List of Operations Tasks in Table D3A addressing pilot functions and maneuvers is divided by flight phases. All simulated helicopter systems functions will be assessed for normal and, where appropriate, alternate operations. Normal, abnormal, and emergency operations associated with a flight phase will be assessed during the evaluation of maneuvers or events within that flight phase.

c. Systems to be evaluated are listed separately under “Any Flight Phase” to ensure appropriate attention to systems checks. Operational navigation systems (including inertial navigation systems, global positioning systems, or other long-range systems) and the associated electronic display systems will be evaluated if installed. The NSP pilot will include in his report to the TPAA, the effect of the system operation and any system limitation.

d. At the request of the TPAA, the NSP Pilot may assess the FTD for a special aspect of a sponsor’s training program during the functions and subjective portion of an evaluation. Such an assessment may include a portion of a 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 necessarily affect the qualification of the FTD.

e. The FAA intends to allow the use of Class III airport models on a limited basis when the sponsor provides the TPAA (or other regulatory authority) an appropriate

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analysis of the skills, knowledge, and abilities (SKAs) necessary for competent performance of the tasks in which this particular media element is used. The analysis should describe the ability of the FTD/visual media to provide an adequate environment in which the required SKAs are satisfactorily performed and learned. The analysis should also include the specific media ele-

ment, such as the visual scene or airport model. Additional sources of information on the conduct of task and capability analysis may be found on the FAA's Advanced Qualification Program (AQP) Web site at: [http://www.faa.gov/education\\_research/training/aqp](http://www.faa.gov/education_research/training/aqp).

END INFORMATION

**TABLE D3A—TABLE OF FUNCTIONS AND SUBJECTIVE TESTS LEVEL 7 FTD**

| QPS requirements  |   |
|---|---|
| Entry No.   | Operations tasks  |
| Tasks in this table are subject to evaluation if appropriate for the helicopter simulated as indicated in the SOQ Configuration List or a Level 7 FTD. Items not installed, not functional on the FTD, and not appearing on the SOQ Configuration List, are not required to be listed as exceptions on the SOQ. |   |
| <b>1. Preflight Procedures</b>  |   |
| 1.a. ....   | Preflight Inspection (Flight Deck Only) switches, indicators, systems, and equipment. |
| 1.b. ....   | APU/Engine start and run-up.  |
| 1.b.1. ....   | Normal start procedures.  |
| 1.b.2. ....   | Alternate start procedures.   |
| 1.b.3. ....   | Abnormal starts and shutdowns (hot start, hung start).                                |
| 1.b.4. ....   | Rotor engagement.   |
| 1.b.5. ....   | System checks.  |
| 1.c. ....   | Taxiing—Ground.   |
| 1.c.1. ....   | Power required to taxi.   |
| 1.c.2. ....   | Brake effectiveness.  |
| 1.c.3. ....   | Ground handling.  |
| 1.c.4. ....   | Abnormal/emergency procedures, for example:   |
| 1.c.4.a. ....   | Brake system failure.   |
| 1.c.4.b. ....   | Ground resonance.   |
| 1.c.4.c. ....   | Other (listed on the SOQ).  |
| 1.d. ....   | Taxiing—Hover.  |
| 1.d.1. ....   | Takeoff to a hover.   |
| 1.d.2. ....   | Instrument response.  |
| 1.d.2.a. ....   | Engine instruments.   |
| 1.d.2.a. ....   | Flight instruments.   |
| 1.d.3. ....   | Hovering turns.   |
| 1.d.4. ....   | Hover power checks.   |
| 1.d.4.a. ....   | In ground effect (IGE).   |
| 1.d.4.b. ....   | Out of ground effect (OGE).   |
| 1.d.5. ....   | Crosswind/tailwind hover.   |
| 1.d.6. ....   | Abnormal/emergency procedures:  |
| 1.d.6.a. ....   | Engine failure.   |

TABLE D3A—TABLE OF FUNCTIONS AND SUBJECTIVE TESTS LEVEL 7 FTD—Continued

| QPS requirements                      |  |
|---------------------------------------|--|
| Entry No.                             | Operations tasks   |
| 1.d.6.b. ....                         | Fuel governing system failure.   |
| 1.d.6.c. ....                         | Settling with power (OGE).   |
| 1.d.6.d. ....                         | Stability augmentation system failure.   |
| 1.d.6.e. ....                         | Directional control malfunction (including Loss of Tail Rotor Effectiveness, LTE). |
| 1.d.6.f. ....                         | Other (listed on the SOQ).   |
| 1.e. ....                             | Pre-takeoff Checks.  |
| <b>2. Takeoff and Departure Phase</b> |  |
| 2.a. ....                             | Normal and Crosswind Takeoff.  |
| 2.a.1. ....                           | From ground.   |
| 2.a.2. ....                           | From hover.  |
| 2.a.3. ....                           | Running.   |
| 2.a.4. ....                           | Crosswind/tailwind.  |
| 2.a.5. ....                           | Maximum performance.   |
| 2.b. ....                             | Instrument.  |
| 2.c. ....                             | Powerplant Failure During Takeoff.   |
| 2.c.1. ....                           | Takeoff with engine failure after critical decision point (CDP).                   |
| 2.d. ....                             | Rejected Takeoff.  |
| 2.e. ....                             | Instrument Departure.  |
| 2.f. ....                             | Other (listed on the SOQ).   |
| <b>3. Climb</b>                       |  |
| 3.a. ....                             | Normal.  |
| 3.b. ....                             | Obstacle clearance.  |
| 3.c. ....                             | Vertical.  |
| 3.d. ....                             | One engine inoperative.  |
| 3.e. ....                             | Other (listed on the SOQ).   |
| <b>4. Inflight Maneuvers</b>          |  |
| 4.a. ....                             | Performance.   |
| 4.b. ....                             | Flying qualities.  |
| 4.c. ....                             | Turns.   |
| 4.c.1. ....                           | Timed.   |
| 4.c.2. ....                           | Normal.  |
| 4.c.3. ....                           | Steep.   |
| 4.d. ....                             | Accelerations and decelerations.   |
| 4.e. ....                             | High-speed vibrations.   |
| 4.f. ....                             | Abnormal/emergency procedures, for example:  |
| 4.f.1. ....                           | Engine fire.   |

TABLE D3A—TABLE OF FUNCTIONS AND SUBJECTIVE TESTS LEVEL 7 FTD—Continued

| QPS requirements                |   |
|---------------------------------|---|
| Entry No.                       | Operations tasks  |
| 4.f.2. ....                     | Engine failure.   |
| 4.f.2.a. ....                   | Powerplant Failure—Multiengine Helicopters.               |
| 4.f.2.b. ....                   | Powerplant Failure—Single-Engine Helicopters.             |
| 4.f.3. ....                     | Inflight engine shutdown (and restart, if applicable).    |
| 4.f.4. ....                     | Fuel governing system failures (e.g., FADEC malfunction). |
| 4.f.5. ....                     | Directional control malfunction.                          |
| 4.f.6. ....                     | Hydraulic failure.  |
| 4.f.7. ....                     | Stability augmentation system failure.                    |
| 4.f.8. ....                     | Rotor vibrations.   |
| 4.f.9. ....                     | Recovery From Unusual Attitudes.                          |
| 4.f.10. ....                    | Settling with Power.                                      |
| 4.g. ....                       | Other (listed on the SOQ).                                |
| <b>5. Instrument Procedures</b> |   |
| 5.a. ....                       | Instrument Arrival.                                       |
| 5.b. ....                       | Holding.  |
| 5.c. ....                       | Precision Instrument Approach.                            |
| 5.c.1. ....                     | Normal—All engines operating.                             |
| 5.c.2. ....                     | Manually controlled—One or more engines inoperative.      |
| 5.c.3. ....                     | Approach procedures:                                      |
| 5.c.3.a. ....                   | PAR.  |
| 5.c.3.b. ....                   | GPS.  |
| 5.c.3.c. ....                   | ILS.  |
| 5.c.3.c.1. ....                 | Manual (raw data).  |
| 5.c.3.c.2. ....                 | Autopilot * only.   |
| 5.c.3.c.3. ....                 | Flight director only.                                     |
| 5.c.3.c.4. ....                 | Autopilot * and flight director (if appropriate) coupled. |
| 5.c.3.d. ....                   | Other (listed on the SOQ).                                |
| 5.d. ....                       | Non-precision Instrument Approach.                        |
| 5.d.1. ....                     | Normal—All engines operating.                             |
| 5.d.2. ....                     | One or more engines inoperative.                          |
| 5.d.3. ....                     | Approach procedures:                                      |
| 5.d.3.a. ....                   | NDB.  |
| 5.d.3.b. ....                   | VOR, RNAV, TACAN, GPS.                                    |
| 5.d.3.c. ....                   | ASR.  |
| 5.d.3.d. ....                   | Circling.   |
| 5.d.3.e. ....                   | Helicopter only.  |

TABLE D3A—TABLE OF FUNCTIONS AND SUBJECTIVE TESTS LEVEL 7 FTD—Continued

| QPS requirements   |  |
|--|--|
| Entry No.  | Operations tasks   |
| 5.d.3.f. ....  | Other (listed on the SOQ).                                   |
| 5.e. ....  | Missed Approach.   |
| 5.e.1. ....  | All engines operating.                                       |
| 5.e.2. ....  | One or more engines inoperative.                             |
| 5.e.3. ....  | Stability augmentation system failure.                       |
| 5.e.4. ....  | Other (listed on the SOQ).                                   |
| <b>6. Landings and Approaches to Landings</b>                  |  |
| 6.a. ....  | Visual Approaches.   |
| 6.a.1. ....  | Normal.  |
| 6.a.2. ....  | Steep.   |
| 6.a.3. ....  | Shallow.   |
| 6.a.4. ....  | Crosswind.   |
| 6.b. ....  | Landings.  |
| 6.b.1. ....  | Normal.  |
| 6.b.1.a. ....  | Running.   |
| 6.b.1.b. ....  | From Hover.  |
| 6.b.2. ....  | Crosswind.   |
| 6.b.3. ....  | Tailwind.  |
| 6.b.4. ....  | One or more engines inoperative.                             |
| 6.b.5. ....  | Rejected Landing.  |
| 6.b.6. ....  | Other (listed on the SOQ).                                   |
| <b>7. Normal and Abnormal Procedures (any phase of flight)</b> |  |
| 7.a. ....  | Helicopter and powerplant systems operation (as applicable). |
| 7.a.1. ....  | Anti-icing/deicing systems.                                  |
| 7.a.2. ....  | Auxiliary powerplant.  |
| 7.a.3. ....  | Communications.  |
| 7.a.4. ....  | Electrical system.   |
| 7.a.5. ....  | Environmental system.  |
| 7.a.6. ....  | Fire detection and suppression.                              |
| 7.a.7. ....  | Flight control system.                                       |
| 7.a.8. ....  | Fuel system.   |
| 7.a.9. ....  | Engine oil system.   |
| 7.a.10. ....   | Hydraulic system.  |
| 7.a.11. ....   | Landing gear.  |
| 7.a.12. ....   | Oxygen.  |
| 7.a.13. ....   | Pneumatic.   |

TABLE D3A—TABLE OF FUNCTIONS AND SUBJECTIVE TESTS LEVEL 7 FTD—Continued

| QPS requirements  |  |
|---|--|
| Entry No.   | Operations tasks   |
| 7.a.14. ....  | Powerplant.  |
| 7.a.15. ....  | Flight control computers.                                  |
| 7.a.16. ....  | Fly-by-wire controls.                                      |
| 7.a.17. ....  | Stabilizer.  |
| 7.a.18. ....  | Stability augmentation and control augmentation system(s). |
| 7.a.19. ....  | Other (listed on the SOQ).                                 |
| 7.b. ....   | Flight management and guidance system (as applicable).     |
| 7.b.1. ....   | Airborne radar.  |
| 7.b.2. ....   | Automatic landing aids.                                    |
| 7.b.3. ....   | Autopilot.*  |
| 7.b.4. ....   | Collision avoidance system.                                |
| 7.b.5. ....   | Flight data displays.                                      |
| 7.b.6. ....   | Flight management computers.                               |
| 7.b.7. ....   | Head-up displays.  |
| 7.b.8. ....   | Navigation systems.  |
| 7.b.9. ....   | Other (listed on the SOQ).                                 |
| <b>8. Emergency Procedures (as applicable)</b>                |  |
| 8.a. ....   | Autorotative Landing.                                      |
| 8.b. ....   | Air hazard avoidance.                                      |
| 8.c. ....   | Ditching.  |
| 8.d. ....   | Emergency evacuation.                                      |
| 8.e. ....   | Inflight fire and smoke removal.                           |
| 8.f. ....   | Retreating blade stall recovery.                           |
| 8.g. ....   | Mast bumping.  |
| 8.h. ....   | Loss of tail rotor effectiveness.                          |
| 8.i. ....   | Other (listed on the SOQ).                                 |
| <b>9. Postflight Procedures</b>                               |  |
| 9.a. ....   | After-Landing Procedures.                                  |
| 9.b. ....   | Parking and Securing.                                      |
| 9.b.1. ....   | Engine and systems operation.                              |
| 9.b.2. ....   | Parking brake operation.                                   |
| 9.b.3. ....   | Rotor brake operation.                                     |
| 9.b.4. ....   | Abnormal/emergency procedures.                             |
| <b>10. Instructor Operating Station (IOS), as appropriate</b> |  |
| 10.a. ....  | Power Switch(es).  |
| 10.b. ....  | Helicopter conditions.                                     |

TABLE D3A—TABLE OF FUNCTIONS AND SUBJECTIVE TESTS LEVEL 7 FTD—Continued

| QPS requirements |  |
|------------------|--|
| Entry No.        | Operations tasks   |
| 10.b.1. ....     | Gross weight, center of gravity, fuel loading and allocation, etc. |
| 10.b.2. ....     | Helicopter systems status.   |
| 10.b.3. ....     | Ground crew functions (e.g., ext. power).                          |
| 10.c. ....       | Airports.  |
| 10.c.1. ....     | Selection.   |
| 10.c.2. ....     | Runway selection.  |
| 10.c.3. ....     | Preset positions (e.g., ramp, over final approach fix).            |
| 10.d. ....       | Environmental controls.  |
| 10.d.1. ....     | Temperature.   |
| 10.d.2. ....     | Climate conditions (e.g., ice, rain).                              |
| 10.d.3. ....     | Wind speed and direction.  |
| 10.e. ....       | Helicopter system malfunctions.                                    |
| 10.e.1. ....     | Insertion/deletion.  |
| 10.e.2. ....     | Problem clear.   |
| 10.f. ....       | Locks, Freezes, and Repositioning.                                 |
| 10.f.1. ....     | Problem (all) freeze/release.                                      |
| 10.f.2. ....     | Position (geographic) freeze/release.                              |
| 10.f.3. ....     | Repositioning (locations, freezes, and releases).                  |
| 10.f.4. ....     | Ground speed control.  |
| 10.g. ....       | Sound Controls.  |
| 10.g.1. ....     | On/off/adjustment.   |
| 10.h. ....       | Control Loading System (as applicable).                            |
| 10.h.1. ....     | On/off/emergency stop.   |
| 10.i. ....       | Observer Stations.   |
| 10.i.1. ....     | Position.  |
| 10.i.2. ....     | Adjustments.   |

\*“Autopilot” means attitude retention mode of operation.

TABLE D3B—TABLE OF FUNCTIONS AND SUBJECTIVE TESTS AIRPORT OR LANDING AREA CONTENT REQUIREMENTS FOR QUALIFICATION AT LEVEL 7 FTD

| QPS requirements  |  |
|---|--|
| Entry No.   | Operations tasks   |
| This table specifies the minimum airport visual model content and functionality to qualify an FTD at the indicated level. This table applies only to the airport/helicopter landing area scenes required for FTD qualification. |  |
| 1. ....   | <b>Functional test content</b> requirements for Level 7 FTDs. The following is the minimum airport/landing area model content requirement to satisfy visual capability tests, and provides suitable visual cues to allow completion of all functions and subjective tests described in this attachment for Level 7 FTDs. |

TABLE D3B—TABLE OF FUNCTIONS AND SUBJECTIVE TESTS AIRPORT OR LANDING AREA CONTENT REQUIREMENTS FOR QUALIFICATION AT LEVEL 7 FTD—Continued

| QPS requirements |   |
|------------------|---|
| Entry No.        | Operations tasks  |
| 1.a. ....        | A minimum of one (1) representative airport and one (1) representative helicopter landing area model. The airport and the helicopter landing area may be contained within the same visual model. If this option is selected, the approach path to the airport runway(s) and the approach path to the helicopter landing area must be different. The model(s) used to meet the following requirements may be demonstrated at either a fictional or a real-world airport or helicopter landing area, but each must be acceptable to the sponsor's TPAA, selectable from the IOS, and listed on the SOQ. |
| 1.b. ....        | Fidelity of the Visual Scene. The fidelity of the visual scene must be sufficient for the aircrew to visually identify the airport and/or helicopter landing area; determine the position of the simulated helicopter within the visual scene; successfully accomplish take-offs, approaches, and landings; and maneuver around the airport and/or helicopter landing area on the ground, or hover taxi, as necessary.  |
| 1.b.1. ....      | For each of the airport/helicopter landing areas described in 1.a., the FTD visual system must be able to provide at least the following:   |
| 1.b.1.a. ....    | A night and twilight (dusk) environment.  |
| 1.b.1.b. ....    | A daylight environment.   |
| 1.c. ....        | Runways:  |
| 1.c.1. ....      | Visible runway number.  |
| 1.c.2. ....      | Runway threshold elevations and locations must be modeled to provide sufficient correlation with helicopter systems (e.g., altimeter).  |
| 1.c.3. ....      | Runway surface and markings.  |
| 1.c.4. ....      | Lighting for the runway in use including runway edge and centerline.  |
| 1.c.5. ....      | Lighting, visual approach aid (VASI or PAPI) and approach lighting of appropriate colors.   |
| 1.c.6. ....      | Taxiway lights.   |
| 1.d. ....        | Helicopter landing area.  |
| 1.d.1. ....      | Standard heliport designation ("H") marking, properly sized and oriented.   |
| 1.d.2. ....      | Perimeter markings for the Touchdown and Lift-Off Area (TLOF) or the Final Approach and Takeoff Area (FATO), as appropriate.  |
| 1.d.3. ....      | Perimeter lighting for the TLOF or the FATO areas, as appropriate.  |
| 1.d.4. ....      | Appropriate markings and lighting to allow movement from the runway or helicopter landing area to another part of the landing facility.   |
| 2. ....          | <b>Visual scene management.</b><br>The following is the minimum visual scene management requirements for a Level 7 FTD.   |
| 2.a. ....        | Runway and helicopter landing area approach lighting must fade into view appropriately in accordance with the environmental conditions set in the FTD.  |
| 2.b. ....        | The direction of strobe lights, approach lights, runway edge lights, visual landing aids, runway centerline lights, threshold lights, touchdown zone lights, and TLOF or FATO lights must be replicated.  |
| 3. ....          | <b>Visual feature recognition.</b><br>The following are the minimum distances at which runway features must be visible. Distances are measured from runway threshold or a helicopter landing area to a helicopter aligned with the runway or helicopter landing area on an extended 3° glide-slope in simulated meteorological conditions. For circling approaches, all tests apply to the runway used for the initial approach and to the runway of intended landing.  |
| 3.a. ....        | For runways: Runway definition, strobe lights, approach lights, and edge lights from 5 sm (8 km) of the threshold.  |
| 3.b. ....        | For runways: Centerline lights and taxiway definition from 3 sm (5 km).   |
| 3.c. ....        | For runways: Visual Approach Aid lights (VASI or PAPI) from 5 sm (8 km) of the threshold.   |
| 3.d. ....        | For runways: Runway threshold lights and touchdown zone from 2 sm (3 km).   |



TABLE D3B—TABLE OF FUNCTIONS AND SUBJECTIVE TESTS AIRPORT OR LANDING AREA CONTENT REQUIREMENTS FOR QUALIFICATION AT LEVEL 7 FTD—Continued

| QPS requirements |   |
|------------------|---|
| Entry No.        | Operations tasks  |
| 3.e. ....        | For runways and helicopter landing areas: Markings within range of landing lights for night/twilight scenes and the surface resolution test on daylight scenes, as required.  |
| 3.f. ....        | For circling approaches: The runway of intended landing and associated lighting must fade into view in a non-distracting manner.  |
| 3.g. ....        | For helicopter landing areas: Landing direction lights and raised FATO lights from 1 sm (1.5 km).   |
| 3.h. ....        | For helicopter landing areas: Flush mounted FATO lights, TLOF lights, and the lighted windsock from 0.5 sm (750 m).   |
| 4. ....          | <p><b>Airport or Helicopter Landing Area Model Content.</b></p> <p>The following prescribes the minimum requirements for an airport/helicopter landing area visual model and identifies other aspects of the environment that must correspond with that model for a Level 7 FTD. For circling approaches, all tests apply to the runway used for the initial approach and to the runway of intended landing. If all runways or landing areas in a visual model used to meet the requirements of this attachment are not designated as “in use,” then the “in use” runways/landing areas must be listed on the SOQ (e.g., KORD, Rwy 9R, 14L, 22R). Models of airports or helicopter landing areas with more than one runway or landing area must have all significant runways or landing areas not “in-use” visually depicted for airport/runway/landing area recognition purposes. The use of white or off white light strings that identify the runway or landing area for twilight and night scenes are acceptable for this requirement; and rectangular surface depictions are acceptable for daylight scenes. A visual system’s capabilities must be balanced between providing visual models with an accurate representation of the airport and a realistic representation of the surrounding environment. Each runway or helicopter landing area designated as an “in-use” runway or area must include the following detail that is developed using airport pictures, construction drawings and maps, or other similar data, or developed in accordance with published regulatory material; however, this does not require that such models contain details that are beyond the design capability of the currently qualified visual system. Only one “primary” taxi route from parking to the runway end or helicopter takeoff/landing area will be required for each “in-use” runway or helicopter takeoff/landing area.</p> |
| 4.a. ....        | The surface and markings for each “in-use” runway or helicopter landing area must include the following:  |
| 4.a.1. ....      | For airports: Runway threshold markings, runway numbers, touchdown zone markings, fixed distance markings, runway edge markings, and runway centerline stripes.   |
| 4.a.2. ....      | For helicopter landing areas: Markings for standard heliport identification (“H”) and TLOF, FATO, and safety areas.   |
| 4.b. ....        | The lighting for each “in-use” runway or helicopter landing area must include the following:  |
| 4.b.1. ....      | For airports: Runway approach, threshold, edge, end, centerline (if applicable), touchdown zone (if applicable), leadoff, and visual landing aid lights or light systems for that runway.   |
| 4.b.2. ....      | For helicopter landing areas: Landing direction, raised and flush FATO, TLOF, windsock lighting.  |
| 4.c. ....        | The taxiway surface and markings associated with each “in-use” runway or helicopter landing area must include the following:  |
| 4.c.1. ....      | For airports: Taxiway edge, centerline (if appropriate), runway hold lines, and ILS critical area(s).   |
| 4.c.2. ....      | For helicopter landing areas: Taxiways, taxi routes, and aprons.  |
| 4.d. ....        | The taxiway lighting associated with each “in-use” runway or helicopter landing area must include the following:  |
| 4.d.1. ....      | For airports: Taxiway edge, centerline (if appropriate), runway hold lines, ILS critical areas.   |
| 4.d.2. ....      | For helicopter landing areas: Taxiways, taxi routes, and aprons.  |
| 4.d.3. ....      | For airports: Taxiway lighting of correct color.  |
| 4.e. ....        | Airport signage associated with each “in-use” runway or helicopter landing area must include the following:   |
| 4.e.1. ....      | For airports: Signs for runway distance remaining, intersecting runway with taxiway, and intersecting taxiway with taxiway.   |
| 4.e.2. ....      | For helicopter landing areas: As appropriate for the model used.  |
| 4.f. ....        | Required visual model correlation with other aspects of the airport or helicopter landing environment simulation:   |

TABLE D3B—TABLE OF FUNCTIONS AND SUBJECTIVE TESTS AIRPORT OR LANDING AREA CONTENT REQUIREMENTS FOR QUALIFICATION AT LEVEL 7 FTD—Continued

| QPS requirements           |   |
|----------------------------|---|
| Entry No.                  | Operations tasks  |
| 4.f.1. ....                | The airport or helicopter landing area model must be properly aligned with the navigational aids that are associated with operations at the "in-use" runway or helicopter landing area.   |
| 4.f.2. ....                | The simulation of runway or helicopter landing area contaminants must be correlated with the displayed runway surface and lighting, if applicable.  |
| 5. ....                    | <b>Correlation with helicopter and associated equipment.</b><br>The following are the minimum correlation comparisons that must be made for a Level 7 FTD.  |
| 5.a. ....                  | Visual system compatibility with aerodynamic programming.   |
| 5.b. ....                  | Visual cues to assess sink rate and depth perception during landings.   |
| 5.c. ....                  | Accurate portrayal of environment relating to FTD attitudes.  |
| 5.d. ....                  | The visual scene must correlate with integrated helicopter systems, where installed (e.g., terrain, traffic and weather avoidance systems and Head-up Guidance System (HGS)).   |
| 5.e. ....                  | Representative visual effects for each visible, own-ship, helicopter external light(s)—taxi and landing light lobes (including independent operation, if appropriate).  |
| 5.f. ....                  | The effect of rain removal devices.   |
| 6. ....                    | <b>Scene quality.</b><br>The following are the minimum scene quality tests that must be conducted for a Level 7 FTD.  |
| 6.a. ....                  | System light points must be free from distracting jitter, smearing and streaking.   |
| 6.b. ....                  | Demonstration of occulting through each channel of the system in an operational scene.  |
| 6.c. ....                  | Six discrete light step controls (0–5).   |
| 7. ....                    | <b>Special weather representations, which include visibility and RVR, measured in terms of distance.</b><br>Visibility/RVR checked at 2,000 ft (600 m) above the airport or helicopter landing area and at two heights below 2,000 ft with at least 500 ft of separation between the measurements. The measurements must be taken within a radius of 10 sm (16 km) from the airport or helicopter landing area.   |
| 7.a. ....                  | Effects of fog on airport lighting such as halos and defocus.   |
| 7.b. ....                  | Effect of own-ship lighting in reduced visibility, such as reflected glare, including landing lights, strobes, and beacons.   |
| 8. ....                    | <b>Instructor control of the following:</b><br>The following are the minimum instructor controls that must be available in a Level 7 FTD.   |
| 8.a. ....                  | Environmental effects: E.g., cloud base, cloud effects, cloud density, visibility in statute miles/kilometers and RVR in feet/meters.   |
| 8.b. ....                  | Airport or helicopter landing area selection.   |
| 8.c. ....                  | Airport or helicopter landing area lighting, including variable intensity.  |
| 8.d. ....                  | Dynamic effects including ground and flight traffic.  |
| <b>End QPS Requirement</b> |   |
| <b>Begin Information</b>   |   |
| 9. ....                    | An example of being able to combine two airport models to achieve two "in-use" runways: One runway designated as the "in-use" runway in the first model of the airport, and the second runway designated as the "in-use" runway in the second model of the same airport. For example, the clearance is for the ILS approach to Runway 27, Circle to Land on Runway 18 right. Two airport visual models might be used: The first with Runway 27 designated as the "in use" runway for the approach to runway 27, and the second with Runway 18 Right designated as the "in use" runway. When the pilot breaks off the ILS approach to runway 27, the instructor may change to the second airport visual model in which runway 18 Right is designated as the "in use" runway, and the pilot would make a visual approach and landing. This process is acceptable to the FAA as long as the temporary interruption due to the visual model change is not distracting to the pilot. |

TABLE D3B—TABLE OF FUNCTIONS AND SUBJECTIVE TESTS AIRPORT OR LANDING AREA CONTENT REQUIREMENTS FOR QUALIFICATION AT LEVEL 7 FTD—Continued

| QPS requirements       |  |
|------------------------|--|
| Entry No.              | Operations tasks   |
| 10. ....               | Sponsors are not required to provide every detail of a runway, but the detail that is provided should be correct within reasonable limits. |
| <b>End Information</b> |  |

TABLE D3C—TABLE OF FUNCTIONS AND SUBJECTIVE TESTS LEVEL 7 FTD VISUAL REQUIREMENTS ADDITIONAL VISUAL MODELS BEYOND MINIMUM REQUIRED FOR QUALIFICATION CLASS II AIRPORT OR HELICOPTER LANDING AREA MODELS

| QPS requirements  |   |
|---|---|
| Entry No.   | Operations tasks  |
| This table specifies the minimum airport or helicopter landing area visual model content and functionality necessary to add visual models to an FTD's visual model library (i.e., beyond those necessary for qualification at the stated level) without the necessity of further involvement of the NSPM or TPAA. |   |
| 1. ....   | Visual scene management.<br><b>The following is the minimum visual scene management requirements.</b>   |
| 1.a. ....   | The installation and direction of the following lights must be replicated for the "in-use" surface:   |
| 1.a.1. ....   | For "in-use" runways: Strobe lights, approach lights, runway edge lights, visual landing aids, runway centerline lights, threshold lights, and touchdown zone lights.   |
| 1.a.2. ....   | For "in-use" helicopter landing areas: Ground level TLOF perimeter lights, elevated TLOF perimeter lights (if applicable), Optional TLOF lights (if applicable), ground FATO perimeter lights, elevated TLOF lights (if applicable), landing direction lights.  |
| 2. ....   | <b>Visual feature recognition.</b><br>The following are the minimum distances at which runway or landing area features must be visible. Distances are measured from runway threshold or a helicopter landing area to an aircraft aligned with the runway or helicopter landing area on a 3° glide-slope from the aircraft to the touchdown point, in simulated meteorological conditions. For circling approaches, all tests apply to the runway used for the initial approach and to the runway of intended landing. |
| 2.a. ....   | For Runways.  |
| 2.a.1. ....   | Strobe lights, approach lights, and edge lights from 5 sm (8 km) of the threshold.  |
| 2.a.2. ....   | Centerline lights and taxiway definition from 3 sm (5 km).  |
| 2.a.3. ....   | Visual Approach Aid lights (VASI or PAPI) from 5 sm (8 km) of the threshold.  |
| 2.a.4. ....   | Threshold lights and touchdown zone lights from 2 sm (3 km).  |
| 2.a.5. ....   | Markings within range of landing lights for night/twilight (dusk) scenes and as required by the surface resolution test on daylight scenes.   |
| 2.a.6. ....   | For circling approaches, the runway of intended landing and associated lighting must fade into view in a non-distracting manner.  |
| 2.b. ....   | For Helicopter landing areas.   |
| 2.b.1. ....   | Landing direction lights and raised FATO lights from 2 sm (3 km).   |
| 2.b.2. ....   | Flush mounted FATO lights, TOFL lights, and the lighted windssock from 1 sm (1500 m).   |
| 2.b.3. ....   | Hover taxiway lighting (yellow/blue/yellow cylinders) from TOFL area.   |
| 2.b.4. ....   | Markings within range of landing lights for night/twilight (dusk) scenes and as required by the surface resolution test on daylight scenes.   |

TABLE D3C—TABLE OF FUNCTIONS AND SUBJECTIVE TESTS LEVEL 7 FTD VISUAL REQUIREMENTS  
 ADDITIONAL VISUAL MODELS BEYOND MINIMUM REQUIRED FOR QUALIFICATION CLASS II AIRPORT  
 OR HELICOPTER LANDING AREA MODELS—Continued

| QPS requirements |   |
|------------------|---|
| Entry No.        | Operations tasks  |
| <b>3.</b> .....  | <p><b>Airport or Helicopter Landing Area Model Content.</b><br/>           The following prescribes the minimum requirements for what must be provided in an airport visual model and identifies other aspects of the airport environment that must correspond with that model. The detail must be developed using airport pictures, construction drawings and maps, or other similar data, or developed in accordance with published regulatory material; however, this does not require that airport or helicopter landing area models contain details that are beyond the designed capability of the currently qualified visual system. For circling approaches, all requirements of this section apply to the runway used for the initial approach and to the runway of intended landing. Only one "primary" taxi route from parking to the runway end or helicopter takeoff/landing area will be required for each "in-use" runway or helicopter takeoff/landing area.</p> |
| 3.a. ....        | The surface and markings for each "in-use" runway or helicopter landing area must include the following:  |
| 3.a.1. ....      | For airports: Runway threshold markings, runway numbers, touchdown zone markings, fixed distance markings, runway edge markings, and runway centerline stripes.   |
| 3.a.2. ....      | For helicopter landing areas: Standard heliport marking ("H"), TOFL, FATO, and safety areas.  |
| 3.b. ....        | The lighting for each "in-use" runway or helicopter landing area must include the following:  |
| 3.b.1. ....      | For airports: Runway approach, threshold, edge, end, centerline (if applicable), touchdown zone (if applicable), leadoff, and visual landing aid lights or light systems for that runway.   |
| 3.b.2. ....      | For helicopter landing areas: Landing direction, raised and flush FATO, TOFL, windsock lighting.  |
| 3.c. ....        | The taxiway surface and markings associated with each "in-use" runway or helicopter landing area must include the following:  |
| 3.c.1. ....      | For airports: Taxiway edge, centerline (if appropriate), runway hold lines, and ILS critical area(s).   |
| 3.c.2. ....      | For helicopter landing areas: Taxiways, taxi routes, and aprons.  |
| 3.d. ....        | The taxiway lighting associated with each "in-use" runway or helicopter landing area must include the following:  |
| 3.d.1. ....      | For airports: Runway edge, centerline (if appropriate), runway hold lines, ILS critical areas.  |
| 3.d.2. ....      | For helicopter landing areas: Taxiways, taxi routes, and aprons.  |
| <b>4.</b> .....  | <p><b>Required visual model correlation with other aspects of the airport environment simulation.</b><br/>           The following are the minimum visual model correlation tests that must be conducted for Level 7 FTD.</p>   |
| 4.a. ....        | The airport model must be properly aligned with the navigational aids that are associated with operations at the "in-use" runway.   |
| 4.b. ....        | Slopes in runways, taxiways, and ramp areas, if depicted in the visual scene, must not cause distracting or unrealistic effects.  |
| <b>5.</b> .....  | <p><b>Correlation with helicopter and associated equipment.</b><br/>           The following are the minimum correlation comparisons that must be made.</p>   |
| 5.a. ....        | Visual system compatibility with aerodynamic programming.   |
| 5.b. ....        | Accurate portrayal of environment relating to flight simulator attitudes.   |
| 5.c. ....        | Visual cues to assess sink rate and depth perception during landings.   |
| <b>6.</b> .....  | <p><b>Scene quality.</b><br/>           The following are the minimum scene quality tests that must be conducted.</p>   |
| 6.a. ....        | Light points free from distracting jitter, smearing or streaking.   |
| 6.b. ....        | Surfaces and textural cues free from apparent and distracting quantization (aliasing).  |
| <b>7.</b> .....  | <p><b>Instructor controls of the following.</b><br/>           The following are the minimum instructor controls that must be available.</p>  |
| 7.a. ....        | Environmental effects, e.g., cloud base (if used), cloud effects, cloud density, visibility in statute miles/kilometers and RVR in feet/meters.   |

TABLE D3C—TABLE OF FUNCTIONS AND SUBJECTIVE TESTS LEVEL 7 FTD VISUAL REQUIREMENTS  
ADDITIONAL VISUAL MODELS BEYOND MINIMUM REQUIRED FOR QUALIFICATION CLASS II AIRPORT  
OR HELICOPTER LANDING AREA MODELS—Continued

| QPS requirements            |  |
|-----------------------------|--|
| Entry No.                   | Operations tasks   |
| 7.b. ....                   | Airport/Heliport selection.  |
| 7.c. ....                   | Airport/Heliport lighting including variable intensity.  |
| 7.d. ....                   | Dynamic effects including ground and flight traffic.   |
| <b>End QPS Requirements</b> |  |
| <b>Begin Information</b>    |  |
| 8. ....                     | Sponsors are not required to provide every detail of a runway or helicopter landing area, but the detail that is provided must be correct within the capabilities of the system. |
| <b>End Information</b>      |  |

TABLE D3D—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 helicopter simulated as indicated in the SOQ Configuration List or for a Level 6 FTD. 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. |   |
| <b>1. Preflight Procedures</b>   |   |
| 1.a. ....  | Preflight Inspection (Flight Deck Only) switches, indicators, systems, and equipment. |
| 1.b. ....  | APU/Engine start and run-up.  |
| 1.b.1. ....  | Normal start procedures.  |
| 1.b.2. ....  | Alternate start procedures.   |
| 1.b.3. ....  | Abnormal starts and shutdowns.  |
| 1.b.4. ....  | Rotor engagement.   |
| 1.b.5. ....  | System checks.  |
| <b>2. Takeoff and Departure Phase</b>  |   |
| 2.a. ....  | Instrument.   |
| 2.b. ....  | Takeoff with engine failure after critical decision point (CDP).                      |
| <b>3. Climb</b>  |   |
| 3.a. ....  | Normal.   |
| 3.b. ....  | One engine inoperative.   |
| <b>4. Inflight Maneuvers</b>   |   |
| 4.a. ....  | Performance.  |
| 4.b. ....  | Flying qualities.   |
| 4.c. ....  | Turns.  |
| 4.c.1. ....  | Timed.  |
| 4.c.2. ....  | Normal.   |
| 4.c.3. ....  | Steep.  |
| 4.d. ....  | Accelerations and decelerations.  |

TABLE D3D—TABLE OF FUNCTIONS AND SUBJECTIVE TESTS LEVEL 6 FTD—Continued

| QPS requirements   |  |
|--|--|
| Entry No.  | Operations tasks   |
| 4.e. ....  | Abnormal/emergency procedures:   |
| 4.e.1. ....  | Engine fire.   |
| 4.e.2. ....  | Engine failure.  |
| 4.e.3. ....  | In-flight engine shutdown (and restart, if applicable).  |
| 4.e.4. ....  | Fuel governing system failures (e.g., FADEC malfunction).  |
| 4.e.5. ....  | Directional control malfunction (restricted to the extent that the maneuver may not terminate in a landing). |
| 4.e.6. ....  | Hydraulic failure.   |
| 4.e.7. ....  | Stability augmentation system failure.   |
| <b>5. Instrument Procedures</b>                                |  |
| 5.a. ....  | Holding.   |
| 5.b. ....  | Precision Instrument Approach.   |
| 5.b.1. ....  | All engines operating.   |
| 5.b.2. ....  | One or more engines inoperative.   |
| 5.b.3. ....  | Approach procedures:   |
| 5.b.4. ....  | PAR.   |
| 5.b.5. ....  | ILS.   |
| 5.b.6. ....  | Manual (raw data).   |
| 5.b.7. ....  | Flight director only.  |
| 5.b.8. ....  | Autopilot* and flight director (if appropriate) coupled.   |
| 5.c. ....  | Non-precision Instrument Approach.   |
| 5.c. ....  | Normal—All engines operating.  |
| 5.c. ....  | One or more engines inoperative.   |
| 5.c. ....  | Approach procedures:   |
| 5.c.1. ....  | NDB.   |
| 5.c.2. ....  | VOR, RNAV, TACAN, GPS.   |
| 5.c.3. ....  | ASR.   |
| 5.c.4. ....  | Helicopter only.   |
| 5.d. ....  | Missed Approach.   |
| 5.d.1. ....  | All engines operating.   |
| 5.d.2. ....  | One or more engines inoperative.   |
| 5.d.3. ....  | Stability augmentation system failure.   |
| <b>6. Normal and Abnormal Procedures (any phase of flight)</b> |  |
| 6.a. ....  | Helicopter and powerplant systems operation (as applicable).   |
| 6.a.1. ....  | Anti-icing/deicing systems.  |
| 6.a.2. ....  | Auxiliary power-plant.   |
| 6.a.3. ....  | Communications.  |

TABLE D3D—TABLE OF FUNCTIONS AND SUBJECTIVE TESTS LEVEL 6 FTD—Continued

| QPS requirements   |  |
|--|--|
| Entry No.  | Operations tasks   |
| 6.a.4. ....  | Electrical system.   |
| 6.a.5. ....  | Environmental system.  |
| 6.a.6. ....  | Fire detection and suppression.                                    |
| 6.a.7. ....  | Flight control system.   |
| 6.a.8. ....  | Fuel system.   |
| 6.a.9. ....  | Engine oil system.   |
| 6.a.10. ....   | Hydraulic system.  |
| 6.a.11. ....   | Landing gear.  |
| 6.a.12. ....   | Oxygen.  |
| 6.a.13. ....   | Pneumatic.   |
| 6.a.14. ....   | Powerplant.  |
| 6.a.15. ....   | Flight control computers.  |
| 6.a.16. ....   | Stability augmentation and control augmentation system(s).         |
| 6.b. ....  | Flight management and guidance system (as applicable).             |
| 6.b.1. ....  | Airborne radar.  |
| 6.b.2. ....  | Automatic landing aids.  |
| 6.b.3. ....  | Autopilot.*  |
| 6.b.4. ....  | Collision avoidance system.  |
| 6.b.5. ....  | Flight data displays.  |
| 6.b.6. ....  | Flight management computers.                                       |
| 6.b.7. ....  | Navigation systems.  |
| <b>7. Postflight Procedures</b>                              |  |
| 7.a. ....  | Parking and Securing.  |
| 7.b. ....  | Engine and systems operation.                                      |
| 7.c. ....  | Parking brake operation.   |
| 7.d. ....  | Rotor brake operation.   |
| 7.e. ....  | Abnormal/emergency procedures.                                     |
| <b>8. Instructor Operating Station (IOS), as appropriate</b> |  |
| 8.a. ....  | Power Switch(es).  |
| 8.b.1. ....  | Helicopter conditions.   |
| 8.b.2. ....  | Gross weight, center of gravity, fuel loading and allocation, etc. |
| 8.b.3. ....  | Helicopter systems status.   |
| 8.b.4. ....  | Ground crew functions (e.g., ext. power).                          |
| 8.c. ....  | Airports and landing areas.  |
| 8.c.1. ....  | Number and selection.  |
| 8.c.2. ....  | Runway or landing area selection.                                  |

TABLE D3D—TABLE OF FUNCTIONS AND SUBJECTIVE TESTS LEVEL 6 FTD—Continued

| QPS requirements |   |
|------------------|---|
| Entry No.        | Operations tasks  |
| 8.c.3. ....      | Preset positions (e.g., ramp, over FAF).                      |
| 8.c.4. ....      | Lighting controls.  |
| 8.d. ....        | Environmental controls.                                       |
| 8.d.1. ....      | Temperature.  |
| 8.d.2. ....      | Climate conditions (e.g., ice, rain).                         |
| 8.d.3. ....      | Wind speed and direction.                                     |
| 8.e. ....        | Helicopter system malfunctions.                               |
| 8.e.1. ....      | Insertion/deletion.   |
| 8.e.2. ....      | Problem clear.  |
| 8.f. ....        | Locks, Freezes, and Repositioning.                            |
| 8.f.1. ....      | Problem (all) freeze/release.                                 |
| 8.f.2. ....      | Position (geographic) freeze/release.                         |
| 8.f.3. ....      | Repositioning (locations, freezes, and releases).             |
| 8.f.4. ....      | Ground speed control.   |
| 8.g. ....        | Sound Controls. On/off/adjustment.                            |
| 8.h. ....        | Control Loading System (as applicable) On/off/emergency stop. |
| 8.i. ....        | Observer Stations.  |
| 8.i.1. ....      | Position.   |
| 8.i.2. ....      | Adjustments.  |

\*“Autopilot” means attitude retention mode of operation.

TABLE D3E—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 helicopter simulated as indicated in the SOQ Configuration List or for a Level 5 FTD. 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. |   |
| <b>1. Preflight Procedures</b>   |   |
| 1.a. ....  | Preflight Inspection (Flight Deck Only) switches, indicators, systems, and equipment. |
| 1.b. ....  | APU/Engine start and run-up.  |
| 1.b.1. ....  | Normal start procedures.  |
| 1.b.2. ....  | Alternate start procedures.   |
| 1.b.3. ....  | Abnormal starts and shutdowns.  |
| <b>2. Climb</b>  |   |
| 2.a. ....  | Normal.   |
| <b>3. Inflight Maneuvers</b>   |   |
| 3.a. ....  | Performance.  |
| 3.b. ....  | Turns, Normal.  |



TABLE D3E—TABLE OF FUNCTIONS AND SUBJECTIVE TESTS LEVEL 5 FTD—Continued

| QPS requirements   |  |
|--|--|
| Entry No.  | Operations tasks   |
| <b>4. Instrument Procedures</b>                                |  |
| 4.a. ....  | Coupled instrument approach maneuvers (as applicable for the systems installed). |
| <b>5. Normal and Abnormal Procedures (any phase of flight)</b> |  |
| 5.a. ....  | Normal system operation (installed systems).                                     |
| 5.b. ....  | Abnormal/Emergency system operation (installed systems).                         |
| <b>6. Postflight Procedures</b>                                |  |
| 6.a. ....  | Parking and Securing.  |
| 6.b. ....  | Engine and systems operation.  |
| 6.c. ....  | Parking brake operation.   |
| 6.d. ....  | Rotor brake operation.   |
| 6.e. ....  | Abnormal/emergency procedures.   |
| <b>7. Instructor Operating Station (IOS), as appropriate</b>   |  |
| 7.a. ....  | Power Switch(es).  |
| 7.b. ....  | Preset positions (ground; air)   |
| 7.c. ....  | Helicopter system malfunctions.  |
| 7.c.1. ....  | Insertion/deletion.  |
| 7.c.2. ....  | Problem clear.   |
| 7.d. ....  | Control Loading System (as applicable) On/off/emergency stop.                    |
| 7.e. ....  | Observer Stations.   |
| 7.e.1. ....  | Position.  |
| 7.e.2. ....  | Adjustments.   |

TABLE D3F—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 helicopter simulated as indicated in the SOQ Configuration List or for a Level 4 FTD. 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. |   |
| <b>1. Preflight Procedures</b>   |   |
| 1.a. ....  | Preflight Inspection (Flight Deck Only) switches, indicators, systems, and equipment. |
| 1.b. ....  | APU/Engine start and run-up.  |
| 1.b.1. ....  | Normal start procedures.  |
| 1.b.2. ....  | Alternate start procedures.   |
| 1.b.3. ....  | Abnormal starts and shutdowns.  |
| <b>2. Normal and Abnormal Procedures (any phase of flight)</b>   |   |
| 2.a. ....  | Normal system operation (installed systems).  |
| 2.b. ....  | Abnormal/Emergency system operation (installed systems).                              |

TABLE D3F—TABLE OF FUNCTIONS AND SUBJECTIVE TESTS LEVEL 4 FTD—Continued

| QPS requirements   |                                 |
|--|---------------------------------|
| Entry No.  | Operations tasks                |
| <b>3. Postflight Procedures</b>                              |                                 |
| 3.a. ....  | Parking and Securing.           |
| 3.b. ....  | Engine and systems operation.   |
| 3.c. ....  | Parking brake operation.        |
| <b>4. Instructor Operating Station (IOS), as appropriate</b> |                                 |
| 4.a. ....  | Power Switch(es).               |
| 4.b. ....  | Preset positions (ground; air)  |
| 4.c. ....  | Helicopter system malfunctions. |
| 4.c.1. ....  | Insertion/deletion.             |
| 4.c.2. ....  | Problem clear.                  |

ATTACHMENT 4 TO APPENDIX D TO PART 60—  
SAMPLE DOCUMENTS

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

Date \_\_\_\_\_

Mr. Charles A. Spillner  
Manager, National Simulator Program  
Federal Aviation Administration  
100 Hartsfield Centre Parkway, Suite 400  
Atlanta, GA 30354

Dear Mr. Spillner:

**RE: Request for Initial/Upgrade Evaluation Date**

This is to advise you of our intent to request an (initial or upgrade) evaluation of our (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 "1/3 on-site" tests provided not later than 14 days prior to the proposed evaluation date.

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

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

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

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

(The sponsor should add additional comments as necessary).

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

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

Sincerely,

Attachment: FTD Information Form  
cc: POI/TCPM

Attachment 4 to Appendix D to Part 60—  
 Figure D4B – Sample Letter, Request for Initial, Upgrade, or Reinstatement Evaluation  
 Attachment: FSTD Information Form  
 INFORMATION

|  |   |  |            |
|--|---|--|------------|
| Date: _____  |   |  |            |
| <b>Section 1. FSTD Information and Characteristics</b> |   |  |            |
| Sponsor Name: _____                                    |   | FSTD Location: _____   |            |
| Address: _____   |   | Physical Address: _____  |            |
| City: _____  |   | City: _____  |            |
| State: _____   |   | State: _____   |            |
| Country: _____   |   | Country: _____   |            |
| ZIP: _____   |   | ZIP: _____   |            |
| Manager _____  |   |  |            |
| Sponsor ID No: _____<br>(Four Letter FAA Designator)   |   | Nearest Airport: _____<br>(Airport Designator)   |            |
| Type of Evaluation Requested: _____                    |   | <input type="checkbox"/> Initial <input type="checkbox"/> Upgrade <input type="checkbox"/> Continuing Qualification <input type="checkbox"/> Special<br><input type="checkbox"/> Reinstatement |            |
| Aircraft Make/model/series: _____                      |   |  |            |
| Initial Qualification:<br>(If Applicable)              | Date: _____ Level _____<br>MM/DD/YYYY   | Manufacturer's<br>Identification or Serial<br>Number _____   |            |
| Upgrade Qualification:<br>(If Applicable)              | Date: _____ Level _____<br>MM/DD/YYYY   | <input type="checkbox"/> eMQTG   |            |
| Qualification Basis: _____                             | <input type="checkbox"/> A <input type="checkbox"/> B <input type="checkbox"/> Interim C <input type="checkbox"/> C <input type="checkbox"/> D<br><input type="checkbox"/> 6 <input type="checkbox"/> 7 <input type="checkbox"/> Provisional Status |  |            |
| <b>Other Technical Information:</b>                    |   |  |            |
| FAA FSTD ID No:<br>(If Applicable)                     | _____   | FSTD Manufacturer:   | _____      |
| Convertible FSTD:                                      | <input type="checkbox"/> Yes:   | Date of Manufacture:   | MM/DD/YYYY |
| Related FAA ID No.<br>(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: _____   |            |
| Motion system manufacturer/type: _____                 |   | FSTD computer(s) identification: _____   |            |
| <b>National Aviation Authority (NAA):</b>              |   |  |            |
| 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 D to Part 60—  
Figure D4B – Sample Letter, Request for Initial, Upgrade, or Reinstatement Evaluation  
Attachment: FSTD Information Form

| INFORMATION  |                                   |   |  |
|--|-----------------------------------|---|--|
| Aircraft Equipment:                                      | Engine Type(s):<br>_____<br>_____ | Flight Instrumentation:<br><input type="checkbox"/> EFIS <input type="checkbox"/> HUD <input type="checkbox"/> HGS <input type="checkbox"/> EFVS<br><input type="checkbox"/> TCAS <input type="checkbox"/> GPWS <input type="checkbox"/> Plain View<br><input type="checkbox"/> GPS <input type="checkbox"/> FMS Type: ____<br><input type="checkbox"/> WX Radar <input type="checkbox"/> Other: ____ | Engine Instrumentation:<br><input type="checkbox"/> EICAS <input type="checkbox"/> FADEC<br><input type="checkbox"/> Other: ____ |
| Airport Models:  | 3.6.1 _____<br>Airport Designator | 3.6.2 _____<br>Airport Designator   | 3.6.3 _____<br>Airport Designator  |
| Circle to Land:  | 3.7.1 _____<br>Airport Designator | 3.7.2 _____<br>Approach   | 3.7.3 _____<br>Landing Runway  |
| Visual Ground Segment                                    | 3.8.1 _____<br>Airport Designator | 3.8.2 _____<br>Approach   | 3.8.3 _____<br>Landing Runway  |
| Section 2. Supplementary Information                     |                                   |   |  |
| FAA Training Program Approval Authority:                 |                                   | <input type="checkbox"/> POI <input type="checkbox"/> TCPM <input type="checkbox"/> 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)                 | <input type="checkbox"/>          | _____   |  |
| Commercial Pilot - Training /Checks:(142)                | <input type="checkbox"/>          | _____   |  |
| Multi-Engine Rating - Training / Checks (142)            | <input type="checkbox"/>          | _____   |  |
| Instrument Rating -Training / Checks (142)               | <input type="checkbox"/>          | _____   |  |
| Type Rating - Training / Checks (135/121/142)            | <input type="checkbox"/>          | _____   |  |
| Proficiency Checks (135/121/142)                         | <input type="checkbox"/>          | _____   |  |
| CAT I: (RVR 2400/1800 ft. DH200 ft)                      | <input type="checkbox"/>          | _____   |  |

Attachment 4 to Appendix D to Part 60—  
 Figure D4B – Sample Letter, Request for Initial, Upgrade, or Reinstatement Evaluation  
 Attachment: FSTD Information Form  
 INFORMATION

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

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

(Date)

Mr. (Name of Training Program Approval Authority):

(Name of 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 D to Part 60—  
Figure D4D – Sample Qualification Test Guide Cover Page

INFORMATION

|  |                      |
|--|----------------------|
| SPONSOR NAME   |                      |
| SPONSOR ADDRESS  |                      |
| FAA QUALIFICATION TEST GUIDE   |                      |
| (SPECIFIC HELICOPTER MODEL)  |                      |
| (  | <i>for example</i> ) |
| (  | Vertiflite AB-320 )  |
| (FTD Identification Including Manufacturer, Serial Number, Visual System Used) |                      |
| (FTD Level)  |                      |
| (Qualification Performance Standard Used)                                      |                      |
| (FTD Location)   |                      |
| FAA Initial Evaluation   |                      |
| Date: _____  |                      |
| _____  | Date: _____          |
| (Sponsor)  |                      |
| _____  | Date: _____          |
| Manager, National Simulator Program, FAA                                       |                      |



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

INFORMATION

|   |  |  |
|---|--|--|
| <p>Federal Aviation Administration<br/>National Simulator Program</p>  <p><i>Certificate of Qualification</i></p> <p>This is to certify that representatives of the National Simulator Program<br/>Completed an evaluation of the</p> <p><b>Go-Fast Training Center</b><br/><b>Vertiflite AB-320 Flight Training Device</b><br/>FAA Identification Number 889</p> <p>And found it to meet the standards set forth in<br/><b>14 CFR Part 60, Appendix D</b><br/><b>Qualification Performance Standards</b></p> <p>The Master Qualification Test Guide and the attached<br/>Configuration List and List of Qualified Tasks<br/>Provide the Qualification Basis for this device to operate at<br/><b><i>Level 6</i></b></p> <p>Until April 30, 2010</p> <p>Unless sooner rescinded or extended by the National Simulator Program Manager</p> <table><tr><td><p>March 15, 2009</p><p>_____</p><p>(date)</p></td><td><p>C. Nordlie</p><p>_____</p><p>(for the NSPM)</p></td></tr></table> | <p>March 15, 2009</p> <p>_____</p> <p>(date)</p>     | <p>C. Nordlie</p> <p>_____</p> <p>(for the NSPM)</p> |
| <p>March 15, 2009</p> <p>_____</p> <p>(date)</p>  | <p>C. Nordlie</p> <p>_____</p> <p>(for the NSPM)</p> |  |

Attachment 4 to Appendix D to Part 60—  
Figure D4F – Sample Statement of Qualification – Configuration List  
INFORMATION

**STATEMENT of QUALIFICATION  
CONFIGURATION LIST**

|  |   |  |                     |
|--|---|--|---------------------|
| Date: _____  |   |  |                     |
| <b>Section 1. FSTD Information and Characteristics</b>       |   |  |                     |
| Sponsor Name: _____  |   | FSTD Location: _____   |                     |
| Address: _____   |   | Physical Address: _____  |                     |
| City: _____  |   | City: _____  |                     |
| State: _____   |   | State: _____   |                     |
| Country: _____   |   | Country: _____   |                     |
| ZIP: _____   |   | ZIP: _____   |                     |
| Manager: _____   |   | Nearest Airport: _____<br>(Airport Designator)   |                     |
| Sponsor ID No:<br>(Four Letter FAA Designator)               |   | _____  |                     |
| Type of Evaluation Requested: _____                          |   | <input type="checkbox"/> Initial <input type="checkbox"/> Upgrade <input type="checkbox"/> Continuing Qualification <input type="checkbox"/> Special<br><input type="checkbox"/> Reinstatement |                     |
| Aircraft Make/model/series: _____                            |   |  |                     |
| Initial Qualification:<br>(If Applicable)                    | Date: _____ Level _____<br>MM/DD/YYYY   | Manufacturer's<br>Identification or Serial<br>Number _____   |                     |
| Upgrade Qualification:<br>(If Applicable)                    | Date: _____ Level _____<br>MM/DD/YYYY   | <input type="checkbox"/> eMQTG   |                     |
| Qualification Basis: _____                                   | <input type="checkbox"/> A <input type="checkbox"/> B <input type="checkbox"/> Interim C <input type="checkbox"/> C <input type="checkbox"/> D<br><input type="checkbox"/> 6 <input type="checkbox"/> 7 <input type="checkbox"/> Provisional Status |  |                     |
| <b>Other Technical Information:</b>                          |   |  |                     |
| FAA FSTD ID No:<br>(If Applicable)                           | _____   | FSTD Manufacturer:   | _____               |
| Convertible FSTD:  | <input type="checkbox"/> Yes: _____   | Date of Manufacture:   | _____<br>MM/DD/YYYY |
| Related FAA ID No.<br>(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: _____   |                     |
| Motion system manufacturer/type: _____                       |   | FSTD computer(s) identification: _____   |                     |
| <b>National Aviation Authority (NAA):</b><br>(If Applicable) |   |  |                     |
| NAA FSTD ID No:  | _____   | Last NAA Evaluation Date:  | _____               |
| NAA Qualification Level:                                     | _____   |  |                     |
| NAA Qualification Basis:                                     | _____   |  |                     |

Attachment 4 to Appendix D to Part 60—  
Figure D4F – 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):<br>_____<br>_____ | Flight Instrumentation:<br><input type="checkbox"/> EFIS <input type="checkbox"/> HUD <input type="checkbox"/> HGS <input type="checkbox"/> EFVS<br><input type="checkbox"/> TCAS <input type="checkbox"/> GPWS <input type="checkbox"/> Plain View<br><input type="checkbox"/> GPS <input type="checkbox"/> FMS Type: _____<br><input type="checkbox"/> WX Radar <input type="checkbox"/> Other: _____ |                                      | Engine Instrumentation:<br><input type="checkbox"/> EICAS <input type="checkbox"/> FADEC<br><input type="checkbox"/> Other: _____ |
|                                      |                                   |   |                                      |   |
| Airport Models:                      | 3.6.1 _____<br>Airport Designator | 3.6.2 _____<br>Airport Designator   | 3.6.3 _____<br>Airport Designator    |   |
| Circle to Land:                      | 3.7.1 _____<br>Airport Designator | 3.7.2 _____<br>Approach   | 3.7.3 _____<br>Landing Runway        |   |
| Visual Ground Segment                | 3.8.1 _____<br>Airport Designator | 3.8.2 _____<br>Approach   | 3.8.3 _____<br>Landing Runway        |   |

| Section 2. Supplementary Information     |       |  |       |
|--|-------|--|-------|
| FAA Training Program Approval Authority: |       | <input type="checkbox"/> POI <input type="checkbox"/> TCPM <input type="checkbox"/> 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)                 | <input type="checkbox"/> | _____   |
| Commercial Pilot - Training /Checks:(142)                | <input type="checkbox"/> | _____   |
| Multi-Engine Rating - Training / Checks (142)            | <input type="checkbox"/> | _____   |
| Instrument Rating -Training / Checks (142)               | <input type="checkbox"/> | _____   |
| Type Rating - Training / Checks (135/121/142)            | <input type="checkbox"/> | _____   |
| Proficiency Checks (135/121/142)                         | <input type="checkbox"/> | _____   |

Attachment 4 to Appendix D to Part 60—  
**Figure D4F – Sample Statement of Qualification – Configuration List**  
**INFORMATION**

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

Attachment 4 to Appendix D to Part 60—  
Figure D4G – Sample Statement of Qualification – List of Qualified Tasks  
INFORMATION

STATEMENT of QUALIFICATION  
LIST of QUALIFIED TASKS

**Go-Fast Training Center Vertiflite AB-320 -- Level C -- FAA ID# 888**

**The FTD is qualified to perform all of the Maneuvers, Procedures, Tasks, and Functions  
Listed in Appendix D, Attachment 1, Table D1B, Minimum FTD Requirements  
In Effect on [mm/dd/yyyy] except for the following listed Tasks or Functions.**

*(Example)*

**Excepted Tasks:**

- 6.f. Fire Detection and Extinguisher System.
- 7.d. Ditching.

***Excepted Simulator Systems:***

Remote IOS

**Additional Qualified Tasks or Functions in addition to those listed in Appendix D,  
Attachment 3, Table D1B, Minimum FTD Requirements.**

(None)

Attachment 4 to Appendix A to Part 60—  
Figure A4H – Sample Continuing Qualification Evaluation Requirements Page  
INFORMATION

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

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

(Repeat as Necessary)

**Attachment 4 to Appendix D to Part 60—**[illegible]

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

## BEGIN QPS REQUIREMENTS

b. First-time FSTD QMS sponsors must submit to the NSPM the proposed QMS program no later than 120 days before the initial FSTD evaluation. The NSPM will notify the sponsor of the acceptability of the program, including any required adjustments. Within 6

c. The Director of Operations for a Part 119 certificate holder, the Chief Instructor for a Part 141 certificate holder, or the equivalent for a Part 142 or Flight Engineer School sponsor must designate a Management Representative (MR) who has the authority to establish and modify the sponsor's policies, practices, and procedures regarding the QMS program for the recurring qualification and the daily use of each FSTD.

(3) The continuing surveillance and analysis by the NSPM of the sponsor's performance and effectiveness in providing a satisfactory FSTD for use on a regular basis.