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SUBCHAPTER D—AIRMEN

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

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§ 60.1 Applicability.

(a) This part prescribes the rules governing the initial and continuing qualification and use of all aircraft flight simulation training devices (FSTD) used for meeting training, evaluation, or flight experience requirements of this chapter for flight crewmember certification or qualification.

(b) The rules of this part apply to each person using or applying to use an FSTD to meet any requirement of this chapter.

(c) The requirements of § 60.33 regarding falsification of applications, records, or reports also apply to each person who uses an FSTD for training, evaluation, or obtaining flight experience required for flight crewmember certification or qualification under this chapter.

§ 60.2 Applicability of sponsor rules to persons who are not sponsors and who are engaged in certain unauthorized activities.

(a) The rules of this part that are directed to a sponsor of an FSTD also apply to any person who uses or causes the use of an FSTD when—

(1) That person knows that the FSTD does not have an FAA-approved sponsor; and

(2) The use of the FSTD by that person is nonetheless claimed for purposes of meeting any requirement of this chapter or that person knows or should have known that the person's acts or omissions would cause another person

to mistakenly credit use of the FSTD for purposes of meeting any requirement of this chapter.

(b) A situation in which paragraph (a) of this section would not apply to a person would be when each of the following conditions are met:

(1) The person sold or leased the FSTD and merely represented to the purchaser or lessee that the FSTD is in a condition in which it should be able to obtain FAA approval and qualification under this part;

(2) The person does not falsely claim to be the FAA-approved sponsor for the FSTD;

(3) The person does not falsely make representations that someone else is the FAA-approved sponsor of the FSTD at a time when that other person is not the FAA-approved sponsor of the FSTD; and

(4) The person's acts or omissions do not cause another person to detrimentally rely on such acts or omissions for the mistaken conclusion that the FSTD is FAA-approved and qualified under this part at the time the FSTD is sold or leased.

§ 60.3 Definitions.

In addition to the definitions in part 1 of this chapter, other terms and definitions applicable to this part are found in appendix F of this part.

§ 60.4 Qualification Performance Standards.

The Qualification Performance Standards (QPS) are published in appendices to this part as follows:

(a) Appendix A contains the QPS for Airplane Flight Simulators.

(b) Appendix B contains the QPS for Airplane Flight Training Devices.

(c) Appendix C contains the QPS for Helicopter Flight Simulators.

(d) Appendix D contains the QPS for Helicopter Flight Training Devices.

(e) Appendix E contains the QPS for Quality Management Systems for FSTDs.

(f) Appendix F contains the QPS for Definitions and Abbreviations for FSTDs.

§ 60.5 Quality management system.

(a) After October 30, 2009, no sponsor may use or allow the use of or offer the use of an FSTD for flight crewmember training or evaluation or for obtaining flight experience to meet any requirement of this chapter unless the sponsor has established and follows a quality management system (QMS), currently approved by the National Simulator Program Manager (NSPM), for the continuing surveillance and analysis of the sponsor's performance and effectiveness in providing a satisfactory FSTD for use on a regular basis as described in QPS appendix E of this part.

(b) The QMS program must provide a process for identifying deficiencies in the program and for documenting how the program will be changed to address these deficiencies.

(c) Whenever the NSPM finds that the QMS program does not adequately address the procedures necessary to meet the requirements of this part, the sponsor must, after notification by the NSPM, change the program so the procedures meet the requirements of this part. Each such change must be approved by the NSPM prior to implementation.

(d) Within 30 days after the sponsor receives a notice described in paragraph (c) of this section, the sponsor may file a petition with the Director of Flight Standards Service (the Director) for reconsideration of the NSPM finding. The sponsor must address its petition to the Director, Flight Standards Service, AFS–1, Federal Aviation Administration, 800 Independence Ave., SW., Washington, DC 20591. The filing of such a petition to reconsider stays the notice pending a decision by the Director. However, if the Director finds that there is a situation that requires immediate action in the interest of safety in air commerce, he may, upon a statement of the reasons, require a change effective without stay.

[71 FR 63426, Oct. 30, 2006, as amended at 72 FR 59599, Oct. 22, 2007]

§ 60.7 Sponsor qualification requirements.

(a) A person is eligible to apply to be a sponsor of an FSTD if the following conditions are met:

(1) The person holds, or is an applicant for, a certificate under part 119, 141, or 142 of this chapter; or holds, or is an applicant for, an approved flight

engineer course in accordance with part 63 of this chapter.

(2) The FSTD will be used, or will be offered for use, in the sponsor's FAA-approved flight training program for the aircraft being simulated as evidenced in a request for evaluation submitted to the NSPM.

(b) A person is a sponsor if the following conditions are met:

(1) The person is a certificate holder under part 119, 141, or 142 of this chapter or has an approved flight engineer course in accordance with part 63 of this chapter.

(2) The person has—

(i) Operations specifications authorizing the use of the specific aircraft or set of aircraft and has an FAA-approved training program under which at least one FSTD, simulating the aircraft or set of aircraft and for which the person is the sponsor, is used by the sponsor as described in paragraphs (b)(5) or (b)(6) of this section; or

(ii) Training specifications or an FAA-approved course of training under which at least one FSTD, simulating that aircraft or set of aircraft and for which the person is the sponsor, is used by the sponsor as described in paragraphs (b)(5) or (b)(6) of this section.

(3) The person has a quality management system currently approved by the NSPM in accordance with §60.5.

(4) The NSPM has accepted the person as the sponsor of the FSTD and that acceptance has not been withdrawn by the FAA.

(5) At least one FSTD (as referenced in paragraph (b)(2)(i) or (b)(2)(ii) of this section) that is initially qualified on or after October 30, 2007, is used within the sponsor's FAA-approved flight training program for the aircraft or set of aircraft at least once within the 12-month period following the initial/upgrade evaluation, and at least once within each subsequent 12-month period thereafter.

(6) At least one FSTD (as referenced in paragraph (b)(2)(i) or (b)(2)(ii) of this section) that was qualified before October 30, 2007, is used within the sponsor's FAA-approved flight training program for the aircraft or set of aircraft at least once within the 12-month period following the first continuing qualification evaluation conducted by the NSPM after October 30, 2007 and at least once within each subsequent 12-month period thereafter.

(c) If the use requirements of paragraphs (b)(2) and either (b)(5) or (b)(6) of this section are not met, the person will forfeit the right to sponsor that FSTD and that person will not be eligible to apply to sponsor that FSTD for at least 12 calendar months following the expiration of the qualification status.

(d) In addition to the FSTD described in paragraph (b) of this section, an FSTD sponsor may sponsor any number of other FSTDs regardless of specific aircraft or set of aircraft provided either—

(1) During the preceding 12-month period, all of the other FSTDs are used within the sponsor's or another certificate holder's FAA-approved flight training program for the aircraft or set of aircraft simulated; or

(2) The sponsor obtains a written statement at least annually from a qualified pilot who has flown the aircraft or set of aircraft (as appropriate) during the preceding 12-month period stating that the subject FSTD's performance and handling qualities, within the normal operating envelope, represent the aircraft or set of aircraft described in the FAA Type Certificate and the type data sheet, if appropriate. The sponsor must retain the two most current written statements for review by the NSPM.

[71 FR 63426, Oct. 30, 2006, as amended at 72 FR 59599, Oct. 22, 2007]

§60.9 Additional responsibilities of the sponsor.

(a) The sponsor must allow the NSPM upon request to inspect the FSTD as soon as practicable. This inspection may include all records and documents relating to the FSTD, to determine its compliance with this part.

(b) The sponsor must do the following for each FSTD:

(1) Establish a mechanism to receive written comments regarding the FSTD and its operation in accordance with the QPS appendix E of this part.

(2) Post in or adjacent to the FSTD the Statement of Qualification issued by the NSPM. An electronic copy of the Statement of Qualification that

may be accessed by an appropriate terminal or display in or adjacent to the FSTD is satisfactory.

(c) Each sponsor of an FSTD must identify to the NSPM by name, one individual to be the management representative (MR).

(1) One person may serve as an MR for more than one FSTD, but one FSTD must not have more than one person serving in this capacity.

(2) Each MR must be an employee of the sponsor with the responsibility and authority to—

(i) Monitor the on-going qualification of assigned FSTDs to ensure that all matters regarding FSTD qualification are being carried out as provided for in this part;

(ii) Ensure that the QMS is properly established, implemented, and maintained by overseeing the structure (and modifying where necessary) of the QMS policies, practices, and procedures; and

(iii) Regularly brief sponsor's management on the status of the on-going FSTD qualification program and the effectiveness and efficiency of the QMS.

(3) The MR serves as the primary contact point for all matters between the sponsor and the NSPM regarding the qualification of that FSTD as provided for in this part.

(4) The MR may delegate the duties described in paragraph (c)(2) and (c)(3) of this section to an individual at each of the sponsor's locations.

§ 60.11 FSTD use.

No person may use or allow the use of or offer the use of an FSTD for flight crewmember training or evaluation or for obtaining flight experience to meet any of the requirements under this chapter unless, in accordance with the QPS for the specific device, the FSTD meets all of the following:

(a) Has a single sponsor who is qualified under § 60.7. The sponsor may arrange with another person for services of document preparation and presentation, as well as FSTD inspection, maintenance, repair, and servicing; however, the sponsor remains responsible for ensuring that these functions are conducted in a manner and with a result of continually meeting the requirements of this part.

(b) Is qualified as described in the Statement of Qualification.

(c) Remains qualified, through satisfactory inspection, continuing qualification evaluations, appropriate maintenance, and use requirements in accordance with this part and the applicable QPS.

(d) Functions during day-to-day training, evaluation, or flight experience activities with the software and hardware that was evaluated as satisfactory by the NSPM and, if modified, modified only in accordance with the provisions of this part. However, this section does not apply to routine software or hardware changes that do not fall under the requirements of § 60.23.

(e) Is operated in accordance with the provisions and limitations of § 60.25.

§ 60.13 FSTD objective data requirements.

(a) Except as provided in paragraph (b) and (c) of this section, for the purposes of validating FSTD performance and handling qualities during evaluation for qualification, the data made available to the NSPM (the validation data package) must include the aircraft manufacturer's flight test data and all relevant data developed after the type certificate was issued (*e.g.*, data developed in response to an airworthiness directive) if such data results from a change in performance, handling qualities, functions, or other characteristics of the aircraft that must be considered for flight crewmember training, evaluation, or for meeting experience requirements of this chapter.

(b) The validation data package may contain flight test data from a source in addition to or independent of the aircraft manufacturer's data in support of an FSTD qualification, but only if this data is gathered and developed by that source in accordance with flight test methods, including a flight test plan, as described in the applicable QPS.

(c) The validation data package may also contain predicted data, engineering simulation data, data from pilot owner or pilot operating manuals, or data from public domain sources, provided this data is acceptable to the NSPM. If found acceptable the data

may then be used in particular applications for FSTD qualification.

(d) Data or other material or elements must be submitted in a form and manner acceptable to the NSPM.

(e) The NSPM may require additional objective data, which may include flight testing if necessary, if the validation data package does not support FSTD qualification requirements as described in this part and the applicable QPS appendix.

(f) When an FSTD sponsor learns, or is advised by an aircraft manufacturer or other data provider, that an addition to, an amendment to, or a revision of data that may relate to FSTD performance or handling characteristics is available, the sponsor must notify the NSPM as described in the applicable QPS.

§60.14 Special equipment and personnel requirements for qualification of the FSTD.

When notified by the NSPM, the sponsor must make available all special equipment and qualified personnel needed to accomplish or assist in the accomplishment of tests during initial qualification, continuing qualification, or special evaluations.

§60.15 Initial qualification requirements.

(a) For each FSTD, the sponsor must submit a request to the NSPM to evaluate the FSTD for initial qualification at a specific level and simultaneously request the Training Program Approval Authority (TPAA) forward a concurring letter to the NSPM. The request must be submitted in the form and manner described in the applicable QPS.

(b) The management representative described in §60.9(c) must sign a statement (electronic signature is acceptable for electronic transmissions) after confirming the following:

(1) The performance and handling qualities of the FSTD represent those of the aircraft or set of aircraft within the normal operating envelope. This determination must be made by a pilot(s) meeting the requirements of paragraph (d) of this section after having flown all of the Operations Tasks listed in the applicable QPS appendix relevant to the qualification level of the FSTD. Exceptions, if any, must be noted. The name of the person(s) making this determination must be available to the NSPM upon request.

(2) The FSTD systems and sub-systems (including the simulated aircraft systems) functionally represent those in the aircraft or set of aircraft. This determination must be made by the pilot(s) described in paragraph (b)(1) of this section, or by a person(s) trained on simulator systems/sub-systems and trained on the operation of the simulated aircraft systems, after having exercised the operation of the FSTD and the pertinent functions available through the Instructor Operating Station(s). Exceptions, if any, must be noted. The name of the person(s) making this determination must be available to the NSPM upon request.

(3) The cockpit represents the configuration of the specific type; or aircraft make, model, and series aircraft being simulated, as appropriate. This determination must be made by the pilot(s) described in paragraph (b)(1) of this section, or by a person(s) trained on the configuration and operation of the aircraft simulated. Exceptions, if any, must be noted. The name of the person(s) making this determination must be available to the NSPM upon request.

(c) Except for those FSTDs previously qualified and described in §60.17, each FSTD evaluated for initial qualification must meet the standard that is in effect at the time of the evaluation. However—

(1) If the FAA publishes a change to the existing standard or publishes a new standard for the evaluation for initial qualification, a sponsor may request that the NSPM apply the standard that was in effect when an FSTD was ordered for delivery if the sponsor—

(i) Within 30 days of the publication of the change to the existing standard or publication of the new standard, notifies the NSPM that an FSTD has been ordered;

(ii) Within 90 days of the NSPM notification described in paragraph (c)(1)(i) of this section, requests that the standard in effect at the time the order was

placed be used for the evaluation for initial qualification; and

(iii) The evaluation is conducted within 24 months following the publication of the change to the existing standard or publication of the new standard.

(2) This notification must include a description of the FSTD; the anticipated qualification level of the FSTD; the make, model, and series of aircraft simulated; and any other pertinent information.

(3) Any tests, tolerances, or other requirements that are current at the time of the evaluation may be used during the initial evaluation, at the request of the sponsor, if the sponsor provides acceptable updates to the required qualification test guide.

(4) The standards used for the evaluation for initial qualification will be used for all subsequent evaluations of the FSTD.

(d) The pilot(s) who contributes to the confirmation statement required by paragraph (b) of this section must—

(1) Be designated by the sponsor; and

(2) Be qualified in—

(i) The aircraft or set of aircraft being simulated; or

(ii) For aircraft not yet issued a type certificate, or aircraft not previously operated by the sponsor or not having previous FAA-approved training programs conducted by the sponsor, an aircraft similar in size and configuration.

(e) The subjective tests that form the basis for the statements described in paragraph (b) of this section and the objective tests referenced in paragraph (f) of this section must be accomplished at the sponsor's training facility, except as provided for in the applicable QPS.

(f) The person seeking to qualify the FSTD must provide the NSPM access to the FSTD for the length of time necessary for the NSPM to complete the required evaluation of the FSTD for initial qualification, which includes the conduct and evaluation of objective and subjective tests, including general FSTD requirements, as described in the applicable QPS, to determine that the FSTD meets the standards in that QPS.

(g) When the FSTD passes an evaluation for initial qualification, the NSPM issues a Statement of Qualification that includes all of the following:

(1) Identification of the sponsor.

(2) Identification of the make, model, and series of the aircraft or set of aircraft being simulated.

(3) Identification of the configuration of the aircraft or set of aircraft being simulated (*e.g.*, engine model or models, flight instruments, or navigation or other systems).

(4) A statement that the FSTD is qualified as either a full flight simulator or a flight training device.

(5) Identification of the qualification level of the FSTD.

(6) A statement that (with the exception of the noted exclusions for which the FSTD has not been subjectively tested by the sponsor or the NSPM and for which qualification is not sought) the qualification of the FSTD includes the tasks set out in the applicable QPS appendix relevant to the qualification level of the FSTD.

(h) After the NSPM completes the evaluation for initial qualification, the sponsor must update the Qualification Test Guide (QTG), with the results of the FAA-witnessed tests together with the results of all the objective tests described in the applicable QPS.

(i) Upon issuance of the Statement of Qualification the updated QTG becomes the Master Qualification Test Guide (MQTG). The MQTG must be made available to the NSPM upon request.

§ 60.16 Additional qualifications for a currently qualified FSTD.

(a) A currently qualified FSTD is required to undergo an additional qualification process if a user intends to use the FSTD for meeting training, evaluation, or flight experience requirements of this chapter beyond the qualification issued for that FSTD. This process consists of the following:

(1) The sponsor:

(i) Must submit to the NSPM all modifications to the MQTG that are required to support the additional qualification.

(ii) Must describe to the NSPM all modifications to the FSTD that are required to support the additional qualification.

(iii) Must submit to the NSPM a confirmation statement as described in §60.15(c) that a pilot, designated by the sponsor in accordance with §60.15(d), has subjectively evaluated the FSTD in those areas not previously evaluated.

(2) The FSTD must successfully pass an evaluation—

(i) Consisting of all the elements of an initial evaluation for qualification in those circumstances where the NSPM has determined that all the elements of an initial evaluation for qualification is necessary; or

(ii) Consisting of those elements of an initial evaluation for qualification designated as necessary by the NSPM.

(b) In making the determinations described in paragraph (a)(2) of this section, the NSPM considers factors including the existing qualification of the FSTD, any modifications to the FSTD hardware or software that are involved, and any additions or modifications to the MQTG.

(c) The FSTD is qualified for the additional uses when the NSPM issues an amended Statement of Qualification in accordance with §60.15(h).

(d) The sponsor may not modify the FSTD except as described in §60.23.

§60.17 Previously qualified FSTDs.

(a) Unless otherwise specified by an FSTD Directive, further referenced in the applicable QPS, or as specified in paragraph (e) of this section, an FSTD qualified before October 30, 2007 will retain its qualification basis as long as it continues to meet the standards, including the objective test results recorded in the MQTG and subjective tests, under which it was originally evaluated, regardless of sponsor. The sponsor of such an FSTD must comply with the other applicable provisions of this part.

(b) For each FSTD qualified before October 30, 2007, no sponsor may use or allow the use of or offer the use of such an FSTD after October 30, 2013 for flight crewmember training, evaluation or flight experience to meet any of the requirements of this chapter, unless that FSTD has been issued a Statement of Qualification, including the Configuration List and the List of Qualified Tasks in accordance with the procedures set out in the applicable QPS.

(c) If the FSTD qualification is lost under §60.27 and—

(i) Restored under §60.27 in less than (2) years, then the qualification basis (in terms of objective tests and subjective tests) for the re-qualification will be those against which the FSTD was originally evaluated and qualified.

(ii) Not restored under §60.27 for two (2) years or more, then the qualification basis (in terms of objective tests and subjective tests) for the re-qualification will be those standards in effect and current at the time of re-qualification application.

(d) Except as provided in paragraph (e) of this section, any change in FSTD qualification level initiated on or after October 30, 2007 requires an evaluation for initial qualification in accordance with this part.

(e) A sponsor may request that an FSTD be permanently downgraded. In such a case, the NSPM may downgrade a qualified FSTD without requiring and without conducting an initial evaluation for the new qualification level. Subsequent continuing qualification evaluations will use the existing MQTG, modified as necessary to reflect the new qualification level.

(f) When the sponsor has appropriate validation data available and receives approval from the NSPM, the sponsor may adopt tests and associated tolerances described in the current qualification standards as the tests and tolerances applicable for the continuing qualification of a previously qualified FSTD. The updated test(s) and tolerance(s) must be made a permanent part of the MQTG.

[71 FR 63426, Oct. 30, 2006, as amended at 72 FR 59599, Oct. 22, 2007]

§60.19 Inspection, continuing qualification evaluation, and maintenance requirements.

(a) *Inspection.* No sponsor may use or allow the use of or offer the use of an FSTD for flight crewmember training, evaluation, or flight experience to meet any of the requirements of this

chapter unless the sponsor does the following:

(1) Accomplishes all appropriate objective tests each year as specified in the applicable QPS.

(2) Completes a functional preflight check within the preceding 24 hours.

(b) *Continuing qualification evaluation.*

(1) This evaluation consists of objective tests, and subjective tests, including general FSTD requirements, as described in the applicable QPS or as may be amended by an FSTD Directive.

(2) The sponsor must contact the NSPM to schedule the FSTD for continuing qualification evaluations not later than 60 days before the evaluation is due.

(3) The sponsor must provide the NSPM access to the objective test results in the MQTG and access to the FSTD for the length of time necessary for the NSPM to complete the required continuing qualification evaluations.

(4) The frequency of NSPM-conducted continuing qualification evaluations for each FSTD will be established by the NSPM and specified in the MQTG.

(5) Continuing qualification evaluations conducted in the calendar month before or after the calendar month in which these continuing qualification evaluations are required will be considered to have been conducted in the calendar month in which they were required.

(6) No sponsor may use or allow the use of or offer the use of an FSTD for flight crewmember training or evaluation or for obtaining flight experience for the flight crewmember to meet any requirement of this chapter unless the FSTD has passed an NSPM-conducted continuing qualification evaluation within the time frame specified in the MQTG or within the grace period as described in paragraph (b)(5) of this section.

(c) *Maintenance.* The sponsor is responsible for continuing corrective and preventive maintenance on the FSTD to ensure that it continues to meet the requirements of this part and the applicable QPS appendix. No sponsor may use or allow the use of or offer the use of an FSTD for flight crewmember training, evaluation, or flight experience to meet any of the requirements of this chapter unless the sponsor does the following:

(1) Maintains a discrepancy log.

(2) Ensures that, when a discrepancy is discovered, the following requirements are met:

(i) A description of each discrepancy is entered in the log and remains in the log until the discrepancy is corrected as specified in § 60.25(b).

(ii) A description of the corrective action taken for each discrepancy, the identity of the individual taking the action, and the date that action is taken is entered in the log.

(iii) The discrepancy log is kept in a form and manner acceptable to the Administrator and is kept in or adjacent to the FSTD. An electronic log that may be accessed by an appropriate terminal or display in or adjacent to the FSTD is satisfactory.

§ 60.20 Logging FSTD discrepancies.

Each instructor, check airman, or representative of the Administrator conducting training, evaluation, or flight experience, and each person conducting the preflight inspection who discovers a discrepancy, including any missing, malfunctioning, or inoperative components in the FSTD, must write or cause to be written a description of that discrepancy into the discrepancy log at the end of the FSTD preflight or FSTD use session.

§ 60.21 Interim qualification of FSTDs for new aircraft types or models.

(a) A sponsor may apply for and the NSPM may issue an interim qualification level for an FSTD for a new type or model of aircraft, even though the aircraft manufacturer's aircraft data package is preliminary, if the sponsor provides the following to the satisfaction of the NSPM—

(1) The aircraft manufacturer's data, which consists of at least predicted data, validated by a limited set of flight test data;

(2) The aircraft manufacturer's description of the prediction methodology used to develop the predicted data; and

(3) The QTG test results.

(b) An FSTD that has been issued interim qualification is deemed to have been issued initial qualification unless

the NSPM rescinds the qualification. Interim qualification terminates two years after its issuance, unless the NSPM determines that specific conditions warrant otherwise.

(c) Within twelve months of the release of the final aircraft data package by the aircraft manufacturer, but no later than two years after the issuance of the interim qualification status, the sponsor must apply for initial qualification in accordance with § 60.15 based on the final aircraft data package approved by the aircraft manufacturer, unless the NSPM determines that specific conditions warrant otherwise.

(d) An FSTD with interim qualification may be modified only in accordance with § 60.23.

§ 60.23 Modifications to FSTDs.

(a) *Description of a modification*. For the purposes of this part, an FSTD is said to have been modified when:

(1) Equipment or devices intended to simulate aircraft appliances are added to or removed from FSTD, which change the Statement of Qualification or the MQTG; or

(2) Changes are made to either software or hardware that are intended to impact flight or ground dynamics; changes are made that impact performance or handling characteristics of the FSTD (including motion, visual, control loading, or sound systems for those FSTD levels requiring sound tests and measurements); or changes are made to the MQTG.

(b) *FSTD Directive*. When the FAA determines that FSTD modification is necessary for safety of flight reasons, the sponsor of each affected FSTD must ensure that the FSTD is modified according to the FSTD Directive regardless of the original qualification standards applicable to any specific FSTD.

(c) *Using the modified FSTD*. The sponsor may not use, or allow the use of, or offer the use of, the FSTD with the proposed modification for flight crewmember training or evaluation or for obtaining flight experience for the flight crewmember to meet any requirement of this chapter unless:

(1) The sponsor has notified the NSPM and the TPAA of their intent to incorporate the proposed modification, and one of the following has occurred;

(i) Twenty-one days have passed since the sponsor notified the NSPM and the TPAA of the proposed modification and the sponsor has not received any response from either the NSPM or the TPAA;

(ii) Twenty-one days have passed since the sponsor notified the NSPM and the TPAA of the proposed modification and one has approved the proposed modification and the other has not responded;

(iii) Fewer than twenty-one days have passed since the sponsor notified the NSPM and the TPAA of the proposed modification and the NSPM and TPAA both approve the proposed modification;

(iv) The sponsor has successfully completed any evaluation the NSPM may require in accordance with the standards for an evaluation for initial qualification or any part thereof before the modified FSTD is placed in service.

(2) The notification is submitted with the content as, and in a form and manner as, specified in the applicable QPS.

(d) *User notification*. When a modification is made to an FSTD that affects the Statement of Qualification, the sponsor must post an addendum to the Statement of Qualification until such time as a permanent, updated statement is posted.

(e) *MQTG update*. The MQTG must be updated with current objective test results in accordance with § 60.15(h) and (i) and appropriate objective data in accordance with § 60.13, each time an FSTD is modified and an objective test or other MQTG section is affected by the modification. If an FSTD Directive is the cause of this update, the direction to make the modification and the record of the modification completion must be filed in the MQTG.

§ 60.25 Operation with missing, malfunctioning, or inoperative components.

(a) No person may knowingly use or allow the use of or misrepresent the capability of an FSTD for any maneuver, procedure, or task that is to be accomplished to meet training, evaluation, or flight experience requirements of this

chapter for flight crewmember certification or qualification when there is a missing, malfunctioning, or inoperative (MMI) component that is required to be present and correctly operate for the satisfactory completion of that maneuver, procedure, or task.

(b) Each MMI component as described in paragraph (a) of this section, or any MMI component installed and required to operate correctly to meet the current Statement of Qualification, must be repaired or replaced within 30 calendar days, unless otherwise required or authorized by the NSPM.

(c) A list of the current MMI components must be readily available in or adjacent to the FSTD for review by users of the device. Electronic access to this list via an appropriate terminal or display in or adjacent to the FSTD is satisfactory. The discrepancy log may be used to satisfy this requirement provided each currently MMI component is listed in the discrepancy log.

§ 60.27 Automatic loss of qualification and procedures for restoration of qualification.

(a) An FSTD qualification is automatically lost when any of the following occurs:

(1) The FSTD is not used in the sponsor's FAA-approved flight training program in accordance with § 60.7(b)(5) or (b)(6) and the sponsor does not obtain and maintain the written statement as described in § 60.7(d)(2).

(2) The FSTD is not inspected in accordance with § 60.19.

(3) The FSTD is physically moved from one location and installed in a different location, regardless of distance.

(4) The MQTG is missing or otherwise not available and a replacement is not made within 30 days.

(b) If FSTD qualification is lost under paragraph (a) of this section, qualification is restored when either of the following provisions is met:

(1) The FSTD successfully passes an evaluation:

(i) For initial qualification, in accordance with §§ 60.15 and 60.17(c) in those circumstances where the NSPM has determined that a full evaluation for initial qualification is necessary; or

(ii) For those elements of an evaluation for initial qualification, in accordance with §§ 60.15 and 60.17(c), as determined to be necessary by the NSPM.

(2) The NSPM advises the sponsor that an evaluation is not necessary.

(c) In making the determinations described in paragraph (b) of this section, the NSPM considers factors including the number of continuing qualification evaluations missed, the number of sponsor-conducted quarterly inspections missed, and the care that had been taken of the device since the last evaluation.

§ 60.29 Other losses of qualification and procedures for restoration of qualification.

(a) Except as provided in paragraph (c) of this section, when the NSPM determines that the FSTD no longer meets qualification standards, the following procedure applies:

(1) The NSPM notifies the sponsor in writing that the FSTD no longer meets some or all of its qualification standards.

(2) The NSPM sets a reasonable period (but not less than 7 days) within which the sponsor may submit written information, views, and arguments on the FSTD qualification.

(3) After considering all material presented, the NSPM notifies the sponsor about the determination with regard to the qualification of the FSTD.

(4) When the NSPM notifies the sponsor that some or all of the FSTD is no longer qualified, the action described in the notification becomes effective not less than 30 days after the sponsor receives that notice unless—

(i) The NSPM finds under paragraph (c) of this section that there is an emergency requiring immediate action with respect to safety in air commerce; or

(ii) The sponsor petitions the Director of Flight Standards Service for reconsideration of the NSPM finding under paragraph (b) of this section.

(b) When a sponsor seeks reconsideration of a decision from the NSPM concerning the FSTD qualification, the following procedure applies:

(1) The sponsor must petition for reconsideration of that decision within 30

days of the date that the sponsor receives a notice that some or all of the FSTD is no longer qualified.

(2) The sponsor must address its petition to the Director, Flight Standards Service, AFS–1, Federal Aviation Administration, 800 Independence Ave., SW., Washington, DC 20591.

(3) A petition for reconsideration, if filed within the 30-day period, suspends the effectiveness of the determination by the NSPM that the FSTD is no longer qualified unless the NSPM has found, under paragraph (c) of this section, that an emergency exists requiring immediate action with respect to safety in air commerce.

(c) If the NSPM find that an emergency exists requiring immediate action with respect to safety in air commerce that makes the procedures set out in this section impracticable or contrary to the public interest:

(1) The NSPM withdraws qualification of some or all of the FSTD and makes the withdrawal of qualification effective on the day the sponsor receives notice of it.

(2) In the notice to the sponsor, the NSPM articulates the reasons for its finding that an emergency exists requiring immediate action with respect to safety in air transportation or air commerce or that makes it impracticable or contrary to the public interest to stay the effectiveness of the finding.

(d) FSTD qualification lost under paragraph (a) or (c) of this section may be restored when either of the following provisions are met:

(1) The FSTD successfully passes an evaluation for initial qualification, in accordance with §§ 60.15 and 60.17(c) in those circumstances where the NSPM has determined that a full evaluation for initial qualification is necessary; or

(2) The FSTD successfully passes an evaluation for those elements of an initial qualification evaluation, in accordance with §§ 60.15 and 60.17(c), as determined to be necessary by the NSPM.

(e) In making the determinations described in paragraph (d) of this section, the NSPM considers factors including the reason for the loss of qualification, any repairs or replacements that may have to have been completed, the number of continuing qualification evaluations missed, the number of sponsor-conducted quarterly inspections missed, and the care that had been taken of the device since the loss of qualification.

§ 60.31 Recordkeeping and reporting.

(a) The FSTD sponsor must maintain the following records for each FSTD it sponsors:

(1) The MQTG and each amendment thereto.

(2) A record of all FSTD modifications affected under § 60.23 since the issuance of the original Statement of Qualification.

(3) A copy of all of the following:

(i) Results of the qualification evaluations (initial and each upgrade) since the issuance of the original Statement of Qualification.

(ii) Results of the objective tests conducted in accordance with § 60.19(a) for a period of 2 years.

(iii) Results of the previous three continuing qualification evaluations, or the continuing qualification evaluations from the previous 2 years, whichever covers a longer period.

(iv) Comments obtained in accordance with § 60.9(b) for a period of at least 90 days.

(4) A record of all discrepancies entered in the discrepancy log over the previous 2 years, including the following:

(i) A list of the components or equipment that were or are missing, malfunctioning, or inoperative.

(ii) The action taken to correct the discrepancy.

(iii) The date the corrective action was taken.

(iv) The identity of the person determining that the discrepancy has been corrected.

(b) The records specified in this section must be maintained in plain language form or in coded form if the coded form provides for the preservation and retrieval of information in a manner acceptable to the NSPM.

§ 60.33 Applications, logbooks, reports, and records: Fraud, falsification, or incorrect statements.

(a) No person may make, or cause to be made, any of the following:

(1) A fraudulent or intentionally false statement in any application or any

amendment thereto, or any other report or test result required by this part.

(2) A fraudulent or intentionally false statement in or a known omission from any record or report that is kept, made, or used to show compliance with this part, or to exercise any privileges under this chapter.

(3) Any reproduction or alteration, for fraudulent purpose, of any report, record, or test result required under this part.

(b) The commission by any person of any act prohibited under paragraph (a) of this section is a basis for any one or any combination of the following:

(1) A civil penalty.

(2) Suspension or revocation of any certificate held by that person that was issued under this chapter.

(3) The removal of FSTD qualification and approval for use in a training program.

(c) The following may serve as a basis for removal of qualification of an FSTD including the withdrawal of approval for use of an FSTD; or denying an application for a qualification:

(1) An incorrect statement, upon which the FAA relied or could have relied, made in support of an application for a qualification or a request for approval for use.

(2) An incorrect entry, upon which the FAA relied or could have relied, made in any logbook, record, or report that is kept, made, or used to show compliance with any requirement for an FSTD qualification or an approval for use.

§ 60.35 Specific full flight simulator compliance requirements.

(a) No device will be eligible for initial or upgrade qualification to a FFS at Level C or Level D under this part unless it includes the equipment and appliances installed and operating to the extent necessary for the issuance of an airman certificate or rating.

(b) No device will be eligible for initial or upgrade qualification to a FFS at Level A or Level B under this part unless it includes the equipment and appliances installed and operating to the extent necessary for the training, testing, and/or checking that comprise the simulation portion of the requirements for issuance of an airman certificate or rating.

§ 60.37 FSTD qualification on the basis of a Bilateral Aviation Safety Agreement (BASA).

(a) The evaluation and qualification of an FSTD by a contracting State to the Convention on International Civil Aviation for the sponsor of an FSTD located in that contracting State may be used as the basis for issuing a U.S. statement of qualification (see applicable QPS, attachment 4, figure 4) by the NSPM to the sponsor of that FSTD in accordance with—

(1) A BASA between the United States and the Contracting State that issued the original qualification; and

(2) A Simulator Implementation Procedure (SIP) established under the BASA.

(b) The SIP must contain any conditions and limitations on validation and issuance of such qualification by the U.S.

APPENDIX A TO PART 60—QUALIFICATION PERFORMANCE STANDARDS FOR AIRPLANE FULL FLIGHT SIMULATORS

BEGIN INFORMATION

This appendix establishes the standards for Airplane Full Flight Simulator (FFS) evaluation and qualification. The Flight Standards Service, National Simulator Program Manager (NSPM), is responsible for the development, application, and implementation of the standards contained within this appendix. The procedures and criteria specified in this appendix will be used by the NSPM, or a person assigned by the NSPM, when conducting airplane FFS evaluations.

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Attachment 1 to Appendix A to Part 60—General Simulator Requirements.
Attachment 2 to Appendix A to Part 60—Full Flight Simulator (FFS) Objective Test.
Attachment 3 to Appendix A to Part 60—Simulator Subjective Evaluation.
Attachment 4 to Appendix A to Part 60—Sample Documents.
Attachment 5 to Appendix A to Part 60—Simulator Qualification Requirements for Windshear Training Program Use.

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. 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) Advisory Circular (AC) 120–28C, Criteria for Approval of Category III Landing Weather Minima.
(11) AC 120–29, Criteria for Approving Category I and Category II Landing Minima for part 121 operators.
(12) AC 120–35B, Line Operational Simulations: Line-Oriented Flight Training, Special Purpose Operational Training, Line Operational Evaluation.
(13) AC 120–41, Criteria for Operational Approval of Airborne Wind Shear Alerting and Flight Guidance Systems.
(14) AC 120–57A, Surface Movement Guidance and Control System (SMGS).
(15) AC 150/5300–13, Airport Design.
(16) AC 150/5340–1G, Standards for Airport Markings.
(17) AC 150/5340–4C, Installation Details for Runway Centerline Touchdown Zone Lighting Systems.
(18) AC 150/5340–19, Taxiway Centerline Lighting System.
(19) AC 150/5340–24, Runway and Taxiway Edge Lighting System.
(20) AC 150/5345–28D, Precision Approach Path Indicator (PAPI) Systems
(21) International Air Transport Association document, ''Flight Simulator Design and Performance Data Requirements,'' as amended.
(22) AC 25–7, as amended, Flight Test Guide for Certification of Transport Category Airplanes.
(23) AC 23–8A, as amended, Flight Test Guide for Certification of Part 23 Airplanes.
(24) International Civil Aviation Organization (ICAO) Manual of Criteria for the Qualification of Flight Simulators, as amended.
(25) Airplane Flight Simulator Evaluation Handbook, Volume I, as amended and Volume II, as amended, The Royal Aeronautical Society, London, UK.
(26) FAA Publication FAA–S–8081 series (Practical Test Standards for Airline Transport Pilot Certificate, Type Ratings, Commercial Pilot, and Instrument Ratings).
(27) The FAA Aeronautical Information Manual (AIM). An electronic version of the AIM is on the internet at *http://www.faa.gov/atpubs*.

END INFORMATION

2. APPLICABILITY (§§ 60.1 & 60.2)

BEGIN INFORMATION

There is no additional regulatory or informational material that applies to §60.1, Applicability, or to §60.2, Applicability of sponsor rules to persons who are not sponsors and who are engaged in certain unauthorized activities.

END INFORMATION

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3. DEFINITIONS (§60.3)

BEGIN INFORMATION

See appendix F for a list of definitions and abbreviations from part 1 and part 60, including the appropriate appendices of part 60.

END INFORMATION

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4. QUALIFICATION PERFORMANCE STANDARDS (§60.4)

BEGIN INFORMATION

There is no additional regulatory or informational material that applies to §60.4, Qualification Performance Standards.

END INFORMATION

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5. QUALITY MANAGEMENT SYSTEM (§60.5)

BEGIN INFORMATION

See appendix E for additional regulatory and informational material regarding Quality Management Systems.

END INFORMATION

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6. SPONSOR QUALIFICATION REQUIREMENTS (§60.7)

BEGIN INFORMATION

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

b. The following examples describe acceptable operational practices:

(1) Example One.

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

(i) If the FFS was qualified prior to October 30, 2007 the 12-month period begins on the date of the first continuing qualification evaluation conducted in accordance with §60.19 after October 30, 2007 and continues for each subsequent 12-month period;

(ii) A device qualified on or after October 30, 2007 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 FFS use required.

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

(2) Example Two.

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

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

OR

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

OR

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

(b) There is no minimum number of hours of FFS 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 FFSs 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 FFSs in the Chicago and Moscow centers) because—

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

OR

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

END INFORMATION

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7. ADDITIONAL RESPONSIBILITIES OF THE SPONSOR (§60.9)

BEGIN INFORMATION

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

END INFORMATION

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8. SIMULATOR USE (§60.11)

BEGIN INFORMATION

There is no additional regulatory or informational material that applies to §60.11, Simulator Use.

END INFORMATION

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9. SIMULATOR OBJECTIVE DATA REQUIREMENTS (§60.13)

BEGIN QPS REQUIREMENTS

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

(1) A flight test plan consisting of:

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

(b) For each maneuver or procedure—

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

(ii) The atmospheric and environmental conditions.

(iii) The initial flight conditions.

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

(v) The data to be gathered.

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

(2) Appropriately qualified flight test personnel.

(3) An understanding of the accuracy of the data to be gathered using appropriate alternative data sources, procedures, and instrumentation that is traceable to a recognized standard as described in Attachment 2, Table A2D.

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

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

(1) In a format that supports the FFS 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 A2A of this appendix.

(4) With any necessary instructions or other details provided, such as yaw damper or throttle position; and

(5) Without alteration, adjustments, or bias; however the 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 FFS 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, an amendment to, or a revision of data that may relate to FFS performance or handling characteristics is available. The data referred to in this paragraph are those data that are used to validate the performance, handling qualities, or

other characteristics of the aircraft, including data related to any relevant changes occurring after the type certificate was issued. This notification must be made within 10 working days.

END QPS REQUIREMENTS

BEGIN INFORMATION

e. The FFS 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 FFS in order to facilitate the notification required by §60.13(f).

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

g. 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 FFS evaluation. It is for this reason that the NSPM recommends that any data supplier not previously experienced in this area review the data necessary for programming and for validating the performance of the FFS, and discuss the flight test plan anticipated for acquiring such data with the NSPM well in advance of commencing the flight tests.

h. 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, Attachment 2 requires the sponsor or other data provider to ensure that a steady state condition exists at the instant of time captured by the ''snapshot.'' This is often verified by showing that a steady state condition existed from some period of time during which the snap shot is taken. The time period most frequently used is 5 seconds prior through 2 seconds following the instant of time captured by the snap shot. This paragraph is primarily addressing the source data and the method by which the data provider ensures that the steady state condition for the snap shot is representative.

i. The NSPM will consider, on a case-by-case basis, whether or not 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 SIMULATOR (§60.14)

BEGIN INFORMATION

a. In the event that the NSPM determines that special equipment or specifically qualified persons will be required to conduct an evaluation, the NSPM will make every attempt to notify the sponsor at least one (1) week, but in no case less than 72 hours, in advance of the evaluation. Examples of special equipment include spot photometers, flight control measurement devices, and sound analyzers. 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 FFS is moved, at the request of the TPAA, or as a result of comments received from FFS that raise questions regarding the continued qualification or use of the FFS.

END INFORMATION

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

BEGIN QPS REQUIREMENTS

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

(1) Meet the general requirements listed in Attachment 1;

(2) Meet the objective testing requirements listed in Attachment 2; and

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

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

(1) A statement that the FFS 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) A qualification test guide (QTG), acceptable to the NSPM, that includes all of the following:

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

(ii) Correlating objective test results obtained from the performance of the FFS as prescribed in the applicable QPS.

(iii) The result of FFS subjective tests prescribed in the applicable QPS.

(iv) 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 simulator objective tests in Attachment 2, Table A2A 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 the conduct of automatic and manual tests;

(3) A means of comparing the FFS 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 FFS.

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 A4C, 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 A4G, for a sample Continuing Qualification Evaluation Requirements page.

(3) A FFS information page that provides the information listed in this paragraph (see Attachment 4, Figure A4B, for a sample FFS information page). For convertible FFSs, the sponsor must submit a separate page for each configuration of the FFS.

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

(b) The airplane model and series being simulated.

(c) The aerodynamic data revision number or reference.

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

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

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

(g) The FFS model and manufacturer.

(h) The date of FFS manufacture.

(i) The FFS computer identification.

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

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

(4) A Table of Contents.

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

(6) List of all relevant data references.

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

(8) Statements of compliance and capability (SOCs) with certain requirements. SOCs must provide references to the sources of information that show the capability of the FFS to comply with the requirements. SOCs must also provide a rationale explaining how the referenced material is used, the mathematical equations and parameter values used, and the conclusions reached. Refer to the ''Additional Details'' column in Attachment 1, Table A1A, ''Simulator Standards,'' or in the ''Test Details'' column in Attachment 2, Table A2A, ''Simulator Objective Tests,'' to see when SOCs are required.

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

(10) The following information for each objective test designated in Attachment 2, Table A2A, 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 FFS objective test results.

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

(h) List of all relevant parameters driven or constrained during the manually conducted 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) Simulator 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 FFS is addressed as a separate FFS for each model and series airplane to which it will be converted and for the FAA qualification level sought. If a sponsor seeks qualification for two or more models of an airplane type using a convertible FFS, the sponsor must submit a QTG for each airplane model, or a supplemented QTG for each airplane model. The NSPM will conduct evaluations for each airplane model.

g. Form and manner of presentation of objective test results in the QTG:

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

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

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

(4) Scaling on graphical presentations must provide the resolution necessary to evaluate the parameters shown in Attachment 2, Table A2A of this appendix.

(5) Tests involving time histories, data sheets (or transparencies thereof) and FFS test results must be clearly marked with appropriate reference points to ensure an accurate comparison between the FFS and the airplane with respect to time. Time histories recorded via a line printer are to be clearly identified for cross plotting on the airplane data. Over-plots must 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 FFS 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 FFS 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 FFS location.

j. All FFSs for which the initial qualification is conducted after October 30, 2013 must have an electronic MQTG (eMQTG) including all objective data obtained from airplane testing, or another approved source (reformatted or digitized), together with correlating objective test results obtained from the performance of the FFS (reformatted or digitized) as prescribed in this appendix. The eMQTG must also contain the general FFS 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 FFS 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 FFSs not covered in subparagraph ''j'' must have an electronic copy of the MQTG by October 30, 2013. A copy of the eMQTG 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.

END QPS REQUIREMENTS

BEGIN INFORMATION

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

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

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

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

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

(4) Cockpit configuration (see Attachment 1 of this appendix);

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

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

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

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

n. The NSPM administers the objective and subjective tests, which includes an examination of functions. The tests include a qualitative assessment of the FFS 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 FFS performance and determining compliance with the requirements of this part.

(2) Subjective tests provide a basis for:

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

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

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

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

o. The tolerances for the test parameters listed in Attachment 2 of this appendix reflect the range of tolerances acceptable to the NSPM for FFS validation and are not to be confused with design tolerances specified for FFS 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.

p. In addition to the scheduled continuing qualification evaluation, each FFS 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 FFS for the conduct of objective and subjective tests and an examination of functions) if the FFS is not being used for flight crewmember training, testing, or checking. However, if the FFS were being used, the evaluation would be conducted in a non-exclusive manner. This non-exclusive evaluation will be conducted by the FFS evaluator accompanying the check airman, instructor, Aircrew Program Designee (APD), or FAA inspector aboard the FFS along with the student(s) and observing the operation of the FFS during the training, testing, or checking activities.

q. 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 level requested but do support a lower level, the NSPM may qualify the FFS at that lower level. For example, if a Level D evaluation is requested and the FFS fails to meet sound test tolerances, it could be qualified at Level C.

r. After an FFS is successfully evaluated, the NSPM issues a statement of qualification (SOQ) to the sponsor. The NSPM recommends the FFS to the TPAA, who will approve the FFS for use in a flight training program. The SOQ will be issued at the satisfactory conclusion of the initial or continuing qualification. However, it is the sponsor's responsibility to obtain TPAA approval prior to using the FSTD in an FAA-approved flight training program.

s. Under normal circumstances, the NSPM establishes a date for the initial or upgrade evaluation within ten (10) working days after determining that a complete QTG is acceptable. Unusual circumstances may warrant establishing an evaluation date before this determination is made. A sponsor may schedule an evaluation date as early as 6 months in advance. However, there may be a delay of 45 days or more in rescheduling and completing the evaluation if the sponsor is unable to meet the scheduled date. See Attachment 4, Figure A4A, Sample Request for Initial, Upgrade, or Reinstatement Evaluation.

t. The numbering system used for objective test results in the QTG should closely follow the numbering system set out in Attachment 2, FFS Objective Tests, Table A2A.

u. 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).

v. Examples of the exclusions for which the FFS 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 windshear training and circling approaches.

END INFORMATION

12. ADDITIONAL QUALIFICATIONS FOR A CURRENTLY QUALIFIED SIMULATOR (§ 60.16)

There is no additional regulatory or informational material that applies to § 60.16, Additional Qualifications for a Currently Qualified FFS.

13. PREVIOUSLY QUALIFIED SIMULATORS (§ 60.17)

BEGIN QPS REQUIREMENTS

a. In instances where a sponsor plans to remove a FFS 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 FFS will be inactive;

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

(3) The NSPM will remove the FFS from the list of qualified FSTDs 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 FFS 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. Simulators qualified prior to October 30, 2007, are not required to meet the general simulation requirements, the objective test requirements, and the subjective test requirements of attachments 1, 2, and 3, respectively, of this appendix.

c. [Reserved]

END QPS REQUIREMENTS

BEGIN INFORMATION

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

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

f. The intent of the requirement listed in § 60.17(b), for each FFS to have a Statement of Qualification 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 FFS 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 FFS.

g. Downgrading of an FFS is a permanent change in qualification level and will necessitate the issuance of a revised Statement of Qualification to reflect the revised qualification level, as appropriate. If a temporary restriction is placed on an FFS because of a missing, malfunctioning, or inoperative component or on-going 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.

h. It is not the intent of the NSPM to discourage the improvement of existing simulation (*e.g.*, the ''updating'' of a visual system to a newer model, 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.

i. The NSPM will determine the evaluation criteria for an FSTD that has been removed from active status. 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 FFS 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 FFS was stored, whether parts were removed from the FFS and whether the FFS was disassembled.

j. The FFS 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 requalification under the standards in effect and current at the time of requalification.

END INFORMATION

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

BEGIN QPS REQUIREMENTS

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

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

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

END QPS REQUIREMENTS

BEGIN INFORMATION

d. 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 FFS systems.

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

f. The continuing qualification evaluations, described in §60.19(b), will normally require 4 hours of FFS 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 FFS. The tests chosen will be performed either automatically or manually and should be able to be conducted within approximately one-third (⅓) of the allotted FFS time.

(3) A subjective evaluation of the FFS 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 (⅔) of the allotted FFS time.

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

g. The requirement established in §60.19(b)(4) regarding the frequency of NSPM-conducted continuing qualification evaluations for each FFS 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 SIMULATOR DISCREPANCIES (§60.20)

There is no additional regulatory or informational material that applies to §60.20. Logging FFS Discrepancies.

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

There is no additional regulatory or informational material that applies to §60.21, Interim Qualification of FFSs for New Airplane Types or Models.

17. MODIFICATIONS TO SIMULATORS (§60.23)

BEGIN QPS REQUIREMENTS

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

b. Prior to using the modified FFS:

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

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

END QPS REQUIREMENTS

BEGIN INFORMATION

FSTD Directives are considered modifications of an FFS. See Attachment 4 for a sample index of effective FSTD Directives.

END INFORMATION

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

BEGIN INFORMATION

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

b. 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.

c. 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 FFS. Repairs having a larger impact on FFS capability to provide the required training, evaluation, or flight experience will have a higher priority for repair or replacement.

END INFORMATION

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

BEGIN INFORMATION

If the sponsor provides a plan for how the FFS 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 FFS is to be maintained) there is a greater likelihood that the NSPM will be able to determine the amount of testing required for requalification.

END INFORMATION

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

BEGIN INFORMATION

If the sponsor provides a plan for how the FFS 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 FFS is to be maintained) there is a greater likelihood that the NSPM will be able to determine the amount of testing required for requalification.

END INFORMATION

21. RECORDKEEPING AND REPORTING (§ 60.31)

BEGIN QPS REQUIREMENTS

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

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

END QPS REQUIREMENTS

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

There are no additional QPS requirements or informational material that apply to § 60.33, Applications, Logbooks, Reports, and Records: Fraud, Falsification, or Incorrect Statements.

23. SPECIFIC FULL FLIGHT SIMULATOR COMPLIANCE REQUIREMENTS (§ 60.35)

There are no additional QPS requirements or informational material that apply to § 60.35, Specific FFS Compliance Requirements.

24. [RESERVED]

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

There are no additional QPS requirements or informational material that apply to § 60.37, FSTD Qualification on the Basis of a Bilateral Aviation Safety Agreement (BASA).

ATTACHMENT 1 TO APPENDIX A TO PART 60—GENERAL SIMULATOR REQUIREMENTS

BEGIN QPS REQUIREMENTS

1. REQUIREMENTS

a. Certain requirements included in this appendix must be supported with a Statement of Compliance and Capability (SOC), which may include objective and subjective tests. The SOC will confirm that the requirement was satisfied, and describe how the requirement was met, such as gear modeling approach or coefficient of friction sources. The requirements for SOCs and tests are indicated in the ''General Simulator Requirements'' column in Table A1A of this appendix.

b. Table A1A describes the requirements for the indicated level of FFS. Many devices include operational systems or functions that exceed the requirements outlined in this section. However, 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 simulator requirements for qualifying an airplane FFS. The sponsor should also consult the objective tests in attachment 2 and the examination of functions and subjective tests listed in attachment 3 to determine the complete requirements for a specific level simulator.

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

(1) General cockpit configuration.

(2) Simulator programming.

(3) Equipment operation.

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

(5) Motion system.

(6) Visual system.

(7) Sound system.

c. Table A1A provides the standards for the General Simulator Requirements.

END INFORMATION

TABLE A1A—MINIMUM SIMULATOR REQUIREMENTS

<<<QPS requirements>>>		Simulator levels				<Information>
No.	General simulator requirements	A	B	C	D	notes
1. General Cockpit Configuration						
1.a	The simulator must have a cockpit that is a replica of the airplane simulated with controls, equipment, observable cockpit indicators, circuit breakers, and bulkheads properly located, functionally accurate and replicating the airplane. The direction of movement of controls and switches must be identical to the airplane. Pilot seats must allow the occupant to achieve the design ''eye position'' established for the airplane being simulated. Equipment for the operation of the cockpit windows must be included, but the actual windows need not be operable. Additional equipment such as fire axes, extinguishers, and spare light bulbs must be available in the FFS but may be relocated to a suitable location as near as practical to the original position. Fire axes, landing gear pins, and any similar purpose instruments need only be represented in silhouette. An SOC is required.	X	X	X	X	For simulator purposes, the cockpit consists of all that space forward of a cross section of the flight deck at the most extreme aft setting of the pilots' seats, including additional required crewmember duty stations and those required bulkheads aft of the pilot seats. For clarification, bulkheads containing only items such as landing gear pin storage compartments, fire axes or extinguishers, spare light bulbs, and aircraft document pouches are not considered essential and may be omitted.
1.b	Those circuit breakers that affect procedures or result in observable cockpit indications must be properly located and functionally accurate. An SOC is required.	X	X	X	X	
2. Programming						

TABLE A1A—MINIMUM SIMULATOR REQUIREMENTS—Continued

<<<QPS requirements>>>		Simulator levels				<Information>
No.	General simulator requirements	A	B	C	D	notes
2.a	A flight dynamics model that accounts for various combinations of drag and thrust normally encountered in flight must correspond to actual flight conditions, including the effect of change in airplane attitude, thrust, drag, altitude, temperature, gross weight, moments of inertia, center of gravity location, and configuration.	X	X	X	X	
2.b	The simulator must have the computer capacity, accuracy, resolution, and dynamic response needed to meet the qualification level sought. An SOC is required.	X	X	X	X	
2.c	Surface operations must be represented to the extent that allows turns within the confines of the runway and adequate controls on the landing and roll-out from a crosswind approach to a landing.	X				
	A subjective test is required.					
2.d	Ground handling and aerodynamic programming must include the following: An SOC is required.					
2.d.1	Ground effect		X	X	X	Ground effect includes modeling that accounts for roundout, flare, touchdown, lift, drag, pitching moment, trim, and power while in ground effect.
2.d.2	Ground reaction		X	X	X	Ground reaction includes modeling that accounts for strut deflections, tire friction, and side forces. This is the reaction of the airplane upon contact with the runway during landing, and may differ with changes in factors such as gross weight, airspeed, or rate of descent on touchdown.
2.d.3	Ground handling characteristics, including aerodynamic and ground reaction modeling including steering inputs, operations with crosswind, braking, thrust reversing, deceleration, and turning radius.		X	X	X	

TABLE A1A—MINIMUM SIMULATOR REQUIREMENTS—Continued

<<<QPS requirements>>>		Simulator levels				<Information>
No.	General simulator requirements	A	B	C	D	notes
2.e	The simulator must employ windshear models that provide training for recognition of windshear phenomena and the execution of recovery procedures. Models must be available to the instructor/evaluator for the following critical phases of flight: (1) Prior to takeoff rotation. (2) At liftoff. (3) During initial climb. (4) On final approach, below 500 ft AGL. The QTG must reference the FAA Windshear Training Aid or present alternate airplane related data, including the implementation method(s) used. If the alternate method is selected, wind models from the Royal Windshear Training Aerospace Establishment (RAE), the Joint Airport Weather Studies (JAWS) Project and other recognized sources may be implemented, but must be supported and properly referenced in the QTG. Only those simulators meeting these requirements may be used to satisfy the training requirements of part 121 pertaining to a certificate holder's approved low-altitude windshear flight training program as described in § 121.409. Objective tests are required for qualification; see Attachment 2 and Attachment 5 of this appendix.			X	X	If desired, Level A and B simulators may qualify for windshear training by meeting these standards; see Attachment 5 of this appendix. Windshear models may consist of independent variable winds in multiple simultaneous components. The FAA Windshear Training Aid presents one acceptable means of compliance with simulator wind model requirements.
2.f	The simulator must provide for automatic testing of simulator hardware and software programming to determine compliance with simulator objective tests as prescribed in Attachment 2. An SOC is required.			X	X	Automatic ''flagging'' of out-of-tolerance situations is encouraged.
2.g	Relative responses of the motion system, visual system, and cockpit instruments, measured by latency tests or transport delay tests. Motion onset should occur before the start of the visual scene change (the start of the scan of the first video field containing different information) but must occur before the end of the scan of that video field. Instrument response may not occur prior to motion onset. Test results must be within the following limits:					The intent is to verify that the simulator provides instrument, motion, and visual cues that are, within the stated time delays, like the airplane responses. For airplane response, acceleration in the appropriate, corresponding rotational axis is preferred.
2.g.1	300 milliseconds of the airplane response ..... Objective Tests are required.	X	X			
2.g.2	150 milliseconds of the airplane response ..... Objective Tests are required.			X	X	
2.h	The simulator must accurately reproduce the following runway conditions: (1) Dry. (2) Wet. (3) Icy. (4) Patchy Wet. (5) Patchy Icy. (6) Wet on Rubber Residue in Touchdown Zone. An SOC is required. Objective tests are required only for dry, wet, and icy runway conditions; see Attachment 2.			X	X	

TABLE A1A—MINIMUM SIMULATOR REQUIREMENTS—Continued

<<<QPS requirements>>>		Simulator levels				<Information>
No.	General simulator requirements	A	B	C	D	notes
2.i	The simulator must simulate: (1) brake and tire failure dynamics, including antiskid failure. (2) decreased brake efficiency due to high brake temperatures, if applicable. An SOC is required.			X	X	Simulator pitch, side loading, and directional control characteristics should be representative of the airplane.
2.j	The simulator must replicate the effects of airframe icing. A Subjective Test is required.			X	X	
2.k	The aerodynamic modeling in the simulator must include: (1) Low-altitude level-flight ground effect; (2) Mach effect at high altitude; (3) Normal and reverse dynamic thrust effect on control surfaces; (4) Aeroelastic representations; and (5) Nonlinearities due to sideslip. An SOC is required and must include references to computations of aeroelastic representations and of nonlinearities due to sideslip.				X	See Attachment 2, paragraph 4, for further information on ground effect.
2.l	The simulator must have aerodynamic and ground reaction modeling for the effects of reverse thrust on directional control, if applicable. An SOC is required.		X	X	X	
3. Equipment Operation						
3.a	All relevant instrument indications involved in the simulation of the airplane must automatically respond to control movement or external disturbances to the simulated airplane; e.g., turbulence or windshear. Numerical values must be presented in the appropriate units. A subjective test is required.	X	X	X	X	
3.b	Communications, navigation, caution, and warning equipment must be installed and operate within the tolerances applicable for the airplane. A subjective test is required.	X	X	X	X	See Attachment 3 for further information regarding long-range navigation equipment.
3.c	Simulator systems must operate as the airplane systems operate under normal, abnormal, and emergency operating conditions on the ground and in flight. A subjective test is required.	X	X	X	X	
3.d	The simulator must provide pilot controls with control forces and control travel that correspond to the simulated airplane. The simulator must also react in the same manner as in the airplane under the same flight conditions. A objective test is required.	X	X	X	X	
4. Instructor or Evaluator Facilities						

TABLE A1A—MINIMUM SIMULATOR REQUIREMENTS—Continued

<<<QPS requirements>>>		Simulator levels				<Information>
No.	General simulator requirements	A	B	C	D	notes
4.a	In addition to the flight crewmember stations, the simulator must have at least two suitable seats for the instructor/check airman and FAA inspector. These seats must provide adequate vision to the pilot's panel and forward windows. All seats other than flight crew seats need not represent those found in the airplane, but must be adequately secured to the floor and equipped with similar positive restraint devices. A subjective test is required.	X	X	X	X	The NSPM will consider alternatives to this standard for additional seats based on unique cockpit configurations.
4.b	The simulator must have controls that enable the instructor/evaluator to control all required system variables and insert all abnormal or emergency conditions into the simulated airplane systems as described in the sponsor's FAA-approved training program; or as described in the relevant operating manual as appropriate. A subjective test is required.	X	X	X	X	
4.c	The simulator must have instructor controls for environmental conditions including wind speed and direction. A subjective test is required.	X	X	X	X	
4.d	The simulator must provide the instructor or evaluator the ability to present ground and air hazards. A subjective test is required.			X	X	For example, another airplane crossing the active runway or converging airborne traffic.
5. Motion System						
5.a	The simulator must have motion (force) cues perceptible to the pilot that are representative of the motion in an airplane. A subjective test is required.	X	X	X	X	For example, touchdown cues should be a function of the rate of descent (RoD) of the simulated airplane.
5.b	The simulator must have a motion (force cueing) system with a minimum of three degrees of freedom (at least pitch, roll, and heave). An SOC is required.	X	X			
5.c	The simulator must have a motion (force cueing) system that produces cues at least equivalent to those of a six-degrees-of-freedom, synergistic platform motion system (i.e., pitch, roll, yaw, heave, sway, and surge). An SOC is required.			X	X	
5.d	The simulator must provide for the recording of the motion system response time. An SOC is required.	X	X	X	X	
5.e	The simulator must provide motion effects programming to include: (1) Thrust effect with brakes set. (2) Runway rumble, oleo deflections, effects of ground speed, uneven runway, centerline lights, and taxiway characteristics. (3) Buffets on the ground due to spoiler/speedbrake extension and thrust reversal. (4) Bumps associated with the landing gear. (5) Buffet during extension and retraction of landing gear. (6) Buffet in the air due to flap and spoiler/speedbrake extension. (7) Approach-to-Stall buffet.		X	X	X	

TABLE A1A—MINIMUM SIMULATOR REQUIREMENTS—Continued

<<<QPS requirements>>>		Simulator levels				<Information>
No.	General simulator requirements	A	B	C	D	notes
	(8) Representative touchdown cues for main and nose gear. (9) Nosewheel scuffing, if applicable. (10) Mach and maneuver buffet. A subjective test is required.					
5.f	The simulator must provide characteristic motion vibrations that result from operation of the airplane if the vibration marks an event or airplane state that can be sensed in the cockpit. A objective test is required.				X	The simulator should be programmed and instrumented in such a manner that the characteristic buffet modes can be measured and compared to airplane data.
6. Visual System						
6.a	The simulator must have a visual system providing an out-of-the-cockpit view. A subjective test is required.	X	X	X	X	
6.b	The simulator must have operational landing lights for night scenes. Where used, dusk (or twilight) scenes require operational landing lights. A subjective test is required.	X	X	X	X	
6.c	The simulator must have instructor controls for the following: (1) Cloudbase. (2) Visibility in statute miles (km) and runway visual range (RVR) in ft. (m). (3) Airport selection. (4) Airport lighting. A subjective test is required.	X	X	X	X	
6.d	Each airport scene displayed must include the following: (1) Airport runways and taxiways. (2) Runway definition. (i) Runway surface and markings. (ii) Lighting for the runway in use, including runway threshold, edge, centerline, touchdown zone, VASI or PAPI, and approach lighting of appropriate colors, as appropriate. (iii) Taxiway lights. A subjective test is required.	X	X	X	X	
6.e	The distances at which runway features are visible, as measured from runway threshold to an airplane aligned with the runway on an extended 3° glide slope must not be less than listed below: (1) Runway definition, strobe lights, approach lights, runway edge white lights VASI or PAPI system lights from 5 statute miles (8 kilometers (km)) of the runway threshold. (2) Runway centerline lights and taxiway definition from 3 statute miles (4.8 km). (3) Threshold lights and touchdown zone lights from 2 statute miles (3.2 km). (4) Runway markings within range of landing lights for night scenes and as required by three (3) arc-minutes resolution on day scenes. A subjective test is required.	X	X	X	X	
6.f	The simulator must provide visual system compatibility with dynamic response programming. A subjective test is required.	X	X	X	X	

TABLE A1A—MINIMUM SIMULATOR REQUIREMENTS—Continued

<<<QPS requirements>>>		Simulator levels				<Information>
No.	General simulator requirements	A	B	C	D	notes
6.g	The simulator must show that the segment of the ground visible from the simulator flight deck is the same as from the airplane flight deck (within established tolerances) when at the correct airspeed, in the landing configuration, at a main wheel height of 100 feet (30 meters) above the touchdown zone, and with visibility of 1,200 ft (350 m) RVR. An SOC is required. An objective test is required.	X	X	X	X	This will show the modeling accuracy of RVR, glideslope, and localizer for a given weight, configuration, and speed within the airplane's operational envelope for a normal approach and landing.
6.h	The simulator must provide visual cues necessary to assess sink rates (provide depth perception) during takeoffs and landings, to include: (1) Surface on runways, taxiways, and ramps. (2) Terrain features. A subjective test is required.		X	X	X	
6.i	The simulator must provide for accurate portrayal of the visual environment relating to the simulator attitude. A subjective test is required.	X	X	X	X	Visual attitude vs. simulator attitude is a comparison of pitch and roll of the horizon as displayed in the visual scene compared to the display on the attitude indicator.
6.j	The simulator must provide for quick confirmation of visual system color, RVR, focus, and intensity. An SOC is required. A subjective test is required.			X	X	
6.k	The simulator must provide a minimum of three airport scenes including: (1) Surfaces on runways, taxiways, and ramps. (2) Lighting of appropriate color for all runways, including runway threshold, edge, centerline, VASI or PAPI, and approach lighting for the runway in use. (3) Airport taxiway lighting. (4) Ramps and buildings that correspond to the sponsor's Line Oriented scenarios, as appropriate. A subjective test is required.			X	X	
6.l	The simulator must be capable of producing at least 10 levels of occulting. A subjective test is required.			X	X	
6.m	Night Visual Scenes. When used in training, testing, or checking activities, the simulator must provide night visual scenes with sufficient scene content to recognize the airport, the terrain, and major landmarks around the airport. The scene content must allow a pilot to successfully accomplish a visual landing. Scenes must include a definable horizon and typical terrain characteristics such as fields, roads and bodies of water and surfaces illuminated by airplane landing lights.	X	X	X	X	

TABLE A1A—MINIMUM SIMULATOR REQUIREMENTS—Continued

<<<QPS requirements>>>		Simulator levels				<Information>
No.	General simulator requirements	A	B	C	D	notes
6.n	Dusk (or Twilight) Visual Scenes. When used in training, testing, or checking activities, the simulator must provide dusk (or twilight) visual scenes with sufficient scene content to recognize the airport, the terrain, and major landmarks around the airport. The scene content must allow a pilot to successfully accomplish a visual landing. Scenes must include a definable horizon and typical terrain characteristics such as fields, roads and bodies of water and surfaces illuminated by airplane landing lights. An SOC is required. A subjective test is required.			X	X	
6.o	Daylight Visual Scenes. The simulator must have night dusk (twilight), and daylight visual scenes with sufficient scene content to recognize the airport, the terrain, and major landmarks around the airport. The scene content must allow a pilot to successfully accomplish a visual landing. Any ambient lighting must not ''washout'' the displayed visual scene. Note: These requirements are applicable to any level of simulator equipped with a ''daylight'' visual system. An SOC is required. A subjective test is required.				X	Brightness capability may be demonstrated with a test pattern of white light using a spot photometer. Daylight visual system is defined as a visual system capable of producing, at a minimum, full color presentations, scene content comparable in detail to that produced by 4,000 edges or 1,000 surfaces for daylight and 4,000 lightpoints for night and dusk scenes, 6 foot-lamberts (20 cd/m^2) of light measured at the pilot's eye position (highlight brightness) and a display which is free of apparent quantization and other distracting visual effects while the simulator is in motion.
6.p	The simulator must provide operational visual scenes that portray physical relationships known to cause landing illusions to pilots. A subjective test is required.				X	For example: short runways, landing approaches over water, uphill or downhill runways, rising terrain on the approach path, unique topographic features.
6.q	The simulator must provide special weather representations of light, medium, and heavy precipitation near a thunderstorm on takeoff and during approach and landing. Representations need only be presented at and below an altitude of 2,000 ft. (610 m) above the airport surface and within 10 miles (16 km) of the airport. A subjective test is required.				X	
6.r	The simulator must present visual scenes of wet and snow-covered runways, including runway lighting reflections for wet conditions, partially obscured lights for snow conditions, or suitable alternative effects. A subjective test is required.				X	
6.s	The simulator must present realistic color and directionality of all airport lighting. A subjective test is required.				X	
7. Sound System						
7.a	The simulator must provide cockpit sounds that result from pilot actions that correspond to those that occur in the airplane.	X	X	X	X	

TABLE A1A—MINIMUM SIMULATOR REQUIREMENTS—Continued

<<<QPS requirements>>>		Simulator levels				<Information>
No.	General simulator requirements	A	B	C	D	notes
7.b	The simulator must accurately simulate the sound of precipitation, windshield wipers, and other significant airplane noises perceptible to the pilot during normal operations, and include the sound of a crash (when the simulator is landed in an unusual attitude or in excess of the structural gear limitations); normal engine and thrust reversal sounds; and the sounds of flap, gear, and spoiler extension and retraction. An SOC is required. A subjective test is required.			X	X	
7.c	The simulator must provide realistic amplitude and frequency of cockpit noises and sounds. Simulator performance must be recorded, compared to amplitude and frequency of the same sounds recorded in the airplane, and be made a part of the QTG. Objective tests are required.				X	

TABLE A1B [RESERVED]

ATTACHMENT 2 TO APPENDIX A TO PART 60—FULL FLIGHT SIMULATOR (FFS) OBJECTIVE TEST

BEGIN INFORMATION

1. For the purposes of this attachment, the flight conditions specified in the Flight Conditions Column of Table A2A, are defined as follows:

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

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

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

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

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

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

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

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

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

3. The QPS Requirements section imposes a duty on the sponsor or other data provider to ensure that a steady state condition exists at the instant of time captured by the ''snapshot'' for cases where the objective test results authorize a ''snapshot test'' or a ''series of snapshot tests'' results in lieu of a time-history. This is often verified by showing that a steady state condition existed from some period prior to, through some period following, the snap shot. The time period most frequently used is from 5 seconds prior through 2 seconds following the instant of time captured by the snap shot. Other time periods may be acceptable as authorized by the NSPM.

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

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

END INFORMATION

BEGIN QPS REQUIREMENTS

1. TEST REQUIREMENTS

a. The ground and flight tests required for qualification are listed in Table of A2A, FFS Objective Tests. Computer generated simulator test results must be provided for each test except where an alternative test is specifically authorized by the NSPM. If a flight condition or operating condition is required for the test but does not apply to the airplane being simulated or to the qualification level sought, it may be disregarded (e.g., an engine out missed approach for a single-engine airplane or a maneuver using reverse thrust for an airplane without reverse thrust capability). Each test result is compared against the validation data described in §60.13 and in this appendix. Although use of a driver program designed to automatically accomplish the tests is encouraged for all simulators and required for Level C and Level D simulators, it must be possible to conduct each test manually while recording all appropriate parameters. The results must be produced on an appropriate recording device acceptable to the NSPM and must include simulator 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 A2A. All results must be labeled using the tolerances and units given.

b. Table A2A in this attachment sets out the test results required, including the parameters, tolerances, and flight conditions for simulator 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 simulator performance. When two tolerance values are given for a parameter, the less restrictive may be used unless otherwise indicated.

c. Certain tests included in this attachment must be supported with a Statement of Compliance and Capability (SOC). In Table A2A, 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 simulator 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 selection. 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 simulator to airplane data throughout a time history, differences must be justified by providing a comparison of other related variables for the condition being assessed.

e. It is not acceptable to program the FFS so that the mathematical modeling is correct only at the validation test points. Unless otherwise noted, simulator tests must represent airplane performance and handling qualities at operating weights and centers of gravity (CG) typical of normal operation. If a test is supported by airplane data at one extreme weight or CG, another test supported by airplane data at mid-conditions or as close as possible to the other extreme must be included, except as may be authorized by the NSPM. Certain tests that are relevant only at one extreme CG or weight condition need not be repeated at the other extreme. Tests of handling qualities must include validation of augmentation devices.

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

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

h. 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.''

i. For previously qualified simulators, 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.

j. Simulators are evaluated and qualified with an engine model simulating the airplane data supplier's flight test engine. For qualification of alternative engine models (either variations of the flight test engines or other manufacturer's engines) additional tests with the alternative engine models may be required. This Attachment contains guidelines for alternative engines.

k. For testing Computer Controlled Airplane (CCA) simulators, or other highly augmented airplane simulators, flight test data is required for the Normal (N) and/or Nonnormal (NN) control states, as indicated in this Attachment. Where test results are independent of control state, Normal or Nonnormal control data may be used. All tests in Table A2A require test results in the Normal control state unless specifically noted otherwise in the Test Details section following the CCA designation. The NSPM will determine what tests are appropriate for airplane simulation data. When making this determination, the NSPM may require other levels of control state degradation for specific airplane tests. Where Non-normal control states are required, test data must be provided for one or more Non-normal control states, and must include the least augmented state. Where applicable, flight test data must record Normal and Non-normal states for:

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

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

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

m. Some tests will not be required for airplanes using airplane hardware in the simulator cockpit (*e.g.*, ''side stick controller''). These exceptions are noted in Section 2 ''Handling Qualities'' in Table A2A of this attachment. However, in these cases, the sponsor must provide a statement that the airplane hardware meets the appropriate manufacturer's specifications and the sponsor must have supporting information to that fact available for NSPM review.

n. For objective test purposes, ''Near maximum'' gross weight is a weight chosen by the sponsor or data provider that is not less than the basic operating weight (BOW) of the airplane being simulated plus 80% of the difference between the maximum certificated gross weight (either takeoff weight or landing weight, as appropriate for the test) and the BOW. ''Light'' gross weight is a weight chosen by the sponsor or data provider that is not more than 120% of the BOW of the airplane being simulated or as limited by the minimum practical operating weight of the test airplane. ''Medium'' gross weight is a weight chosen by the sponsor or data provider that is approximately ±10% of the average of the numerical values of the BOW and the maximum certificated gross weight. (NOTE: BOW is the empty weight of the aircraft plus the weight of the following: normal oil quantity; lavatory servicing fluid; potable water; required crewmembers and their baggage; and emergency equipment. (References: Advisory Circular 120–27, ''Aircraft Weight and Balance;'' and FAA–H–8083–1, ''Aircraft Weight and Balance Handbook.'').

END QPS REQUIREMENTS

TABLE A2A—FULL FLIGHT SIMULATOR (FFS) OBJECTIVE TESTS

<<<QPS REQUIREMENTS>>>									Information notes
Test		Tolerance	Flight Conditions	Test details	Simulator Level				
No.	Title				A	B	C	D	
1. Performance									
1.a.	**Taxi**								
1.a.1	Minimum Radius Turn	±3 ft (0.9 m) or 20% of airplane turn radius.	Ground	Record both Main and Nose gear turning radius. This test is to be accomplished without the use of brakes and only minimum thrust, except for airplanes requiring asymmetric thrust or braking to turn.		X	X	X	
1.a.2	Rate of Turn vs. Nosewheel Steering Angle (NWA).	±10% or ±2% sec. turn rate	Ground	Record a minimum of two speeds, greater than minimum turning radius speed, with a spread of at least 5 knots groundspeed.		X	X	X	

1.b	Takeoff			All commonly used takeoff flap settings are to be demonstrated at least once in the tests for minimum unstick (1.b.3.), normal takeoff (1.b.4.), critical engine failure on takeoff (1.b.5.), or crosswind takeoff (1.b.6.).					
1.b.1	Ground Acceleration Time andDistance.	±5% time and distance or ±5% time and ±200 ft (61 m) of distance.	Takeoff	Record acceleration time and distance for a minimum of 80% of the time from brake release to V_R. Preliminary aircraft certification data may be used.	X	X	X	X	May be combined with normal takeoff (1.b.4.) or rejected takeoff (1.b.7.). Plotted data should be shown using appropriate scales for each portion of the maneuver.

TABLE A2A—FULL FLIGHT SIMULATOR (FFS) OBJECTIVE TESTS—Continued

<<<QPS REQUIREMENTS>>>									Information notes
Test		Tolerance	Flight Conditions	Test details	Simulator Level				
No.	Title				A	B	C	D	
1.b.2	Minimum Control Speed—ground (V_{mcg}) using aerodynamic controls only (per applicable airworthiness standard or alternative) or engine inoperative test to demonstrate ground control characteristics.	±25% of maximum airplane lateral deviation or ±5 ft (1.5 m). Additionally, for those simulators of airplanes with reversible flight control systems: Rudder pedal force; ±10% or ±5 lb (2.2 daN).	Takeoff	Engine failure speed must be within ±1 knot of airplane engine failure speed. Engine thrust decay must be that resulting from the mathematical model for the engine variant applicable to the full flight simulator under test. If the modeled engine is not the same as the airplane manufacturer's flight test engine, a further test may be run with the same initial conditions using the thrust from the flight test data as the driving parameter.	X	X	X	X	If a V_{mcg} test is not available an acceptable alternative is a flight test snap engine deceleration to idle at a speed between $V_1$1 and V_1—10 knots, followed by control of heading using aerodynamic control only. Recovery should be achieved with the main gear on the ground. To ensure only aerodynamic control is used, nosewheel steering should be disabled (i.e., castored) or the nosewheel held slightly off the ground.

1.b.3	Minimum Unstick Speed (V_{mu}) or equivalent test to demonstrate early rotation takeoff characteristics.	±3 kts airspeed, ±1.5° pitch angle.	Takeoff	Record main landing gear strut compression or equivalent air/ground signal. Record from 10 kt before start of rotation until at least 5 seconds after the occurrence of main gear lift-off.	X	X	X	X	V_{mu} is defined as the minimum speed at which the last main landing gear leaves the ground. Main landing gear strut compression or equivalent air/ground signal should be recorded. If a V_{mu} test is not available, alternative acceptable flight tests are a constant high-attitude take-off run through main gear lift-off of an early rotation take-off.

TABLE A2A—FULL FLIGHT SIMULATOR (FFS) OBJECTIVE TESTS—Continued

<<<QPS REQUIREMENTS>>>									Information notes
Test		Tolerance	Flight Conditions	Test details	Simulator Level				
No.	Title				A	B	C	D	
1.b.4	Normal Takeoff	±3 kts airspeed, ±1.5° pitch angle, ±1.5° angle of attack, ±20 ft (6 m) height. Additionally, for those simulators of airplanes with reversible flight control systems: Stick/Column Force; ±10% or ± 5 lb (2.2 daN).	Takeoff	Record takeoff profile from brake release to at least 200 ft (61 m) above ground level (AGL). If the airplane has more than one certificated takeoff configuration, a different configuration must be used for each weight. Data are required for a takeoff weight at near maximum takeoff weight with a mid-center of gravity and for a light takeoff weight with an aft center of gravity, as defined in appendix F.	X	X	X	X	This test may be used for ground acceleration time and distance (1.b.1.). Plotted data should be shown using appropriate scales for each portion of the maneuver.

1.b.5	Critical Engine Failure on Takeoff.	±3 kts airspeed, ±1.5° pitch angle, ±1.5° angle of attack, ±20 ft (6 m) height, ±3° heading angle, ±2° bank angle, ±2° sideslip angle. Additionally, for those simulators of airplanes with reversible flight control systems: Stick/Column Force; ±10% or ±5 lb (2.2 daN); Wheel Force; ±10% or ±3 lb (1.3 daN); and Rudder Pedal Force; ±10% or ±5 lb (2.2 daN).	Takeoff	Record takeoff profile at near maximum takeoff weight from prior to engine failure to at least 200 ft (61 m) AGL. Engine failure speed must be within ±3 kts of airplane data.	X	X	X	X	
1.b.6	Crosswind Takeoff	±3 kts airspeed, ±1.5° pitch angle, ±1.5° angle of attack, ±20 ft (6 m) height, ±2° bank angle, ±2° sideslip angle; ±3° heading angle. Additionally, for those simulators of airplanes with reversible flight control systems: Stick/Column Force; ±10% or ±5 lb (2.2 daN) stick/column force, ±10% or ±3 lb (1.3 daN) wheel force, ±10% or ±5 lb (2.2 daN) rudder pedal force.	Takeoff	Record takeoff profile from brake release to at least 200 ft (61 m) AGL. Requires test data, including information on wind profile for a crosswind component of at least 60% of the maximum described in the Airplane Flight Manual (AFM), as measured at 33 ft (10 m) above the runway.	X	X	X	X	In those situations where a maximum crosswind or a maximum demonstrated crosswind is not included in the AFM, contact the NSPM.

TABLE A2A—FULL FLIGHT SIMULATOR (FFS) OBJECTIVE TESTS—Continued

<<<QPS REQUIREMENTS>>>									Information notes
Test		Tolerance	Flight Conditions	Test details	Simulator Level				
No.	Title				A	B	C	D	
1.b.7	Rejected Takeoff	±5% time or ±1.5 sec, ±7.5% distance or ±250 ft (±76 m).	Takeoff	Record time and distance from brake release to full stop. Speed for initiation of the reject must be at least 80% of V_1 speed. The airplane must be at or near the maximum takeoff gross weight. Use maximum braking effort, auto or manual.	X	X	X	X	Autobrakes will be used where applicable.
1.b.8	Dynamic Engine Failure After Takeoff.	±20% or ±2°/sec body angular rates.	Takeoff	Engine failure speed must be within ±3 kts of airplane data. Record Hands Off from 5 secs. before to at least 5 secs. after engine failure or 30° Bank, whichever occurs first. Engine failure may be a snap deceleration to idle. (**CCA:** Test in Normal and Non-normal control state.).			X	X	For safety considerations, airplane flight test may be performed out of ground effect at a safe altitude, but with correct airplane configuration and airspeed.
1.c.	Climb								

1.c.1	Normal Climb, all engines operating.	±3 kts airspeed, ±5% or ±100 FPM (0.5 m/Sec.) climb rate.	Clean	Flight test data is preferred, however, airplane performance manual data is an acceptable alternative. Record at nominal climb speed and mid-initial climb altitude. Flight simulator performance must be recorded over an interval of at least 1,000 ft. (300m).	X	X	X	X	
1.c.2	One engine Inoperative	±3 kts airspeed, ±5% or ±100 FPM (0.5 m/Sec.) climb rate, but not less than the FAA-Apprioved Airplane Flight Manual (AFM) values.	For part 23 airplanes, in accordance with part 23. For part 25 airplanes, Second Segment Climb.	Flight test data is preferred, however, airplane performance manual data is an acceptable alternative. Test at weight, altitude, or temperature limiting conditions. Record at nominal climb speed. Flight simulator performance must be recorded over an interval of at least 1,000 ft. (300m).	X	X	X	X	
1.c.3	One Engine Inoperative En route Climb.	±10% time, ±10% distance, ±10% fuel used.	Clean	Record results for at least a 5000 ft (1550 m) climb segment. Flight test data or airplane performance manual data may be used.			X	X	

TABLE A2A—FULL FLIGHT SIMULATOR (FFS) OBJECTIVE TESTS—Continued

<<<QPS REQUIREMENTS>>>									Information notes
Test		Tolerance	Flight Conditions	Test details	Simulator Level				
No.	Title				A	B	C	D	
1.c.4	One Engine Inoperative Approach Climb (if the approved AFM requires specific performance in icing conditions).	±3 kts airspeed, ±5% or ±100 FPM (0.5 m/Sec.) climb rate, but not less than the climb gradient requirements of 14 CFR parts 23 or 25 climb gradient, as appropriate.	Approach	Record results at near maximum gross landing weight as defined in appendix F. Flight test data or airplane performance manual data may be used. Flight simulator performance must be recorded over an interval of at least 1,000 ft. (300m).	X	X	X	X	The airplane should be configured with all anti-ice and de-ice systems operating normally, with the gear up and go-around flaps set. All icing accountability considerations should be applied in accordance with the AFM for an approach in icing conditions.
1.d	Cruise/Descent								
1.d.1	Level flight acceleration	±5% Time	Cruise	Record results for a minimum of 50 kts speed increase using maximum continuous thrust rating or equivalent.	X	X	X	X	
1.d.2	Level flight deceleration	±5% Time	Cruise	Record results for a minimum of 50 kts speed decrease using idle power.	X	X	X	X	

1.d.3	Cruise performance	±0.05 EPR or ±5% of N_1, or ±5% of Torque, ±5% of fuel flow.	Cruise	May be a single snapshot showing instantaneous fuel flow or a minimum of 2 consecutive snapshots with a spread of at least 3 minutes in steady flight.			X	X	
1.e	Stopping								
1.e.1	Stopping time and distance, using manual application of wheel brakes and no reverse thrust on a dry runway.	±5% of time. For distance up to 4000 ft (1220 m): ±200 ft (61 m) or ±10%, whichever is smaller. For distance greater than 4000 ft (1220 m): ±5% of distance.	Landing	Record time and distance for at least 80% of the total time from touch down to full stop. Data is required for weights at medium and near maximum landing weights. Data for brake system pressure and position of ground spoilers (including method of deployment, if used) must be provided. Engineering data may be used for the medium gross weight condition.	X	X	X	X	

TABLE A2A—FULL FLIGHT SIMULATOR (FFS) OBJECTIVE TESTS—Continued

<<<QPS REQUIREMENTS>>>									Information notes
Test		Tolerance	Flight Conditions	Test details	Simulator Level				
No.	Title				A	B	C	D	
1.e.2	Stopping time and distance, using reverse thrust and no wheel brakes on a dry runway.	±5% time and the smaller of ±10% or ±200 ft (61 m) of distance.	Landing	Record time and distance for at least 80% of the total time from initiation of reverse thrust to the minimum operating speed with full reverse thrust. Data is required for medium and near maximum landing gross weights. Data on the position of ground spoilers, (including method of deployment, if used) must be provided. Engineering data may be used for the medium gross weight condition.	X	X	X	X	

1.e.3	Stopping distance, using wheel brakes and no reverse thrust on a wet runway.	±10% of distance or ±200 ft (61 m).	Landing	Either flight test data or manufacturer's performance manual data must be used where available. Engineering data based on dry runway flight test stopping distance modified by the effects of contaminated runway braking coefficients are an acceptable alternative.			X	X	
1.e.4	Stopping distance, using wheel brakes and no reverse thrust on an icy runway.	±10% of distance or ±200 ft (61 m).	Landing	Either flight test or manufacturer's performance manual data must be used, where available. Engineering data based on dry runway flight test stopping distance modified by the effects of contaminated runway braking coefficients are an acceptable alternative.			X	X	
1.f	Engines								

TABLE A2A—FULL FLIGHT SIMULATOR (FFS) OBJECTIVE TESTS—Continued

<<<QPS REQUIREMENTS>>>									Information notes
Test		Tolerance	Flight Conditions	Test details	Simulator Level				
No.	Title				A	B	C	D	
1.f.1	Acceleration	±10% T_t and ±10% T_i, or ±0.25 sec.	Approach or landing	Record engine power (N_1, N_2, EPR, Torque) from flight idle to go-around power for a rapid (slam) throttle movement.	X	X	X	X	T_i is the total time from initial throttle movement until reaching a 10% response of engine power. T_t is the total time from initial throttle movement to reaching 90% of go around power.
1.f.2	Deceleration	±10% T_t and ±10% T_i, or ±0.25 sec.	Ground	Record engine power (N_1, N_2, EPR, Torque) from Max T/O power to 90% decay of Max T/O power for a rapid (slam) throttle movement.					T_i is the total time from initial throttle movement until reaching a 10% response of engine power. T_t is the total time from initial throttle movement to reaching 90% decay of maximum takeoff power.
2. Handling Qualities									

	For simulators requiring Static or Dynamic tests at the controls (i.e., column, wheel, rudder pedal), special test fixtures will not be required during initial or upgrade evaluations if the sponsor's QTG/MQTG shows both text fixture results *and* the results of an alternative approach, such as computer plots produced concurrently, that provide satisfactory agreement. Repeat of the alternative method during the initial or upgrade evaluation would then satisfy this test requirement. For initial and upgrade evaluations, the control dynamic characteristics must be measured at and recorded directly from the cockpit controls, and must be accomplished in takeoff, cruise, and landing flight conditions and configurations. Testing of position versus force is not applicable if forces are generated solely by use of airplane hardware in the full flight simulator								Contact the NSPM for clarification of any issue regarding airplanes with reversible controls.
2.a	Static Control Tests								
2.a.1.a	Pitch Controller Position vs. Force and Surface Position Calibration.	±2 lb (0.9 daN) breakout, ±10% or ±5 lb (2.2 daN) force, ±2° elevator.	Ground	Record results for an uninterrupted control sweep to the stops.	X	X	X	X	Test results should be validated (where possible) with in-flight data from tests such as longitudinal static stability or stalls. Static and dynamic flight control tests should be accomplished at the same feel or impact pressures.
2.a.1.b	(Reserved)								
2.a.2.a	Roll Controller Position vs. Force Surface Position Calibration.	±2 lb (0.9 daN) breakout, ±10% or ±3 lb (1.3 daN) force, ±2° aileron, ±3° spoiler angle.	Ground	Record results for an uninterrupted control sweep to the stops.	X	X	X	X	Test results should be validated with in-flight data from tests such as engine out trims, steady state or sideslips. Static and dynamic flight control tests should be accomplished at the same feel or impact pressures.
2.a.2.b. ...	(Reserved).								

TABLE A2A—FULL FLIGHT SIMULATOR (FFS) OBJECTIVE TESTS—Continued

<<<QPS REQUIREMENTS>>>									Information notes
Test		Tolerance	Flight Conditions	Test details	Simulator Level				
No.	Title				A	B	C	D	
2.a.3.a. ...	Rudder Pedal Position vs. Force and Surface Position Calibration.	±5 lb (2.2 daN) breakout, ±10% or ±5 lb (2.2 daN) force, ±2½ rudder angle.	Ground	Record results for an uninterrupted control sweep to the stops.	X	X	X	X	Test results should be validated with in-flight data from tests such as engine out trims, steady state or sideslips. Static and dynamic flight control tests should be accomplished at the same feel or impact pressures.
2.a.3.b. ...	(Reserved).								
2.a.4	Nosewheel Steering Controller Force & Position Calibration.	±2 lb (0.9 daN) breakout, ±10% or ±3 lb (1.3 daN) force, ±2½ nosewheel angle.	Ground	Record results for an uninterrupted control sweep to the stops.	X	X	X	X	
2.a.5	Rudder Pedal Steering Calibration.	±°nosewheel angle	Ground	Record results for an uninterrupted control sweep to the stops.	X	X	X	X	
2.a.6	Pitch Trim Indicator vs. Surface Position Calibration.	±0.5° of computed trim surface angle.	Ground	.....	X	X	X	X	The purpose of the test is to compare full flight simulator against design data or equivalent
2.a.7	(Reserved)	.							

2.a.8	Alignment of Cockpit Throttle Lever vs. Selected Engine Parameter.	±5° of throttle lever angle, or ±3% N1 or ±03 EPR, or ± torque. For propeller-driven airplanes where the propeller control levers do not have angular travel, a tolerance of ±0.8 inch (±2 cm.) applies.	Ground	Requires simultaneous recording for all engines. The tolerances apply against airplane data and between engines. In the case of propeller powered airplanes, if a propeller lever is present, it must also be checked. For airplanes with throttle "detents," all detents must be presented. May be a series of snapshot test results..	X	X	X	X	
2.a.9	Brake Pedal Position vs. Force and Brake System Pressure Calibation.	±5 lb (2.2 daN) or 10% force, ±150 psi (1.0 MPa) or ±10% brake system pressure.	Ground	Hydraulic system pressure must be related to pedal position through a ground static test.	X	X	X	X	Full flight simulator computer output results may be used to show compliance.
2.b	Dynamic Control Tests.								
	(3) Tests 2.b.1., 2.b.2., and 2.b.3 are not applicable if dynamic response is generated solely by use of airplane hardware in the full flight simulator. Power setting is that required for level flight unless otherwise specified.								

TABLE A2A—FULL FLIGHT SIMULATOR (FFS) OBJECTIVE TESTS—Continued

<<<QPS REQUIREMENTS>>>									Information notes
Test		Tolerance	Flight Conditions	Test details	Simulator Level				
No.	Title				A	B	C	D	
2.b.1	Pitch Control	For underdamped systems ±10% of time from 90% of initial displacement (0.9 A_d) to first zero crossing and ±10 (n+1)% of period thereafter ±10% amplitude of first overshoot applied to all overshoots greater than 5% of initial displacement (.05 A_d). ±1 overshoot (first significant overshoot must be matched). For overdamped systems: ±10% of time from 90% of initial displacement (0.9 A_d) to 10% of initial displacement (0.1 A_d)	Takeoff, Cruise, and Landing.	Data must show normal control displacement in both directions. Tolerances apply against the absolute values of each period (considered independently). Normal control displacement for this test is 25% to 50% of the maximum allowable pitch controller deflection for flight conditions limited by the maneuvering load envelope.			X	X	"n" is the sequential period of a full cycle of oscillation. Refer to paragraph 3 of this attachment for more information. Static and dynamic flight control tests should be accomplished at the same feel or impact pressures. For the alternate method (see paragraph 3 of this attachment). The slow sweep is the equivalent to the static test 2.a.1. For the moderate and rapid sweeps: ±2 lb (0.9 daN) or ±10% dynamic increment above the static force.

2.b.2	Roll Control	For underdamped systems: ±10% of time from 90% of initial displacement (0.9 A_d) to first zero crossing, and ±10 (n+1)% of period thereafter. ±10% amplitude of first overshoot, applied to all overshoots greater than 5% of initial displacement (.05 A_d), ±1 overshoot (first significant overshoot must be matched) For overdamped systems: ±10% of time from 90% of initial displacement (0.9 A_d) to 10% of initial displacement (0.1 A_d)	Takeoff, Cruise, and Landing.	Data must show normal control displacement in both directions. Tolerances apply against the absolute values of each period (considered independently). Normal control displacement for this test is 25% to 50% of maximum allowable roll controller deflection for flight conditions limited by the maneuvering load envelope.			X	X	"n" is the sequential period of a full cycle of oscillation. Refer to paragraph 3 of this attachment for more information. Static and dynamic flight control tests should be accomplished at the same feel or impact pressures. For the alternate method (see paragraph 3 of this attachment). The slow sweep is the equivalent to the static test 2.a.2. For the moderate and rapid sweeps: ±2 lb (0.9 daN) or ±10% dynamic increment above the static force.

TABLE A2A—FULL FLIGHT SIMULATOR (FFS) OBJECTIVE TESTS—Continued

<<<QPS REQUIREMENTS>>>									Information notes
Test		Tolerance	Flight Conditions	Test details	Simulator Level				
No.	Title				A	B	C	D	
2.b.3	Yaw Control	For underdamped systems: ±10% of time from 90% of initial displacement (0.9 A_d) to first zero crossing, and ±10 (n+1)% of period thereafter ±10% amplitude of first overshoot, applied to all overshoots greater than 5% of initial displacement (.05 A_d), ±1 overshoot (first significant overshoot must be matched). For overdamped systems: ±10% of time from 90% of initial displacement (0.9 A_d) to 10% of initial displacement (0.1 A_d)	Takeoff, Cruise, and Landing.	Data must show normal control displacement in both directions. Tolerances apply against the absolute values of each period (considered independently). Normal control displacement for this test is 25% to 50% of full throw.			X	X	"n" is the sequential period of a full cycle of oscillation. Refer to paragraph 3 of this attachment for more information. Static and dynamic flight control tests should be accomplished at the same feel or impact pressures. For the alternate method (see paragraph 3 of this attachment). The slow sweep is the equivalent to the static test 2.a.3. For the moderate and rapid sweeps: ±2 lb (0.9 daN) or ±10% dynamic increment above the static force.

2.b.4	Small Control Inputs—Pitch.	±0.15°/sec body pitch rate or ±20% of peak body pitch rate applied throughout the time history.	Approach or Landing	Control inputs must be typical of minor corrections made while established on an ILS approach course (approximately 0.5°/sec to 2°/sec pitch rate). The test must be in both directions, showing time history data from 5 seconds before until at least 5 seconds after initiation of control input. CCA: Test in normal and non-normal control states.			X	X	

TABLE A2A—FULL FLIGHT SIMULATOR (FFS) OBJECTIVE TESTS—Continued

<<<QPS REQUIREMENTS>>>									Information notes
Test		Tolerance	Flight Conditions	Test details	Simulator Level				
No.	Title				A	B	C	D	
2.b.5	Small Control Inputs—Roll.	±0.15°/sec body roll rate or ±20% of peak body roll rate applied throughout the time history.	Approach or landing	Control inputs must be typical of minor corrections made while established on an ILS approach course (approximately 0.5°/sec to 2°/sec roll rate). The test must be run in only one direction; however, for airplanes that exhibit non-symmetrical behavior, the test must include both directions. Time history data must be recorded from 5 seconds before until at least 5 seconds after initiation of control input. CCA: Test in normal and non-normal control states.			X	X	

2.b.6	Small Control Inputs—Yaw.	±0.15°/sec body yaw rate or ±20% of peak body yaw rate applied throughout the time history.	Approach or landing	Control inputs must be typical of minor corrections made while established on an ILS approach course (approximately 0.5°/sec to 2°/sec yaw rate). The test must be run in only one direction; however, for airplanes that exhibit non-symmetrical behavior, the test must include both directions. Time history data must be recorded from 5 seconds before until at least 5 seconds after initiation of control input. CCA: Test in normal and non-normal control states.			X	X	
2.c	Longitudinal Control Tests								
	Power setting is that required for level flight unless otherwise specified								

TABLE A2A—FULL FLIGHT SIMULATOR (FFS) OBJECTIVE TESTS—Continued

<<<QPS REQUIREMENTS>>>									Information notes
Test		Tolerance	Flight Conditions	Test details	Simulator Level				
No.	Title				A	B	C	D	
2.c.1	Power Change Dynamics	±3 kt airspeed, ±100 ft (30 m) altitude, ±20% or ±1.5° pitch angle.	Approach	Power is changed from the thrust setting required for approach or level flight to maximum continuous thrust or go-around power setting. Record the uncontrolled free response from at least 5 seconds before the power change is initiated to 15 seconds after the power change is completed. CCA: Test in normal and non-normal control states.	X	X	X	X	

2.c.2	Flap/Slat Change Dynamics.	±3 kt airspeed, ±100 ft (30 m) altitude, ±20% or ±1.5° angle.	Takeoff through initial flap retraction, and approach to landing.	Record the uncontrolled free response from at least 5 seconds before the configuration change is initiated to 15 seconds after the configuration change is completed. CCA: Test in normal and non-normal control states.	X	X	X	X	
2.c.3	Spoiler/Speedb rake Change Dynamics.	±3 kt airspeed, ±100 ft (30 m) altitude, ±20% or ±1.5° pitch angle.	Cruise	Record the uncontrolled free response from at least 5 seconds before the configuration change is initiated to 15 seconds after the configuration change is completed. Record results for both extension and retraction. CCA: Test in normal and non-normal control states.	X	X	X	X	

TABLE A2A—FULL FLIGHT SIMULATOR (FFS) OBJECTIVE TESTS—Continued

<<<QPS REQUIREMENTS>>>									Information notes
Test		Tolerance	Flight Conditions	Test details	Simulator Level				
No.	Title				A	B	C	D	
2.c.4	Gear Change Dynamics	±3 kt airspeed, ±100 ft (30 m) altitude, ±20% or ±1.5° pitch angle.	Takeoff (retraction), and Approach (extension).	Record the time history of uncontrolled free response for a time increment from at least 5 seconds before the configuration change is initiated to 15 seconds after the configuration change is completed. CCA: Test in normal and non-normal control states.	X	X	X	X	
2.c.5	Longitudinal Trim	±0.5° stabilizer, ±1° elevator, ±1° pitch angle, ±5% net thrust or equivalent.	Cruise, Approach, and Landing.	Record steady-state condition with wings level and thrust set for level flight. May be a series of snapshot tests. CCA: Test in normal and non-normal control states.	X	X	X	X	

2.c.6	Longitudinal Maneuvering Stability (Stick Force/g).	±5 lb (±2.2 daN) or ±10% pitch controller force.. Alternative method: ±1° or ±10% change of elevator	Cruise, Approach, and Landing.	Continuous time history data or a series of snapshot tests may be used. Record results up to approximately 30° of bank for approach and landing configurations. Record results for up to approximately 45° of bank for the cruise configuration. The force tolerance is not applicable if forces are generated solely by the use of airplane hardware in the full flight simulator. The alternative method applies to airplanes that do not exhibit "stick-force-per-g" characteristics. CCA: Test in normal and non-normal control states.	X	X	X	X	

TABLE A2A—FULL FLIGHT SIMULATOR (FFS) OBJECTIVE TESTS—Continued

<<<QPS REQUIREMENTS>>>									Information notes
Test		Tolerance	Flight Conditions	Test details	Simulator Level				
No.	Title				A	B	C	D	
2.c.7	Longitudinal	±5 lb (±2.2 daN) or ±10% pitch controller force.. Alternative method: ±1° or ±10% change of elevator.	Approach	Record results for at least 2 speeds above and 2 speeds below trim speed. May be a series of snapshot test results. The force tolerance is not applicable if forces are generated solely by the use of airplane hardware in the full flight simulator. The alternative method applies to airplanes that do not exhibit speed stability characteristics. CCA: Test in normal and non-normal control states.	X	X	X	X	

2.c.8	Stall Characteristics	±3 kt airspeed for initial buffet, stall warning, and stall speeds. Additionally, for those simulators with reversible flight control systems: ±10% or ±5 lb (2.2 daN)) Stick/Column force (prior to "g break" only).	Second Segment Climb, and Approach or Landing.	The stall maneuver must be entered with thrust at or near idle power and wings level (1g). Record the stall warning signal and initial buffet, if applicable. Time history data must be recorded for full staff and initiation of recovery. The stall warning signal must occur in the proper relation to buffet/stall. Full flight simulators of airplanes exhibiting a sudden pitch attitude change or "g break" must demonstrate this characteristic. CCA: Test in normal and non-normal control states.	X	X	X	X	

TABLE A2A—FULL FLIGHT SIMULATOR (FFS) OBJECTIVE TESTS—Continued

<<<QPS REQUIREMENTS>>>									Information notes
Test		Tolerance	Flight Conditions	Test details	Simulator Level				
No.	Title				A	B	C	D	
2.c.9	Phugoid Dynamics	±10% period, ±10% of time to ½ or double amplitude or ±.02 of damping ratio.	Cruise	The test must include whichever is less of the following: Three full cycles (six overshoots after the input is completed), or the number of cycles sufficient to determine time to ½ or double amplitude. CCA: Test in Non-normal and non-normal control states.	X	X	X	X	
2.c.10	Short Period Dynamics ..	±1.5° pitch angle or ±2°/sec pitch rate, ±0.10g acceleration.	Cruise	CCA: Test in Normal and Non-normal control states.		X	X		
2.c.11	(Reserved)	.....	.....	.....					
2.d	Lateral Directional Tests								
	Power setting is that required for level flight unless otherwise specified								

2.d.1	Minimum Control Speed, Air (V_{mca} or V_{mcl}), per Applicable Airworthiness Standard or Low Speed Engine Inoperative Handling Characteristics in the Air.	±3 kt airspeed	Takeoff or Landing (whichever is most critical in the airplane).	Takeoff thrust must be used on the operating engine(s). A time history or a series of snapshot tests may be used. CCA: Test in Normal and Non-normal control states.	X	X	X	X	Low Speed Engine Inoperative Handling may be governed by a performance or control limit that prevents demonstration of V_{mca} in the conventional manner.
2.d.2	Roll Response (Rate)	±10% or ±2°/sec roll rate. Additionally, for those simulators of airplanes with reversible flight control systems: ±10% or ±3lb (1.3 daN) wheel force.	Cruise, and Approach or Landing.	Record results for normal roll controller deflection (about one-third of maximum roll controller travel). May be combined with step input of flight deck roll controller test (2.d.3).	X	X	X	X	
2.d.3	Roll Response to Cockpit Roll Controller Step Input.	±10% or ±2° bank angle	Approach or Landing	Record from initiation of roll through 10 seconds after control is returned to neutral and released. May be combined with roll response (rate) test (2.d.2). CCA: Test in Normal and Non-normal control states.	X	X	X	X	With wings level, apply a step roll control input using approximately one-third of the roll controller travel. When reaching approximately 20° to 30° of bank, abruptly return the roll controller to neutral and allow approximately 10 seconds of airplane free response.

TABLE A2A—FULL FLIGHT SIMULATOR (FFS) OBJECTIVE TESTS—Continued

<<<QPS REQUIREMENTS>>>									Information notes
Test		Tolerance	Flight Conditions	Test details	Simulator Level				
No.	Title				A	B	C	D	
2.d.4	Spiral Stability	Correct trend and ±2° or ±10% bank angle in 20 seconds. Alternate test requires correct trend and ±2° aileron.	Cruise	Record results for both directions. Airplane data averaged from multiple tests may be used. As an alternate test, demonstrate the lateral control required to maintain a steady turn with a bank angle of approximately 30° CCA: Test in Normal and Non-normal control states.	X	X	X	X	
2.d.5	Engine Inoperative Trim	±1° rudder angle or ±1° tab angle or equivalent pedal, ±2° sideslip angle.	Second Segment Climb, and Approach or Landing.	May be a series of snapshot tests.	X	X	X	X	The test should be performed in a manner similar to that for which a pilot is trained to trim an engine failure condition. Second segment climb test should be at takeoff thrust. Approach or landing test should be at thrust for level flight.

2.d.6	Rudder Response	±2°/sec or ±10% yaw rate	Approach or Landing	Record results for stability augmentation system ON and OFF. A rudder step input of 20%–30% rudder pedal throw is used. CCA: Test in Normal and Non-normal control states.	X	X	X	X	
2.d.7	Dutch Roll (Yaw Damper OFF).	±0.5 sec or ±10% of period, ±10% of time to ½ or double amplitude or ±.02 of damping ratio. ±20% or ±1 sec of time difference between peaks of bank and sideslip.	Cruise, and Approach or Landing.	Record results for at least 6 complete cycles with stability augmentation OFF. CCA: Test in Normal and Non-normal control states.		X	X	X	
2.d.8	Steady State Sideslip	For given rudder position, ±2° bank angle, ±1° sideslip angle, ±10% or ±2° aileron, ±10% or ±5° spoiler or equivalent roll, controller position or force. Additionally, for those simulators of airplanes with reversible flight control systems: ±10% or ±3 lb (1.3 daN) wheel force ±10% or ±5 lb (2.2 daN) rudder pedal force.	Approach or Landing	May be a series of snapshot test results using at least two rudder positions. Propeller driven airplanes must test in each direction.	X	X	X	X	
2.e	Landings								

TABLE A2A—FULL FLIGHT SIMULATOR (FFS) OBJECTIVE TESTS—Continued

<<<QPS REQUIREMENTS>>>									Information notes
Test		Tolerance	Flight Conditions	Test details	Simulator Level				
No.	Title				A	B	C	D	
2.e.1	Normal Landing	±3 kt airspeed, ±1.5° pitch angle, ±1.5° angle of attack, ±10% or ±10 ft (3 m) height. Additionally, for those simulators of airplanes with reversible flight control systems: ±10% or ±5 lbs (±2.2 daN) stick/column force.	Landing	Record results from a minimum of 200 ft (61 m) AGL to nose-wheel touchdown.. CCA: Test in Normal and Non-normal control states		X	X	X	Tests should be conducted with two normal landing flap settings (if applicable). One should be at or near maximum certificated landing weight. The other should be at light or medium landing weight.
2.e.2	Miminum Flap Landing ..	±3 kt airspeed, ±1.5° pitch angle, ±1.5° angle of attack, ±10% or ±10 ft (3 m) height. Additionally, for those simulators of airplanes with reversible flight control systems: ±10% or ±5 lbs (2.2 daN) stick/column force.	Minimum Certified Landing Flap Configuration.	Record results from a minimum of 200 ft (61 m) AGL to nosewheel touchdown with airplane at near Maximum Landing Weight.			X	X	
2.e.3	Crosswind Landing	±3 kt airspeed, ±1.5° pitch angle, ±1.5° angle of attack, ±10% or ±10 ft (3 m) height ±2° bank angle, ±2° sideslip angle, ±3° heading angle. Additionally, for those simulators of airplanes with reversible flight control systems: ±10% or ±3 lbs (1.3 daN) wheel force ±10% or ±5 lb (2.2 daN) rudder pedal force.	Landing	Record results from a minimum of 200 ft (61 m) AGL, through nosewheel touchdown, to 50% decrease in main landing gear touchdown speed.		X	X	X	Test data should include information on wind profile, for a crosswind component of 60% of the maximum described in the AFM as measured at 33 ft (10m) above the runway.

2.e.4	One Engine Inoperative Landing.	±3 kt airspeed, ±1.5° pitch angle, ±1.5° angle of attack, ±10% height or ±10 ft (3 m); ±2° bank angle, ±2° sideslip angle, ±3° heading.	Landing	Record results from a minimum of 200 ft (61 m) AGL, through nosewheel touchdown, to 50% decrease in main landing gear touchdown speed or less.		X	X	X	
2.e.5	Autopilot landing (if applicable).	±5 ft (1.5m) flare height, ±0.5 sec T_f, ±140 ft/min (.7 m/sec) rate of descent at touchdown. ±10 ft (3 m) lateral deviation during rollout.	Landing	If autopilot provides rollout guidance, record lateral deviation from touchdown to a 50% decrease in main landing gear touchdown speed or less. Time of autopilot flare mode engage and main gear touchdown must be noted.		X	X	X	T_f = duration of flare
2.e.6	All engines operating, autopilot, go around.	±3 kt airspeed, ±1.5° pitch angle, ±1.5° angle of attack.	As per AFM	Normal, all-engines-operating, Go Around with the autopilot engaged (if applicable) at medium landing weight. CCA: Test in Normal and Non-normal control states		X	X	X	

TABLE A2A—FULL FLIGHT SIMULATOR (FFS) OBJECTIVE TESTS—Continued

<<<QPS REQUIREMENTS>>>									Information notes
Test		Tolerance	Flight Conditions	Test details	Simulator Level				
No.	Title				A	B	C	D	
2.e.7	One engine inoperative go around.	±3 kt airspeed, ±1.5° pitch angle, ±1.5° angle of attack, ±2° bank angle, ±2° slideslip angle.	As per AFM	The one engine inoperative go around is required at near maximum certificated landing weight with the critical engine inoperative using manual controls. If applicable, an additional engine inoperative go around test must be accomplished with the autopilot engaged. CCA: Test in Normal and Non-normal control states		X	X	X	
2.e.8	Directional control (rudder effectiveness) with symmetric reverse thrust.	±2°/sec yaw rate, ±5 kts airspeed.	Landing	Record results starting from a speed approximating touchdown speed to the minimum thrust reverser operation speed. With full reverse thrust, apply yaw control in both directions until reaching minimum thrust reverser operation speed.		X	X	X	

2.e.9	Directional control (rudder effectiveness) with symmetric reverse thrust.	±5 kt airspeed, ±3° heading angle.	Landing	Maintain heading with yaw control with full reverse thrust on the operating engine(s). Record results starting from a speed approximating touchdown speed to a speed at which control of yaw cannot be maintained or until reaching minimum thrust reverser operation speed, whichever is higher. The tolerance applies to the low speed end of the data recording.		X	X	X	
2.f	Ground Effect.								
	Test to demonstrate Ground Effect.	±1° elevator or stabilizer angle, ±5% net thrust or equivalent, ±1° angle of attack, ±10% height or ±5 ft (1.5 m), ±3 kt airspeed, ±1° pitch angle.	Landing	The Ground Effect model must be validated by the test selected and a rationale must be provided for selecting the particular test.		X	X	X	See paragraph 4, Ground Effect, in this attachment for additional information.
2.g	Windshear								

TABLE A2A—FULL FLIGHT SIMULATOR (FFS) OBJECTIVE TESTS—Continued

<<<QPS REQUIREMENTS>>>									Information notes
Test		Tolerance	Flight Conditions	Test details	Simulator Level				
No.	Title				A	B	C	D	
	Four tests, two takeoff and two landing, with one of each conducted in still air and the other with windshear active to demonstrate windshear models.	See Attachment 5	Takeoff and Landing	Requires windshear models that provide training in the specific skills needed to recognize windshear phenomena and to execute recovery procedures. See Attachment 5 for tests, tolerances, and procedures.			X	X	See Attachment 5 for information related to Level A and B simulators.
2.h	Flight Maneuver and Envelope Protection Functions								
	The requirements of tests h(1) through (6) of this attachment are applicable to computer controlled airplanes only. Time history results are required for simulator response to control inputs during entry into envelope protection limits including both normal and degraded control states if the function is different. See thrust as required to reach the envelope protection function								
2.h.1	Overspeed	±5 kt airspeed	Cruise			X	X	X	
2.h.2	Minimum Speed	±3 kt airspeed	Takeoff, Cruise, and Approach or Landing.			X	X	X	
2.h.3	Load Factor	±0.1g normal load factor	Takeoff, Cruise			X	X	X	
2.h.4	Pitch Angle	±1.5° pitch angle	Cruise, Approach			X	X	X	
2.h.5	Bank Angle	±2° or ±10% bank angle	Approach			X	X	X	

2.h.6	Angle of Attack	±1.5° angle of attack	Second Segment Climb, and Approach or Landing.	.....		X	X	X	
3. Motion System									
3.a	Frequency response.								
		Based on Simulator Capability	N/A	The test must demonstrate frequency response of the motion system.	X	X	X	X	This test is not required as part of continuing qualification evaluations, and should be part of the MQTG.
3.b	(Reserved)								
3.c	(Reserved)								
3.d	Motion system repeatability								
		±0.05g actual platform linear acceleration.	None	A demonstration is required and must be made part of the MQTG. The assessment procedures must be designed to ensure that the motion system hardware and software (in normal flight simulator operating mode) continue to perform as originally qualified.	X	X	X	X	
3.e	(Reserved)								
3.f	(Reserved)								
4. Visual System									

TABLE A2A—FULL FLIGHT SIMULATOR (FFS) OBJECTIVE TESTS—Continued

<<<QPS REQUIREMENTS>>>									Information notes
Test		Tolerance	Flight Conditions	Test details	Simulator Level				
No.	Title				A	B	C	D	
4.a	Visual System Response Time: Relative responses of the motion system, visual system, and cockpit instruments must be coupled closely to provide integrated sensory cues. Visual change may start before motion response, but motion acceleration must be initiated before completion of the visual scan of the first video field containing different information								See paragraph 14 of this attachment for additional information.
4.a.1	Latency								

	These systems must respond to abrupt input at the pilot's position.	The response must not be prior to that time when the airplane responds and may respond 300 ms (or less) after the airplane responds under the same conditions.	N/A	Simultaneously record: 1) the output from the pilot's controller(s); 2) the output from an accelerometer attached to the motion system platform located at an acceptable location near the pilots' seats; 3) the output signal to the visual system display (including visual system analog delays); and 4) the output signal to the pilot's attitude indicator or an equivalent test approved by the Administrator.	X	X			The intent is to verify that the simulator provides instrument, motion, and visual cues that are, within the stated time delays, like the airplane responses. For airplane response, acceleration in the appropriate, corresponding rotational axis is preferred. Simulator Latency is measured from the start of a control input to the appropriate perceivable change in flight instrument indication; visual system response; or motion system response (this does not include airplane response time as per the manufacturer's data).

TABLE A2A—FULL FLIGHT SIMULATOR (FFS) OBJECTIVE TESTS—Continued

<<<QPS REQUIREMENTS>>>									Information notes
Test		Tolerance	Flight Conditions	Test details	Simulator Level				
No.	Title				A	B	C	D	
		The response must not be prior to that time when the airplane responds and may respond 150 ms (or less) after the airplane responds under the same conditions.	N/A	Simultaneously record: 1) the output from the pilot's controller(s); 2) the output from an accelerometer attached to the motion system platform located at an acceptable location near the pilots' seats; 3) the output signal to the visual system display (including visual system analog delays); and 4) the output signal to the pilot's attitude indicator or an equivalent test approved by the Administrator.			X	X	The transport delay is the time between the control input and the individual hardware (i.e., instruments, motion system, visual system) responses. If Transport Delay is the chosen method to demonstrate relative responses, it is expected that, when reviewing those existing tests where latency can be identified (*e.g.*, short period, roll response, rudder response) the sponsor and the NSPM will apply additional scrutiny to ensure proper simulator response.
4.a.2	Transport Delay								

	As an alternative to the Latency requirement a transport delay objective test may be used to demonstrate that the simulator 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 the control loading electronics and interfacing through all the simulation software modules in the correct order, using a handshaking protocol, finally through the normal output interfaces to the instrument displays, the motion system, and the visual system An SOC is required.			A recordable start time for the test must be provided with the pilot flight control input. The migration of the signal must permit normal computation time to be consumed and must not alter the flow of information through the hardware/software system.					The transport delay is the time between the control input and the individual hardware (*i.e.*, instruments, motion system, visual system) responses. If Transport Delay is the chosen method to demonstrate relative responses, it is expected that, when reviewing those existing tests where latency can be identified (*e.g.*, short period, roll response, rudder response) the sponsor and the NSPM will apply additional scrutiny to ensure proper simulator response.
		The response must not be prior to that time when the airplane responds and may respond 300 ms (or less) after controller movement.	N/A	.....	X	X			
		The response must not be prior to that time when the airplane responds and may respond 150 ms (or less) after controller movement.	N/A	.....			X	X	

TABLE A2A—FULL FLIGHT SIMULATOR (FFS) OBJECTIVE TESTS—Continued

<<<QPS REQUIREMENTS>>>									Information notes
Test		Tolerance	Flight Conditions	Test details	Simulator Level				
No.	Title				A	B	C	D	
	.....	The response must not be prior to that time when the airplane responds and may respond 150 ms (or less) after controller movement.	N/A	.....			X	X	response, rudder response) the sponsor and the NSPM will apply additional scrutiny to ensure proper simulator response.
4.b	Field of View								
4.b.1	Continuous collimated visual field of view.	Minimum continuous collimated field of view providing 45° horizontal and 30° vertical field of view for each pilot seat. Both pilot seat visual systems must be operable simultaneously.	N/A	Required as part of MQTG but not required as part of continuing evaluations.	X	X			A vertical field of view of 30° may be insufficient to meet visual ground segment requirements.
4.b.2.	(Reserved)								
4.b.3.	(Reserved)								
4.c.	(Reserved)								
4.d.	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^2) by the brightness level of any adjacent dark square. This requirement is applicable to any level of simulator equipped with a daylight visual system.			X	X	Measurements should 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.e.	Highlight brightness								

TABLE A2A—FULL FLIGHT SIMULATOR (FFS) OBJECTIVE TESTS—Continued

<<<QPS REQUIREMENTS>>>									Information notes
Test		Tolerance	Flight Conditions	Test details	Simulator Level				
No.	Title				A	B	C	D	
		Not less than six (6) foot-lamberts (20 cd/m²).	N/A	Measure the brightness of a white square while superimposing a highlight on that white square. The use of calligraphic capabilities to enhance the raster brightness is acceptable; however, measuring lightpoints is not acceptable. This requirement is applicable to any level of simulator equipped with a daylight visual system.			X	X	Measurements should 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.f	Surface resolution								

		Not greater than three (3) arc minutes.	N/A	An SOC is required and must include the relevant calculations and an explanation of those calculations. This requirement is applicable to any level of simulator equipped with a daylight visual system.			X	X	The eye will subtend two arc minutes when positioned on a 3° glide slope, 6,876 ft slant range from the centrally located threshold of a black runway surface painted with white threshold bars that are 16 ft wide with 4-foot gaps between the bars.
4.g.	Light point size								
	.....	Not greater than six (6) arc-minutes.	N/A	An SOC is required and must include the relevant calculations and an explanation of those calculations. This requirement is applicable to any level of simulator equipped with a daylight visual system.			X	X	Light point size should be measured using a test pattern consisting of a centrally located single row of 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.h.	Light point contrast ratio								
4.h.1.	(Reserved)								

TABLE A2A—FULL FLIGHT SIMULATOR (FFS) OBJECTIVE TESTS—Continued

<<<QPS REQUIREMENTS>>>									Information notes
Test		Tolerance	Flight Conditions	Test details	Simulator Level				
No.	Title				A	B	C	D	
4.h.2	For Level C and D simulators.	Not less than 25:1.	N/A	An SOC is required and must include the relevant calculations.			X	X	A 1° spot photometer is 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.i	Visual ground segment								

.....	The QTG must contain appropriate calculations and a drawing showing the pertinent data used to establish the airplane location and the segment of the ground that is visible considering design eyepoint, the airplane attitude, cockpit cut-off angle, and a visibility of 1200 ft (350 m) RVR. Simulator performance must be measured against the QTG calculations. Sponsors must provide this data for each simulator (regardless of previous qualification standards) to qualify the simulator for all instrument approaches. The data submitted must include at least the following:. (1) Static airplane 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 cockpit 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) Airplane pitch angle on approach. (3) Airplane data for manual testing: (i) Gross weight.	.....	The simulator must be verified for visual ground segment and visual scene content for the airplane in landing configuration and a main wheel height of 100 ft (30m) above the touchdown zone, on glide slope with an RVR value set at 1,200 ft (350m).	X	X	X	X	Pre-position for this test is encouraged but may be achieved via manual or autopilot control to the desired position.

TABLE A2A—FULL FLIGHT SIMULATOR (FFS) OBJECTIVE TESTS—Continued

<<<QPS REQUIREMENTS>>>									Information notes
Test		Tolerance	Flight Conditions	Test details	Simulator Level				
No.	Title				A	B	C	D	
		(ii) airplane configuration. (iii) Approach airspeed.							

5. (Reserved)

BEGIN INFORMATION

2. GENERAL

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

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

END INFORMATION

BEGIN INFORMATION

3. CONTROL DYNAMICS

a. General. The characteristics of an airplane flight control system have a major effect on handling qualities. A significant consideration in pilot acceptability of an airplane is the ''feel'' provided through the flight controls. Considerable effort is expended on airplane feel system design so that pilots will be comfortable and will consider the airplane desirable to fly. In order for a FFS to be representative, it should ''feel'' like the airplane being simulated. Compliance with this requirement is determined by comparing a recording of the control feel dynamics of the FFS to actual airplane measurements in the takeoff, cruise and landing configurations.

(1) Recordings such as free response to an impulse or step function are classically used to estimate the dynamic properties of electromechanical systems. In any case, 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 FFS control loading system to the airplane system is essential. The required dynamic control tests are described in Table A2A of this attachment.

(2) For initial and upgrade evaluations, the QPS requires that control dynamics characteristics be measured and recorded directly from the flight controls (Handling Qualities—Table A2A). This procedure is usually accomplished by measuring the free response of the controls using a step or impulse input to excite the system. The procedure should be accomplished in the takeoff, cruise and landing flight conditions and configurations.

(3) For airplanes with irreversible control systems, measurements may be obtained on the ground if proper pitot-static inputs are provided to represent airspeeds typical of those encountered in flight. Likewise, it may be shown that for some airplanes, takeoff, cruise, and landing configurations have like effects. Thus, one may suffice for another. In either case, engineering validation or airplane manufacturer rationale should be submitted as justification for ground tests or for eliminating a configuration. For FFSs requiring static and dynamic tests at the controls, special test fixtures will not be required during initial and upgrade evaluations if the QTG shows both test fixture results and the results of an alternate approach (e.g., computer plots that were produced concurrently and show satisfactory agreement). Repeat of the alternate method during the initial evaluation would satisfy this test requirement.

b. Control Dynamics Evaluation. The dynamic properties of control systems are often stated in terms of frequency, damping and a number of other classical measurements. In order to establish a consistent means of validating test results for FFS control loading, criteria are needed that will clearly define the measurement interpretation and the applied tolerances. Criteria are needed for underdamped, critically damped and overdamped systems. 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 are not readily measured from a response time history. Therefore, the following suggested measurements may be used:

(1) For Level C and D simulators. Tests to verify that control feel dynamics represent the airplane should show that the dynamic damping cycles (free response of the controls) match those of the airplane within specified tolerances. The NSPM recognizes that several different testing methods may be used to verify the control feel dynamic response. The NSPM will consider the merits of testing methods based on reliability and consistency. One acceptable method of evaluating the response and the tolerance to be applied is described below for the underdamped and critically damped cases. A sponsor using this method to comply with the QPS requirements should perform the tests as follows:

(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 nonuniform periods in the response. Each period

will be independently compared to the respective period of the airplane control system and, consequently, will enjoy the full tolerance specified for that period. The damping tolerance will be applied to overshoots on an individual basis. Care should be taken when applying the tolerance to small overshoots since the significance of such overshoots becomes questionable. Only those overshoots larger than 5 per cent of the total initial displacement should be considered. The residual band, labeled $T(A_d)$ on Figure A2A is ±5 percent of the initial displacement amplitude A_d from the steady state value of the oscillation. Only oscillations outside the residual band are considered significant. When comparing FFS data to airplane data, the process should begin by overlaying or aligning the FFS and airplane steady state values and then comparing amplitudes of oscillation peaks, the time of the first zero crossing and individual periods of oscillation. The FFS should show the same number of significant overshoots to within one when compared against the airplane data. The procedure for evaluating the response is illustrated in Figure A2A.

(b) Critically damped and overdamped response. Due to the nature of critically damped and overdamped responses (no overshoots), the time to reach 90 percent of the steady state (neutral point) value should be the same as the airplane within ±10 percent. Figure A2B illustrates the procedure.

(c) 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 table summarizes the tolerances, T, for underdamped systems, and ''n'' is the sequential period of a full cycle of oscillation. See Figure A2A of this attachment for an illustration of the referenced measurements.

$T(P_0)$ ±10% of P_0
$T(P_1)$ ±20% of P_1
$T(P_2)$ ±30% of P_2
$T(P_n)$ ±10(n+1)% of P_n
$T(A_n)$ ±10% of A_1
$T(A_d)$ ±5% of A_d = residual band
Significant overshoots First overshoot and ±1 subsequent overshoots

(b) The following tolerance applies to critically damped and overdamped systems only. See Figure A2B for an illustration of the reference measurements:

$T(P_0)$ ±10% of P_0

c. Alternate method for Control Dynamics Evaluation. Another acceptable method of evaluating the response and the tolerance to be applied for airplanes with hydraulically powered flight controls and artificial feel systems is described below. Instead of free response measurements, the system is validated by measurements of control force and rate of movement. A sponsor using this alternate method to comply with the QPS requirements should perform the tests as follows:

(1) For each axis of pitch, roll and yaw, the control should be forced to its maximum extreme position for the following distinct rates. These tests would be conducted at typical taxi, takeoff, cruise and landing conditions.

(a) Static test. Slowly move the control such that approximately 100 seconds are required to achieve a full sweep. 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 in approximately 10 seconds.

(c) Fast dynamic test. Achieve a full sweep in approximately 4 seconds.

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

(2) *Tolerances.*

(a) Static test. Same as tests 2.a.1., 2.a.2., and 2.a.3. in Table A2A in this attachment.

(b) Dynamic test. ±2 lb (±0.9 daN)or ±10 per cent on dynamic increment above static test.

(c) The NSPM are open to alternative means such as the one described above. Such alternatives, however, would have to be justified and appropriate to the application. For example, the method described here may not apply to all manufacturers' systems and certainly not to airplanes with reversible control systems. Hence, each case shall be considered on its own merit on an ad hoc basis. If the NSPM finds that alternative methods do not result in satisfactory performance, then more conventionally accepted methods must be used.

END INFORMATION

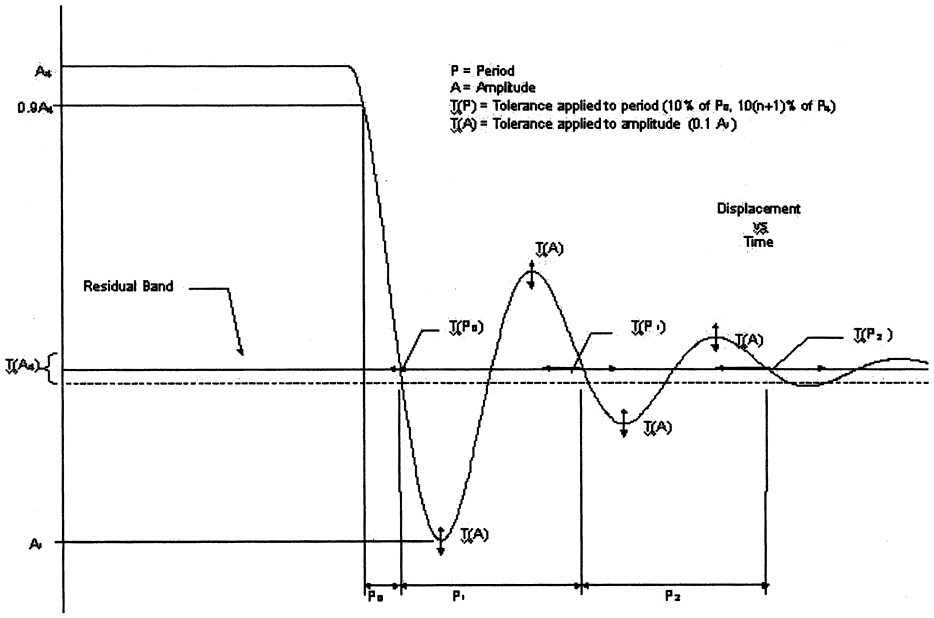


Figure A2A
Underdamped Step Response

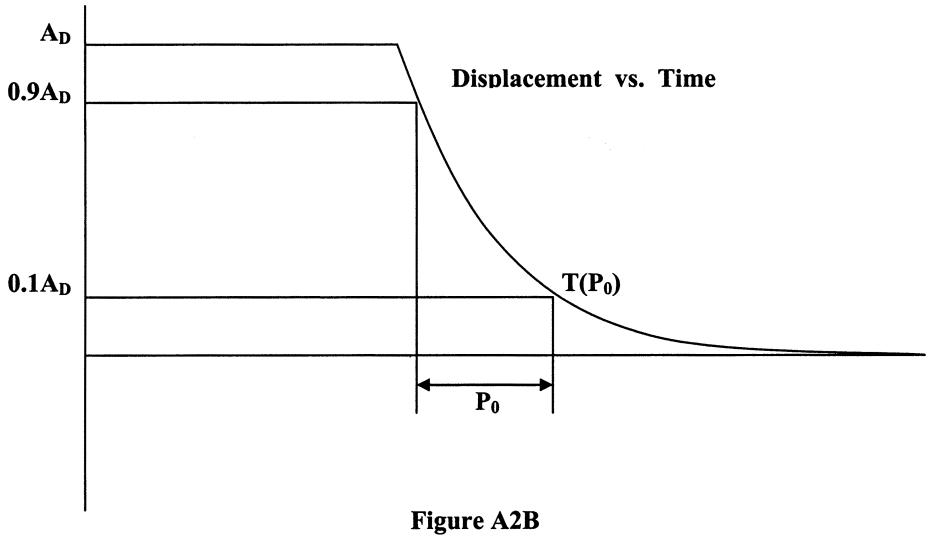


Figure A2B
Critically and Overdamped Step Response

BEGIN INFORMATION

4. GROUND EFFECT

a. For an FFS to be used for take-off and landing (not applicable to Level A simulators in that the landing maneuver may not be credited in a Level A simulator) it should reproduce the aerodynamic changes that occur in ground effect. The parameters chosen for FFS validation should indicate these changes.

(1) A dedicated test should be provided that will validate the aerodynamic ground effect characteristics.

(2) The organization performing the flight tests may select appropriate test methods and procedures to validate ground effect. However, the flight tests should be performed with enough duration near the ground to sufficiently validate the ground-effect model.

b. The NSPM will consider the merits of testing methods based on reliability and consistency. Acceptable methods of validating ground effect are described below. If other methods are proposed, rationale should be provided to conclude that the tests performed validate the ground-effect model. A sponsor using the methods described below to comply with the QPS requirements should perform the tests as follows:

(1) Level fly-bys. The level fly-bys should be conducted at a minimum of three altitudes within the ground effect, including one at no more than 10% of the wingspan above the ground, one each at approximately 30% and 50% of the wingspan where height refers to main gear tire above the ground. In addition, one level-flight trim condition should be conducted out of ground effect (*e.g.*, at 150% of wingspan).

(2) Shallow approach landing. The shallow approach landing should be performed at a glide slope of approximately one degree with negligible pilot activity until flare.

c. The lateral-directional characteristics are also altered by ground effect. For example, because of changes in lift, roll damping is affected. The change in roll damping will affect other dynamic modes usually evaluated for FFS validation. In fact, Dutch roll dynamics, spiral stability, and roll-rate for a given lateral control input are altered by ground effect. Steady heading sideslips will also be affected. These effects should be accounted for in the FFS modeling. Several tests such as crosswind landing, one engine inoperative landing, and engine failure on take-off serve to validate lateral-directional ground effect since portions of these tests are accomplished as the aircraft is descending through heights above the runway at which ground effect is an important factor.

5. [RESERVED]

6. [RESERVED]

7. [RESERVED]

8. [RESERVED]

9. [RESERVED]

10. [RESERVED]

11. [RESERVED]

12. [RESERVED]

13. [RESERVED]

14. [RESERVED]

15. [RESERVED]

END INFORMATION

BEGIN INFORMATION

16. ALTERNATIVE DATA SOURCES, PROCEDURES, AND INSTRUMENTATION: LEVEL A AND LEVEL B SIMULATORS ONLY

a. In recent years, considerable progress has been made in the improvement of aerodynamic modeling techniques. Additionally, those who have demonstrated success in combining these modeling techniques with minimal flight testing have incorporated the use of highly mature flight controls models and have had extensive experience in comparing the output of their effort with actual flight test data.

b. It has become standard practice for experienced simulator manufacturers to use modeling techniques to establish databases for new simulator configurations while awaiting the availability of actual flight test data. The data generated from the aerodynamic modeling techniques is then compared to the flight test data when it becomes available. The results of such comparisons have become increasingly consistent, indicating that these techniques, applied with the appropriate experience, are dependable and accurate for the development of aerodynamic models for use in Level A and Level B simulators.

c. Based on this history of successful comparisons, the NSPM has concluded that those who are experienced in the development of aerodynamic models may use modeling techniques to alter the method for acquiring flight test data for Level A or Level B simulators.

d. The information in Table A2E (Alternative Data Sources, Procedures, and Instrumentation) is presented to describe an acceptable alternative to data sources for simulator modeling and validation and an acceptable alternative to the procedures and

instrumentation traditionally used to gather such modeling and validation data.

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

(2) The sponsor should coordinate with the NSPM prior to using alternative data sources in a flight test or data gathering effort.

e. The NSPM position regarding the use of these alternative data sources, procedures, and instrumentation is based on the following presumptions:

(1) Data gathered through the alternative means does not require angle of attack (AOA) measurements or control surface position measurements for any flight test. However, AOA can be sufficiently derived if the flight test program ensures the collection of acceptable level, unaccelerated, trimmed flight data. All of the simulator time history tests that begin in level, unaccelerated, and trimmed flight, including the three basic trim tests and ''fly-by'' trims, can be a successful validation of angle of attack by comparison with flight test pitch angle. (NOTE: Due to the criticality of angle of attack in the development of the ground effects model, particularly critical for normal landings and landings involving cross-control input applicable to Level B simulators, stable ''fly-by'' trim data will be the acceptable norm for normal and cross-control input landing objective data for these applications.)

(2) The use of a rigorously defined and fully mature simulation controls system model that includes accurate gearing and cable stretch characteristics (where applicable), determined from actual aircraft measurements. Such a model does not require control surface position measurements in the flight test objective data in these limited applications.

(3) The authorized uses of Level A and Level B simulators (as listed in the appropriate Commercial, Instrument, or Airline Transport Pilot and/or Type Rating Practical Test Standards) for ''initial,'' ''transition,'' or ''upgrade'' training, still requires additional flight training and/or flight testing/checking in the airplane or in a Level C or Level D simulator.

f. The sponsor is urged to contact the NSPM for clarification of any issue regarding airplanes with reversible control systems. Table A2E is not applicable to Computer Controlled Aircraft full flight simulators.

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

h. The term ''inertial measurement system'' is used in the following table to include the use of a functional global positioning system (GPS).

END INFORMATION

TABLE A2E—ALTERNATIVE DATA SOURCES, PROCEDURES, AND INSTRUMENTATION

Information				
Table of objective tests	Sim level		Alternative data sources, procedures, and instrumentation	Notes and reminders
Test reference number and title	A	B		
1.a.1. Performance. Taxi. Minimum Radius turn.	X	X	TIR, AFM, or Design data may be used.	
1.a.2. Performance. Taxi. Rate of Turn vs. Nosewheel Steering Angle.		X	Data may be acquired by using a constant tiller position, measured with a protractor or full rudder pedal application for steady state turn, and synchronized video of heading indicator. If less than full rudder pedal is used, pedal position must be recorded.	A single procedure may not be adequate for all airplane steering systems, therefore appropriate measurement procedures must be devised and proposed for NSPM concurrence.
1.b.1. Performance. Takeoff. Ground Acceleration Time and Distance.	X	X	Preliminary certification data may be used. Data may be acquired by using a stopwatch, calibrated airspeed, and runway markers during a takeoff with power set before brake release. Power settings may be hand recorded. If an inertial measurement system is installed, speed and distance may be derived from acceleration measurements.	

TABLE A2E—ALTERNATIVE DATA SOURCES, PROCEDURES, AND INSTRUMENTATION—Continued

Information				
Table of objective tests	Sim level		Alternative data sources, procedures, and instrumentation	Notes and reminders
Test reference number and title	A	B		
1.b.2. Performance. Takeoff. Minimum Control Speed—ground (V_{mcg}) using aerodynamic controls only (per applicable airworthiness standard) or low speed, engine inoperative ground control characteristics.	X	X	Data may be acquired by using an inertial measurement system and a synchronized video of: The calibrated airplane instruments and the force/position measurements of cockpit controls..	Rapid throttle reductions at speeds near V_{mcg} may be used while recording appropriate parameters. The nose wheel must be free to caster, or equivalently freed of sideforce generation.
1.b.3. Performance. Takeoff. Minimum Unstick Speed (V_{mu}) or equivalent test to demonstrate early rotation takeoff characteristics.	X	X	Data may be acquired by using an inertial measurement system and a synchronized video of: The calibrated airplane instruments and the force/position measurements of cockpit controls.	
1.b.4. Performance. Takeoff. Normal Takeoff.	X	X	Data may be acquired by using an inertial measurement system and a synchronized video of: The calibrated airplane instruments and the force/position measurements of cockpit controls. AOA can be calculated from pitch attitude and flight path.	
1.b.5. Performance. Takeoff. Critical Engine Failure during Takeoff.	X	X	Data may be acquired by using an inertial measurement system and a synchronized video of: The calibrated airplane instruments and the force/position measurements of cockpit controls.	Record airplane dynamic response to engine failure and control inputs required to correct flight path.
1.b.6. Performance. Takeoff. Crosswind Takeoff.	X	X	Data may be acquired by using an inertial measurement system and a synchronized video of: The calibrated airplane instruments and the force/position measurements of cockpit controls.	The ''1:7 law'' to 100 feet (30 meters) is an acceptable wind profile.
1.b.7. Performance. Takeoff. Rejected Takeoff.	X	X	Data may be acquired with a synchronized video of: Calibrated airplane instruments, thrust lever position, engine parameters, and distance (e.g., runway markers). A stopwatch is required.	
1.b.8. Dynamic Engine Failure After Takeoff.	N/A	N/A	Applicable only to Level C or Level D FSTDs.	
1.c.1. Performance. Climb. Normal Climb all engines operating..	X	X	Data may be acquired with a synchronized video of: Calibrated airplane instruments and engine power throughout the climb range.	
1.c.2. Performance. Climb. One engine Inoperative Climb.	X	X	Data may be acquired with a synchronized video of: Calibrated airplane instruments and engine power throughout the climb range.	
1.c.3. One Engine Inoperative—Enroute Climb.	N/A	N/A	Applicable only to Level C or Level D FSTDs.	
1.c.4. Performance. Climb. One Engine Inoperative Approach Climb (if approved AFM requires specific performance in icing conditions).	X	X	Data may be acquired with a synchronized video of calibrated airplane instruments and engine power throughout the climb range.	

TABLE A2E—ALTERNATIVE DATA SOURCES, PROCEDURES, AND INSTRUMENTATION—Continued

Information				
Table of objective tests	Sim level		Alternative data sources, procedures, and instrumentation	Notes and reminders
Test reference number and title	A	B		
1.d.1. Cruise/Descent. Level flight acceleration..	X	X	Data may be acquired with a synchronized video of: calibrated airplane instruments, thrust lever position, engine parameters, and elapsed time.	
1.d.2. Cruise/Descent. Level flight deceleration.	X	X	Data may be acquired with a synchronized video of: Calibrated airplane instruments, thrust lever position, engine parameters, and elapsed time.	
1.d.3. Cruise Performance	N/A	N/A	Applicable only to Level C or Level D FSTDs.	
1.d.4. Cruise/Descent. Idle descent.	X	X	Data may be acquired with a synchronized video of: calibrated airplane instruments, thrust lever position, engine parameters, and elapsed time.	
1.d.5. Cruise/Descent. Emergency Descent.	X	X	Data may be acquired with a synchronized video of: calibrated airplane instruments, thrust lever position, engine parameters, and elapsed time.	
1.e.1. Performance. Stopping. Deceleration time and distance, using manual application of wheel brakes and no reverse thrust on a dry runway.	X	X	Data may be acquired during landing tests using a stopwatch, runway markers, and a synchronized video of: Calibrated airplane instruments, thrust lever position and the pertinent parameters of engine power.	
1.e.2. Performance. Ground. Deceleration Time and Distance, using reverse thrust and no wheel brakes.	X	X	Data may be acquired during landing tests using a stop watch, runway markers, and a synchronized video of: Calibrated airplane instruments, thrust lever position and the pertinent parameters of engine power.	
1.e.3. Stopping Distance—wheel brakes, and no reverse thrust on a wet runway.	N/A	N/A	Applicable only to Level C and Level D FSTDs.	
1.e.4. Stopping Distance—wheel brakes, and no reverse thrust on an icy runway.	N/A	N/A	Applicable only to Level C and Level D FSTDs.	
1.f.1. Performance. Engines. Acceleration.	X	X	Data may be acquired with a synchronized video recording of: engine instruments and throttle position.	
1.f.2. Performance. Engines. Deceleration.	X	X	Data may be acquired with a synchronized video recording of: Engine instruments and throttle position.	
2.a.1.a. Handling Qualities. Static Control Checks. Pitch Controller Position vs. Force and Surface Position Calibration.	X	X	Surface position data may be acquired from flight data recorder (FDR) sensor or, if no FDR sensor, at selected, significant column positions (encompassing significant column position data points), acceptable to the NSPM, using a control surface protractor on the ground (for airplanes with reversible control systems, this function should be accomplished with winds less than 5 kts.). Force data may be acquired by using a hand-held force gauge at the same column position data points.	

TABLE A2E—ALTERNATIVE DATA SOURCES, PROCEDURES, AND INSTRUMENTATION—Continued

Information				
Table of objective tests	Sim level		Alternative data sources, procedures, and instrumentation	Notes and reminders
Test reference number and title	A	B		
2.a.2.a. Handling Qualities. Static Control Checks. Roll Controller Position vs. Force and Surface Position Calibration.	X	X	Surface position data may be acquired from flight data recorder (FDR) sensor or, if no FDR sensor, at selected, significant wheel positions (encompassing significant wheel position data points), acceptable to the NSPM, using a control surface protractor on the ground (for airplanes with reversible control systems, this function should be accomplished with winds less than 5 kts.). Force data may be acquired by using a hand-held force gauge at the same wheel position data points.	
2.a.3.a. Handling Qualities. Static Control Checks. Rudder Pedal Position vs. Force and Surface Position Calibration.	X	X	Surface position data may be acquired from flight data recorder (FDR) sensor or, if no FDR sensor, at selected, significant rudder pedal positions (encompassing significant rudder pedal position data points), acceptable to the NSPM, using a control surface protractor on the ground (for airplanes with reversible control systems, this function should be accomplished with winds less than 5 kts.). Force data may be acquired by using a hand-held force gauge at the same rudder pedal position data points.	
2.a.4. Handling Qualities. Static Control Checks. Nosewheel Steering Controller Force & Position.	X	X	Breakout data may be acquired with a hand-held force gauge. The remainder of the force to the stops may be calculated if the force gauge and a protractor are used to measure force after breakout for at least 25% of the total displacement capability.	
2.a.5. Handling Qualities. Static Control Checks. Rudder Pedal Steering Calibration.	X	X	Data may be acquired through the use of force pads on the rudder pedals and a pedal position measurement device, together with design data for nose wheel position.	
2.a.6. Handling Qualities. Static Control Checks. Pitch Trim Indicator vs. Surface Position Calibration.	X	X	Data may be acquired through calculations.	
2.a.7. Handling qualities. Static control tests. Pitch trim rate..	X	X	Data may be acquired by using a synchronized video of pitch trim indication and elapsed time through range of trim indication.	
2.a.8. Handling Qualities. Static Control tests. Alignment of Cockpit Throttle Lever Angle vs. Selected engine parameter.	X	X	Data may be acquired through the use of a temporary throttle quadrant scale to document throttle position. Use a synchronized video to record steady state instrument readings or hand-record steady state engine performance readings.	
2.a.9. Handling qualities. Static control tests. Brake pedal position vs. force and brake system pressure calibration.	X	X	Use of design or predicted data is acceptable. Data may be acquired by measuring deflection at ''zero'' and ''maximum'' and calculating deflections between the extremes using the airplane design data curve.	

TABLE A2E—ALTERNATIVE DATA SOURCES, PROCEDURES, AND INSTRUMENTATION—Continued

Information				
Table of objective tests	Sim level		Alternative data sources, procedures, and instrumentation	Notes and reminders
Test reference number and title	A	B		
2.c.1. Handling qualities. Longitudinal control tests. Power change dynamics.	X	X	Data may be acquired by using an inertial measurement system and a synchronized video of: The calibrated airplane instruments and throttle position.	
2.c.2. Handling qualities. Longitudinal control tests. Flap/slat change dynamics.	X	X	Data may be acquired by using an inertial measurement system and a synchronized video of: Calibrated airplane instruments and flap/slat position.	
2.c.3. Handling qualities. Longitudinal control tests. Spoiler/speedbrake change dynamics.	X	X	Data may be acquired by using an inertial measurement system and a synchronized video of: The calibrated airplane instruments and spoiler/speedbrake position.	
2.c.4. Handling qualities. Longitudinal control tests. Gear change dynamics.	X	X	Data may be acquired by using an inertial measurement system and a synchronized video of: The calibrated airplane instruments and gear position.	
2.c.5. Handling qualities. Longitudinal control tests. Longitudinal trim.	X	X	Data may be acquired through use of an inertial measurement system and a synchronized video of: The cockpit controls position (previously calibrated to show related surface position) and the engine instrument readings.	
2.c.6. Handling qualities. Longitudinal control tests. Longitudinal maneuvering stability (stick force/g).	X	X	Data may be acquired through the use of an inertial measurement system and a synchronized video of: The calibrated airplane instruments; a temporary, high resolution bank angle scale affixed to the attitude indicator; and a wheel and column force measurement indication.	
2.c.7. Handling qualities. Longitudinal control tests. Longitudinal static stability.	X	X	Data may be acquired through the use of a synchronized video of: the airplane flight instruments and a hand-held force gauge.	
2.c.8. Handling qualities. Longitudinal control tests. Stall characteristics.	X	X	Data may be acquired through a synchronized video recording of: A stopwatch and the calibrated airplane airspeed indicator. Hand-record the flight conditions and airplane configuration.	Airspeeds may be cross-checked with those in the TIR and AFM.
2.c.9. Handling qualities. Longitudinal control tests. Phugoid dynamics.	X	X	Data may be acquired by using an inertial measurement system and a synchronized video of: The calibrated airplane instruments and the force/position measurements of cockpit controls.	
2.c.10. Handling qualities. Longitudinal control tests. Short period dynamics.		X	Data may be acquired by using an inertial measurement system and a synchronized video of: The calibrated airplane instruments and the force/position measurements of cockpit controls.	
2.d.1. Handling qualities. Lateral directional tests. Minimum control speed, air (V_{mca} or V_{mci}), per applicable airworthiness standard or Low speed engine inoperative handling characteristics in the air.	X	X	Data may be acquired by using an inertial measurement system and a synchronized video of: The calibrated airplane instruments and the force/position measurements of cockpit controls.	

TABLE A2E—ALTERNATIVE DATA SOURCES, PROCEDURES, AND INSTRUMENTATION—Continued

Information				
Table of objective tests	Sim level		Alternative data sources, procedures, and instrumentation	Notes and reminders
Test reference number and title	A	B		
2.d.2. Handling qualities. Lateral directional tests. Roll response (rate).	X	X	Data may be acquired by using an inertial measurement system and a synchronized video of: The calibrated airplane instruments and the force/position measurements of cockpit lateral controls.	May be combined with step input of cockpit roll controller test, 2.d.3
2.d.3. Handling qualities. Lateral directional tests. Roll response to cockpit roll controller step input.	X	X	Data may be acquired by using an inertial measurement system and a synchronized video of: The calibrated airplane instruments and the force/position measurements of cockpit lateral controls..	
2.d.4. Handling qualities. Lateral directional tests. Spiral stability.	X	X	Data may be acquired by using an inertial measurement system and a synchronized video of: The calibrated airplane instruments; the force/position measurements of cockpit controls; and a stopwatch.	
2.d.5. Handling qualities. Lateral directional tests. Engine inoperative trim.	X	X	Data may be hand recorded in-flight using high resolution scales affixed to trim controls that have been calibrated on the ground using protractors on the control/trim surfaces with winds less than 5 kts.. OR Data may be acquired during second segment climb (with proper pilot control input for an engine-out condition) by using a synchronized video of: The calibrated airplane instruments; and the force/position measurements of cockpit controls	Trimming during second segment climb is not a certification task and should not be conducted until a safe altitude is reached.
2.d.6. Handling qualities. Lateral directional tests. Rudder response.	X	X	Data may be acquired by using an inertial measurement system and a synchronized video of: The calibrated airplane instruments; the force/position measurements of rudder pedals.	
2.d.7. Handling qualities. Lateral directional tests. Dutch roll, (yaw damper OFF).	X	X	Data may be acquired by using an inertial measurement system and a synchronized video of: The calibrated airplane instruments; the force/position measurements of cockpit controls.	
2.d.8. Handling qualities. Lateral directional tests. Steady state sideslip.		X	Data may be acquired by using an inertial measurement system and a synchronized video of: The calibrated airplane instruments; the force/position measurements of cockpit controls. Ground track and wind corrected heading may be used for sideslip angle..	
2.e.1. Handling qualities. Landings. Normal landing.		X	Data may be acquired by using an inertial measurement system and a synchronized video of: The calibrated airplane instruments; the force/position measurements of cockpit controls.	

TABLE A2E—ALTERNATIVE DATA SOURCES, PROCEDURES, AND INSTRUMENTATION—Continued

Information				
Table of objective tests	Sim level		Alternative data sources, procedures, and instrumentation	Notes and reminders
Test reference number and title	A	B		
2.e.3. Handling qualities. Landings. Crosswind landing.		X	Data may be acquired by using an inertial measurement system and a synchronized video of: The calibrated airplane instruments; the force/position measurements of cockpit controls.	
2.e.4. Handling qualities. Landings. One engine inoperative landing.		X	Data may be acquired by using an inertial measurement system and a synchronized video of: The calibrated airplane instruments; the force/position measurements of cockpit controls. Normal and lateral accelerations may be recorded in lieu of AOA and sideslip.	
2.e.5. Handling qualities. Landings. Autopilot landing (if applicable).		X	Data may be acquired by using an inertial measurement system and a synchronized video of: the calibrated airplane instruments; the force/position measurements of cockpit controls. Normal and lateral accelerations may be recorded in lieu of AOA and sideslip.	
2.e.6. Handling qualities. Landings. All engines operating, autopilot, go around.		X	Data may be acquired by using an inertial measurement system and a synchronized video of: The calibrated airplane instruments; the force/position measurements of cockpit controls. Normal and lateral accelerations may be recorded in lieu of AOA and sideslip.	
2.e.7. Handling qualities. Landings. One engine inoperative go around.		X	Data may be acquired by using an inertial measurement system and a synchronized video of: The calibrated airplane instruments; the force/position measurements of cockpit controls. Normal and lateral accelerations may be recorded in lieu of AOA and sideslip.	
2.e.8. Handling qualities. Landings. Directional control (rudder effectiveness with symmetric thrust).		X	Data may be acquired by using an inertial measurement system and a synchronized video of: The calibrated airplane instruments; the force/position measurements of cockpit controls. Normal and lateral accelerations may be recorded in lieu of AOA and sideslip.	
2.e.9. Handling qualities. Landings. Directional control (rudder effectiveness with asymmetric reverse thrust).			Data may be acquired by using an inertial measurement system and a synchronized video of: The calibrated airplane instruments; the force/position measurements of cockpit controls. Normal and lateral accelerations may be recorded in lieu of AOA and sideslip.	
2.f. Handling qualities. Ground effect. Test to demonstrate ground effect.		X	Data may be acquired by using calibrated airplane instruments, an inertial measurement system, and a synchronized video of: The calibrated airplane instruments; the force/position measurements of cockpit controls.	

ATTACHMENT 3 TO APPENDIX A TO PART 60—SIMULATOR SUBJECTIVE EVALUATION

1. DISCUSSION

BEGIN INFORMATION

a. The subjective tests provide a basis for evaluating the capability of the simulator to perform over a typical utilization period; determining that the simulator accurately simulates each required maneuver, procedure, or task; and verifying correct operation of the simulator controls, instruments, and systems. The items listed in the following Tables are for simulator evaluation purposes only. They must not be used to limit or exceed the authorizations for use of a given level of simulator as described on the Statement of Qualification or as may be approved by the TPAA.

b. The tests in Table A3A, Operations Tasks, in this attachment, address pilot functions, including maneuvers and procedures (called flight tasks), and is divided by flight phases. The performance of these tasks by the NSPM includes an operational examination of the visual system and special effects. There are flight tasks included to address some features of advanced technology airplanes and innovative training programs. For example, ''high angle-of-attack maneuvering'' is included to provide a required alternative to ''approach to stalls'' for airplanes employing flight envelope protection functions.

c. The tests in Table A3A, Operations Tasks, and Table A3G, Instructor Operating Station of this attachment, address the overall function and control of the simulator including the various simulated environmental conditions; simulated airplane system operations (normal, abnormal, and emergency); visual system displays; and special effects necessary to meet flight crew training, evaluation, or flight experience requirements.

d. All simulated airplane 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 flight tasks or events within that flight phase. Simulated airplane systems are listed separately under ''Any Flight Phase'' to ensure appropriate attention to systems checks. Operational navigation systems (including inertial navigation systems, global positioning systems, or other long-range systems) and the associated electronic display systems will be evaluated if installed. The NSP pilot will include in his report to the TPAA, the effect of the system operation and any system limitation.

e. Simulators demonstrating a satisfactory circling approach will be qualified for the circling approach maneuver and may be approved for such use by the TPAA in the sponsor's FAA-approved flight training program. To be considered satisfactory, the circling approach will be flown at maximum gross weight for landing, with minimum visibility for the airplane approach category, and must allow proper alignment with a landing runway at least 90° different from the instrument approach course while allowing the pilot to keep an identifiable portion of the airport in sight throughout the maneuver (reference—14 CFR 91.175(e)).

f. At the request of the TPAA, the NSPM may assess a device to determine if it is capable of simulating certain training activities in a sponsor's training program, such as a portion of a Line Oriented Flight Training (LOFT) scenario. Unless directly related to a requirement for the qualification level, the results of such an evaluation would not affect the qualification level of the simulator. However, if the NSPM determines that the simulator does not accurately simulate that training activity, the simulator would not be approved for that training activity.

g. Previously qualified simulators with certain early generation Computer Generated Image (CGI) visual systems, are limited by either the capability of the Image Generator or the display system used. These systems are:

(1) Early CGI visual systems that are excepted from the requirement of including runway numbers as a part of the specific runway marking requirements are:

(a) Link NVS and DNVS.

(b) Novoview 2500 and 6000.

(c) FlightSafety VITAL series up to, and including, VITAL III, but not beyond.

(d) Redifusion SP1, SP1T, and SP2.

(2) Some early CGI visual systems are excepted from the requirement of including runway numbers, unless the runways are used for LOFT training sessions. These LOFT airport models require runway numbers but only for the specific runway end (one direction) used in the LOFT session. The systems required to display runway numbers only for LOFT scenes are:

(a) FlightSafety VITAL IV.

(b) Redifusion SP3 and SP3T.

(c) Link-Miles Image II.

(3) The following list of previously qualified CGI and display systems are incapable of generating blue lights. These systems are not required to have accurate taxi-way edge lighting:

(a) Redifusion SP1.

(b) FlightSafety Vital IV.

(c) Link-Miles Image II and Image IIT.

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

The NSPM will evaluate each device to determine the appropriate qualification level

based on the limitations of the visual system.

END INFORMATION

TABLE A3A—FUNCTIONS AND SUBJECTIVE TESTS

<<< QPS requirements >>>

Item No.	Operations tasks	Simulator level			
		A	B	C	D
	Tasks in this table are subjecgt to evaluation if appropriate for the airplane simulated as indicated in the SOQ Configuration List and/or the level of simulator qualification involved. Items not installed or not functional on the simulator and, therefore, not appearing on the SOQ Configuration List, are not required to be listed as exceptions on the SOQ.				
1.	Preparation For Flight. Preflight. Accomplish a functions check of all switches, indicators, systems, and equipment at all crewmembers' and instructors' stations and determine that the flight deck design and functions are identical to that of the airplane simulated.	X	X	X	X
2.	Surface Operations (Pre-Take-Off).				
2.a.	Engine Start.				
2.a.1.	Normal start	X	X	X	X
2.a.2.	Alternate start procedures	X	X	X	X
2.a.3.	Abnormal starts and shutdowns (e.g., hot/hung start, tail pipe fire)	X	X	X	X
2.b.	Pushback/Powerback		X	X	X
2.c.	Taxi.				
2.c.1.	Thrust response	X	X	X	X
2.c.2.	Power lever friction	X	X	X	X
2.c.3.	Ground handling	X	X	X	X
2.c.4.	Nose wheel scuffing			X	X
2.c.5.	Brake operation (normal and alternate/emergency)	X	X	X	X
2.c.6.	Brake fade (if applicable)	X	X	X	X
3.	Take-off.				
3.a.	Normal.				
3.a.1.	Airplane/engine parameter relationships	X	X	X	X
3.a.2.	Acceleration characteristics (motion)	X	X	X	X
3.a.3.	Nose wheel and rudder steering	X	X	X	X
3.a.4.	Crosswind (maximum demonstrated)	X	X	X	X
3.a.5.	Special performance (e.g., reduced V_1, max de-rate, short field operations)	X	X	X	X
3.a.6.	Low visibility take-off	X	X	X	X
3.a.7.	Landing gear, wing flap leading edge device operation	X	X	X	X
3.a.8.	Contaminated runway operation			X	X
3.b.	Abnormal/emergency				
3.b.1.	Rejected Take-off	X	X	X	X
3.b.2.	Rejected special performance (e.g., reduced V_1, max de-rate, short field operations).	X	X	X	X
3.b.3.	With failure of most critical engine at most critical point, continued take-off	X	X	X	X

TABLE A3A—FUNCTIONS AND SUBJECTIVE TESTS—Continued

<<< QPS requirements >>>					
Item No.	Operations tasks	Simulator level			
		A	B	C	D
3.b.4.	With wind shear	X	X	X	X
3.b.5.	Flight control system failures, reconfiguration modes, manual reversion and associated handling.	X	X	X	X
3.b.6.	Rejected takeoff with brake fade			X	X
3.b.7.	Rejected, contaminated runway			X	X
	(i).				
4.	Climb.				
4.a.	Normal.	X	X	X	X
4.b.	One or more engines inoperative	X	X	X	X
5.	Cruise.				
5.a.	Performance characteristics (speed vs. power)	X	X	X	X
5.b.	High altitude handling	X	X	X	X
5.c.	High Mach number handling (Mach tuck, Mach buffet) and recovery (trim change).	X	X	X	X
5.d.	Overspeed warning (in excess of V_{mo} or M_{mo})	X	X	X	X
5.e.	High IAS handling	X	X	X	X
6.	Maneuvers.				
6.a.	High angle of attack, approach to stalls, stall warning, buffet, and g-break (take-off, cruise, approach, and landing configuration).	X	X	X	X
6.b.	Flight envelope protection (high angle of attack, bank limit, overspeed, etc)	X	X	X	X
6.c.	Turns with/without speedbrake/spoilers deployed	X	X	X	X
6.d.	Normal and steep turns	X	X	X	X
6.e.	In flight engine shutdown and restart (assisted and windmill)	X	X	X	X
6.f.	Maneuvering with one or more engines inoperative, as appropriate	X	X	X	X
6.g.	Specific flight characteristics (e.g., direct lift control)	X	X	X	X
6.h.	Flight control system failures, reconfiguration modes, manual reversion and associated handling.	X	X	X	X
7.	Descent.				
7.a.	Normal	X	X	X	X
7.b.	Maximum rate (clean and with speedbrake, etc)	X	X	X	X
7.c.	With autopilot	X	X	X	X
7.d.	Flight control system failures, reconfiguration modes, manual reversion and associated handling.	X	X	X	X
8.	Instrument Approaches and Landing.				

TABLE A3A—FUNCTIONS AND SUBJECTIVE TESTS—Continued

<<< QPS requirements >>>					
Item No.	Operations tasks	Simulator level			
		A	B	C	D
	Those instrument approach and landing tests relevant to the simulated airplane type are selected from the following list. Some tests are made with limiting wind velocities, under windshear conditions, and with relevant system failures, including the failure of the Flight Director. If Standard Operating Procedures allow use autopilot for non-precision approaches, evaluation of the autopilot will be included. Level A simulators are not authorized to credit the landing maneuver.				
8.a.	Precision.				
8.a.1.	PAR	X	X	X	X
8.a.2.	CAT I/GBAS (ILS/MLS) published approaches	X	X	X	X
	(i) Manual approach with/without flight director including landing	X	X	X	X
	(ii) Autopilot/autothrottle coupled approach and manual landing	X	X	X	X
	(iii) Manual approach to DH and go-around all engines.	X	X	X	X
	(iv) Manual one engine out approach to DH and go-around	X	X	X	X
	(v) Manual approach controlled with and without flight director to 30 m (100 ft) below CAT I minima.				
	A. With cross-wind (maximum demonstrated)	X	X	X	X
	B. With windshear	X	X	X	X
	(vi) Autopilot/autothrottle coupled approach, one engine out to DH and go-around approach, one engine out to DH and go-around.	X	X	X	X
	(vii) Approach and landing with minimum/standby electrical power	X	X	X	X
8.a.3.	CAT II/GBAS (ILS/MLS) published approaches.	X	X	X	X
	(i) Autopilot/autothrottle coupled approach to DH and landing	X	X	X	X
	(ii) Autopilot/autothrottle coupled approach to DH and go-around	X	X	X	X
	(iii) Autocoupled approach to DH and manual go-around	X	X	X	X
	(iv) Category II published approach (auto-coupled, autothrottle)	X	X	X	X
8.a.4.	CAT III/GBAS (ILS/MLS) published approaches	X	X	X	X
	(i) Autopilot/autothrottle coupled approach to land and rollout	X	X	X	X
	(ii) Autopilot/autothrottle coupled approach to DH/Alert Height and go-around	X	X	X	X
	(iii) Autopilot/autothrottle coupled approach to land and rollout with one engine out.	X	X	X	X
	(iv) Autopilot/autothrottle coupled approach to DH/Alert Height and go-around with one engine out.	X	X	X	X
	(v) Autopilot/autothrottle coupled approach (to land or to go around)	X	X	X	X
	A. With generator failure	X	X	X	X
	B. With 10 knot tail wind	X	X	X	X
	C. With 10 knot crosswind	X	X	X	X
		X	X	X	X
8.b.	Non-precision.				
8.b.1.	NDB	X	X	X	X
8.b.2.	VOR, VOR/DME, VOR/TAC	X	X	X	X
8.b.3.	RNAV (GNSS/GPS)	X	X	X	X
8.b.4.	ILS LLZ (LOC), LLZ(LOC)/BC	X	X	X	X

TABLE A3A—FUNCTIONS AND SUBJECTIVE TESTS—Continued

<<< QPS requirements >>>					
Item No.	Operations tasks	Simulator level			
		A	B	C	D
8.b.5.	ILS offset localizer	X	X	X	X
8.b.6.	Direction finding facility (ADF/SDF)	X	X	X	X
8.b.7.	Airport surveillance radar (ASR)	X	X	X	X
9.	Visual Approaches (Visual Segment) And Landings				
	Flight simulators with visual systems, which permit completing a special approach procedure in accordance with applicable regulations, may be approved for that particular approach procedure				
9.a.	Maneuvering, normal approach and landing, all engines operating with and without visual approach aid guidance.	X	X	X	X
9.b.	Approach and landing with one or more engines inoperative	X	X	X	X
9.c.	Operation of landing gear, flap/slats and speedbrakes (normal and abnormal)	X	X	X	X
9.d.	Approach and landing with crosswind (max. demonstrated)	X	X	X	X
9.e.	Approach to land with windshear on approach	X	X	X	X
9.f.	Approach and landing with flight control system failures, reconfiguration modes, manual reversion and associated handling (most significant degradation which is probable).	X	X	X	X
9.g.	Approach and landing with trim malfunctions	X	X	X	X
9.g.1.	Longitudinal trim malfunction	X	X	X	X
9.g.2.	Lateral-directional trim malfunction	X	X	X	X
9.h.	Approach and landing with standby (minimum) electrical/hydraulic power	X	X	X	X
9.i.	Approach and landing from circling conditions (circling approach)	X	X	X	X
9.j.	Approach and landing from visual traffic pattern	X	X	X	X
9.k.	Approach and landing from non-precision approach	X	X	X	X
9.l.	Approach and landing from precision approach	X	X	X	X
9.m.	Approach procedures with vertical guidance (APV), e.g., SBAS.	X	X	X	X
10.	Missed Approach.				
10.a.	All engines	X	X	X	X
10.b.	One or more engine(s) out	X	X	X	X
10.c.	With flight control system failures, reconfiguration modes, manual reversion and associated handling.	X	X	X	X
11.	Surface Operations (Landing roll and taxi).				
11.a.	Spoiler operation	X	X	X	X
11.b.	Reverse thrust operation	X	X	X	X
11.c.	Directional control and ground handling, both with and without reverse thrust		X	X	X
11.d.	Reduction of rudder effectiveness with increased reverse thrust (rear pod-mounted engines).		X	X	X
11.e.	Brake and anti-skid operation with dry, wet, and icy conditions			X	X
11.f.	Brake operation, to include auto-braking system where applicable	X	X	X	X
12.	Any Flight Phase.				

TABLE A3A—FUNCTIONS AND SUBJECTIVE TESTS—Continued

<<< QPS requirements >>>					
Item No.	Operations tasks	Simulator level			
		A	B	C	D
12.a.	Airplane and engine systems operation.				
12.a.1.	Air conditioning and pressurization (ECS)	X	X	X	X
12.a.2.	De-icing/anti-icing	X	X	X	X
12.a.3.	Auxiliary power unit (APU)	X	X	X	X
12.a.4.	Communications	X	X	X	X
12.a.5.	Electrical	X	X	X	X
12.a.6.	Fire and smoke detection and suppression	X	X	X	X
12.a.7.	Flight controls (primary and secondary)	X	X	X	X
12.a.8.	Fuel and oil, hydraulic and pneumatic	X	X	X	X
12.a.9.	Landing gear	X	X	X	X
12.a.10.	Oxygen	X	X	X	X
12.a.11.	Engine	X	X	X	X
12.a.12.	Airborne radar	X	X	X	X
12.a.13.	Autopilot and Flight Director	X	X	X	X
12.a.14.	Collision avoidance systems. (e.g., (E)GPWS, TCAS)	X	X	X	X
12.a.15.	Flight control computers including stability and control augmentation	X	X	X	X
12.a.16.	Flight display systems	X	X	X	X
12.a.17.	Flight management computers	X	X	X	X
12.a.18.	Head-up guidance, head-up displays	X	X	X	X
12.a.19.	Navigation systems	X	X	X	X
12.a.20.	Stall warning/avoidance	X	X	X	X
12.a.21.	Wind shear avoidance equipment	X	X	X	X
12.a.22.	Automatic landing aids	X	X	X	X
12.b.	Airborne procedures				
12.b.1.	Holding	X	X	X	X
12.b.2.	Air hazard avoidance (Traffic, Weather)			X	X
12.b.3.	Windshear.			X	X
12.b.4.	Effects of airframe ice			X	X
12.c.	Engine shutdown and parking.				
12.c.1.	Engine and systems operation	X	X	X	X
12.c.2.	Parking brake operation	X	X	X	X

Table A3B [Reserved]
Table A3C [Reserved]
Table A3D [Reserved]
Table A3E [Reserved]
Table A3F [Reserved]

TABLE A3G— FUNCTIONS AND SUBJECTIVE TESTS

<<< QPS requirements >>>					
Item number	Operations tasks	Simulator level			
		A	B	C	D
	Functions in this table are subject to evaluation only if appropriate for the airplane and/or the system is installed on the specific simular.				
1.	Simulator Power Switch(es)	X	X	X	X
2.	Airplane conditions.				
2.a.	Gross weight, center of gravity, fuel loading and allocation	X	X	X	X
2.b.	Airplane systems status	X	X	X	X
2.c.	Ground crew functions (e.g., ext. power, push back)	X	X	X	X
3.	Airports.				
3.a.	Number and selection	X	X	X	X
3.b.	Runway selection	X	X	X	X
3.c.	Runway surface condition (e.g., rough, smooth, icy, wet)			X	X
3.d.	Preset positions (e.g., ramp, gate, #1 for takeoff, takeoff position, over FAF)	X	X	X	X
3.e.	Lighting controls	X	X	X	X
4.	Environmental controls.				
4.a	Visibility (statute miles (kilometers))	X	X	X	X
4.b.	Runway visual range (in feet (meters))	X	X	X	X
4.c.	Temperature	X	X	X	X
4.d.	Climate conditions (e.g., ice, snow, rain)	X	X	X	X
4.e.	Wind speed and direction	X	X	X	X
4.f.	Windshear			X	X
4.g.	Clouds (base and tops)	X	X	X	X
5.	Airplane system malfunctions (Inserting and deleting malfunctions into the simulator).	X	X	X	X
6.	Locks, Freezes, and Repositioning				
6.a.	Problem (all) freeze / release	X	X	X	X
6.b.	Position (geographic) freeze/release	X	X	X	X
6.c.	Repositioning (locations, freezes, and releases).	X	X	X	X
6.d.	Ground speed control	X	X	X	X
7.	Remote IOS	X	X	X	X
8.	Sound Controls On/ off/ adjustment	X	X	X	X
9.	Motion / Control Loading System.				
9.a.	On / off / emergency stop	X	X	X	X
9.b.	Crosstalk (motion response in a given degree of freedom not perceptible in other degrees of freedom).	X	X	X	X
9.c.	Smoothness (no perceptible ''turn-around bump'' as the direction of motion reverses with the simulator being ''flown'' normally).	X	X	X	X
10.	Observer Seats / Stations. Position / Adjustment / Positive restraint system.	X	X	X	X

BEGIN INFORMATION

1. INTRODUCTION

a. The following is an example test schedule for an Initial/Upgrade evaluation that covers the majority of the requirements set out in the Functions and Subjective test requirements. It is not intended that the schedule be followed line by line, rather, the example should be used as a guide for preparing a schedule that is tailored to the airplane, sponsor, and training task.

b. Functions and subjective tests should be planned. This information has been organized as a reference document with the considerations, methods, and evaluation notes for each individual aspect of the simulator task presented as an individual item. In this way the evaluator can design their own test plan, using the appropriate sections to provide guidance on method and evaluation criteria. Two aspects should be present in any test plan structure:

(1) An evaluation of the simulator to determine that it replicates the aircraft and performs reliably for an uninterrupted period equivalent to the length of a typical training session.

(2) The simulator should be capable of operating reliably after the use of training device functions such as repositions or malfunctions.

c. A detailed understanding of the training task will naturally lead to a list of objectives that the simulator should meet. This list will form the basis of the test plan. Additionally, once the test plan has been formulated, the initial conditions and the evaluation criteria should be established. The evaluator should consider all factors that may have an influence on the characteristics observed during particular training tasks in order to make the test plan successful.

2. EVENTS

a. Initial Conditions.
(1) Airport;
(2) QNH;
(3) Temperature;
(4) Wind/Crosswind;
(5) Zero Fuel Weight/Fuel/Gross Weight/Center of Gravity
b. Initial Checks.
(1) Documentation of Simulator.
(a) Simulator Acceptance Test Manuals.
(b) Simulator Approval Test Guide.
(c) Technical Logbook Open Item List.
(d) Daily Functional Pre-flight Check.
(2) Documentation of User/Carrier Flight Logs.
(a) Simulator Operating/Instructor Manual.
(b) Difference List (Aircraft/Simulator).
(c) Flight Crew Operating Manuals.
(d) Performance Data for Different Fields.
(e) Crew Training Manual.
(f) Normal/Abnormal/Emergency Checklists.
(3) Simulator External Checks.
(a) Appearance and Cleanliness.
(b) Stairway/Access Bridge.
(c) Emergency Rope Ladders.
(d) ''Motion On''/''Flight in Progress'' Lights.
(4) Simulator Internal Checks.
(a) Cleaning/Disinfecting Towels (for cleaning oxygen masks).
(b) Cockpit Layout (compare with difference list).
(5) Equipment.
(a) Quick Donning Oxygen Masks.
(b) Head Sets.
(c) Smoke Goggles.
(d) Sun Visors.
(e) Escape Rope.
(f) Chart Holders.
(g) Flashlights.
(h) Fire Extinguisher (inspection date).
(i) Crash Axe.
(j) Gear Pins.
c. Power Supply and APU Start Checks.
(1) Batteries and Static Inverter.
(2) APU Start with Battery.
(3) APU Shutdown using Fire Handle.
(4) External Power Connection.
(5) APU Start with External Power.
(6) Abnormal APU Start/Operation.
d. Cockpit Checks.
(1) Cockpit Preparation Checks.
(2) FMC Programming.
(3) Communications and Navigational Aids Checks.
e. Engine Start.
(1) Before Start Checks.
(2) Battery Start with Ground Air Supply Unit.
(3) Engine Crossbleed Start.
(4) Normal Engine Start.
(5) Abnormal Engine Starts.
(6) Engine Idle Readings.
(7) After Start Checks.
f. Taxi Checks.
(1) Pushback/Powerback.
(2) Taxi Checks.
(3) Ground Handling Check:
(a) Power required to initiate ground roll.
(b) Thrust response.
(c) Nose Wheel and Pedal Steering.
(d) Nosewheel Scuffing.
(e) Perform 180 degree turns.
(f) Brakes Response and Differential Braking using Normal, Alternate and Emergency.
(g) Brake Systems.
(h) Eye height and fore/aft position.
(4) Runway Roughness.
g. Visual Scene—Ground Assessment.
(Select 3 different visual models and perform the following checks with Day, Dusk and Night selected, as appropriate):
(1) Visual Controls.
(a) Daylight, Dusk, Night Scene Controls.
(b) Cockpit ''Daylight'' ambient lighting.

(c) Environment Light Controls.
(d) Runway Light Controls.
(e) Taxiway Light Controls.
(2) Scene Content.
(a) Ramp area for buildings, gates, airbridges, maintenance ground equipment, parked aircraft.
(b) Daylight shadows, night time light pools.
(c) Taxiways for correct markings, taxiway/runway, marker boards, CAT I & II/III hold points, taxiway shape/grass areas, taxiway light (positions and colors).
(d) Runways for correct markings, lead-off lights, boards, runway slope, runway light positions, and colors, directionality of runway lights.
(e) Airport environment for correct terrain and, significant features.
(f) Visual scene aliasing, color, and occulting levels.
(3) Ground Traffic Selection.
(4) Environment Effects.
(a) Low cloud scene.
(i) Rain:
(A) Runway surface scene.
(B) Windshield wiper—operation and sound.
(ii) Hail:
(A) Runway surface scene.
(B) Windshield wiper—operation and sound.
(b) Lightning/thunder.
(c) Snow/ice runway surface scene.
(d) Fog.
h. Takeoff.
(Select one or several of the following test cases):
(1) T/O Configuration Warnings.
(2) Engine Takeoff Readings.
(3) Rejected Takeoff (Dry/Wet/Icy Runway) and check the following:
(a) Autobrake function.
(b) Anti-skid operation.
(c) Motion/visual effects during deceleration.
(d) Record stopping distance (use runway plot or runway lights remaining).
(Continue taxiing along the runway while applying brakes and check the following).
(e) Center line lights alternating red/white for 2000 feet/600 meters.
(f) Center line lights all red for 1000 feet/300 m.
(g) Runway end, red stop bars.
(h) Braking fade effect.
(i) Brake temperature indications.
(4) Engine Failure between VI and V2.
(5) Normal Takeoff:
(a) During ground roll check the following:
(i) Runway rumble.
(ii) Acceleration cues.
(iii) Groundspeed effects.
(iv) Engine sounds.
(v) Nosewheel and rudder pedal steering.
(b) During and after rotation, check the following:
(i) Rotation characteristics.
(ii) Column force during rotation.
(iii) Gear uplock sounds/bumps.
(iv) Effect of slat/flap retraction during climbout.
(6) Crosswind Takeoff (check the following):
(a) Tendency to turn into or out of the wind.
(b) Tendency to lift upwind wing as airspeed increases.
(7) Windshear during Takeoff (check the following):
(a) Controllable during windshear encounter.
(b) Performance adequate when using correct techniques.
(c) Windshear Indications satisfactory.
(d) Motion cues satisfactory (particularly turbulence).
(8) Normal Takeoff with Control Malfunction.
(9) Low Visibility T/O (check the following):
(a) Visual cues.
(b) Flying by reference to instruments.
(c) SID Guidance on LNAV.
i. Climb Performance.
Select one or several of the following test cases:
(1) Normal Climb—Climb while maintaining recommended speed profile and note fuel, distance and time.
(2) Single Engine Climb—Trim aircraft in a zero wheel climb at V2.
NOTE: Up to 5° bank towards the operating engine(s) is permissible. Climb for 3 minutes and note fuel, distance, and time. Increase speed toward en route climb speed and retract flaps. Climb for 3 minutes and note fuel, distance, and time.
j. Systems Operation During Climb.
Check normal operation and malfunctions as appropriate for the following systems:
(1) Air conditioning/Pressurization/Ventilation.
(2) Autoflight.
(3) Communications.
(4) Electrical.
(5) Fuel.
(6) Icing Systems.
(7) Indicating and Recording systems.
(8) Navigation/FMS.
(9) Pneumatics.
k. Cruise Checks.
(Select one or several of the following test cases):
(1) Cruise Performance.
(2) High Speed/High Altitude Handling (check the following):
(a) Overspeed warning.
(b) High Speed buffet.
(c) Aircraft control satisfactory.
(d) Envelope limiting functions on Computer Controlled Airplanes.
(Reduce airspeed to below level flight buffet onset speed, start a turn, and check the following:)

(e) High Speed buffet increases with G loading.

(Reduce throttles to idle and start descent, deploy the speedbrake, and check the following:)

(f) Speedbrake indications.

(g) Symmetrical deployment.

(h) Airframe buffet.

(i) Aircraft response hands off.

(3) Yaw Damper Operation.

(Switch off yaw dampers and autopilot. Initiate a Dutch roll and check the following:)

(a) Aircraft dynamics.

(b) Simulator motion effects.

(Switch on yaw dampers, re-initiate a Dutch roll and check the following:)

(c) Damped aircraft dynamics.

(4) APU Operation.

(5) Engine Gravity Feed.

(6) Engine Shutdown and Driftdown Check: FMC operation Aircraft performance.

(7) Engine Relight.

l. Descent.

Select one of the following test cases:

(1) Normal Descent Descend while maintaining recommended speed profile and note fuel, distance and time.

(2) Cabin Depressurization/Emergency Descent

m. Medium Altitude Checks.

(Select one or several of the following test cases)

(1) High Angle of Attack/Stall. Trim the aircraft at 1.4 Vs, establish 1 kt/sec^2 deceleration rate, and check the following—

(a) System displays/operation satisfactory.

(b) Handling characteristics satisfactory.

(c) Stall and Stick shaker speed.

(d) Buffet characteristics and onset speed.

(e) Envelope limiting functions on Computer Controlled Airplanes.

(Recover to straight and level flight and check the following:)

(f) Handling characteristics satisfactory.

(2) Turning Flight.

(Roll aircraft to left, establish a 30° to 45° bank angle, and check the following:)

(a) Stick force required, satisfactory.

(b) Wheel requirement to maintain bank angle.

(c) Slip ball response, satisfactory.

(d) Time to turn 180°.

(Roll aircraft from 45° bank one way to 45° bank the opposite direction while maintaining altitude and airspeed—check the following:)

(e) Controllability during maneuver.

(3) Degraded flight controls.

(4) Holding Procedure (check the following:)

(a) FMC operation.

(b) Auto pilot auto thrust performance.

(5) Storm Selection (check the following:)

(a) Weather radar controls.

(b) Weather radar operation.

(c) Visual scene corresponds with WXR pattern.

(Fly through storm center, and check the following:)

(d) Aircraft enters cloud.

(e) Aircraft encounters representative turbulence.

(f) Rain/hail sound effects evident.

(As aircraft leaves storm area, check the following:)

(g) Storm effects disappear.

(6) TCAS (check the following:)

(a) Traffic appears on visual display.

(b) Traffic appears on TCAS display(s).

(As conflicting traffic approaches, take relevant avoiding action, and check the following:)

(c) Visual and TCAS system displays.

n. Approach And Landing.

Select one or several of the following test cases while monitoring flight control and hydraulic systems for normal operation and with malfunctions selected:

(1) Flaps/Gear Normal Operation (Check the following:)

(a) Time for extension/retraction.

(b) Buffet characteristics.

(2) Normal Visual Approach and Landing.

Fly a normal visual approach and landing—check the following:

(a) Aircraft handling.

(b) Spoiler operation.

(c) Reverse thrust operation.

(d) Directional control on the ground.

(e) Touchdown cues for main and nose wheel.

(f) Visual cues.

(g) Motion cues.

(h) Sound cues.

(i) Brake and Anti-skid operation.

(3) Flaps/Gear Abnormal Operation or with hydraulic malfunctions.

(4) Abnormal Wing Flaps/Slats Landing.

(5) Manual Landing with Control Malfunction.

(a) Aircraft handling.

(b) Aircraft handling.

(c) Radio Aids and instruments.

(d) Visual scene content and cues.

(e) Motion cues.

(f) Sound cues.

(6) Non-precision Approach—All Engines Operating.

(a) Aircraft handling.

(b) Aircraft handling.

(c) Radio Aids and instruments.

(d) Visual scene content and cues.

(e) Motion cues.

(f) Sound cues.

(7) Circling Approach.

(a) Aircraft handling.

(b) Aircraft handling.

(c) Radio Aids and instruments.

(d) Visual scene content and cues.

(e) Motion cues.

(f) Sound cues.

(8) Non-precision Approach—One Engine Inoperative.
(a) Aircraft handling.
(b) Aircraft handling.
(c) Radio Aids and instruments.
(d) Visual scene content and cues.
(e) Motion cues.
(f) Sound cues.
(9) One Engine Inoperative Go-around.
(a) Aircraft handling.
(b) Aircraft handling.
(c) Radio Aids and instruments.
(d) Visual scene content and cues.
(e) Motion cues.
(f) Sound cues.
(10) CAT I Approach and Landing with raw-data ILS.
(a) Aircraft handling.
(b) Aircraft handling.
(c) Radio Aids and instruments.
(d) Visual scene content and cues.
(e) Motion cues.
(f) Sound cues.
(11) CAT I Approach and Landing with Limiting Crosswind.
(a) Aircraft handling.
(b) Aircraft handling.
(c) Radio Aids and instruments.
(d) Visual scene content and cues.
(e) Motion cues.
(f) Sound cues.
(12) CAT I Approach with Windshear. Check the following:
(a) Controllable during windshear encounter.
(b) Performance adequate when using correct techniques.
(c) Windshear indications/warnings.
(d) Motion cues (particularly turbulence).
(13) CAT II Approach and Automatic Go-Around.
(14) CAT III Approach and Landing—System Malfunctions.
(15) CAT III Approach and Landing—1 Engine Inoperative.
(16) GPWS evaluation.
o. Visual Scene—In-Flight Assessment.
Select three (3) different visual models and perform the following checks with ''day,'' ''dusk,'' and ''night'' (as appropriate) selected. Reposition the aircraft at or below 2000 feet within 10 nm of the airfield. Fly the aircraft around the airport environment and assess control of the visual system and evaluate the visual scene content as described below:
(1) Visual Controls.
(a) Daylight, Dusk, Night Scene Controls.
(b) Cockpit ambient lighting during ''daylight'' conditions.
(c) Environment Light Controls.
(d) Runway Light Controls.
(e) Taxiway Light Controls.
(f) Approach Light Controls.
(2) Scene Content.
(a) Airport environment for correct terrain and significant features.
(b) Runways for correct markings, runway slope, directionality of runway lights.
(c) Visual scene for aliasing, colour, and occulting.
Reposition the aircraft to a long, final approach for an ''ILS runway.'' Select flight freeze when the aircraft is 5-statute miles (sm)/8-kilometers (km) out and on the glide slope.
Check the following:
(3) Scene content.
(a) Airfield features.
(b) Approach lights.
(c) Runway definition.
(d) Runway definition.
(e) Runway edge lights and VASI lights.
(f) Strobe lights.
Release flight freeze. Continue flying the approach with NP engaged. Select flight freeze when aircraft is 3 sm/5 km out and on the glide slope. Check the following:
(4) Scene Content.
(a) Runway centerline light.
(b) Taxiway definition and lights.
Release flight freeze and continue flying the approach with A/P engaged. Select flight freeze when aircraft is 2 sm/3 km out and on the glide slope. Check the following:
(5) Scene content.
(a) Runway threshold lights.
(b) Touchdown zone lights. At 200 ft radio altitude and still on glide slope, select Flight Freeze. Check the following:
(6) Scene content.
(a) Runway markings.
Set the weather to Category I conditions and check the following:
(7) Scene content.
(a) Visual ground segment.
Set the weather to Category II conditions, release Flight Freeze, re-select Flight Freeze at 100 feet radio altitude, and check the following:
(8) Scene content.
(a) Visual ground segment.
Select night/dusk (twilight) conditions and check the following:
(9) Scene content.
(a) Runway markings visible within landing light lobes.
Set the weather to Category III conditions, release Flight Freeze, re-select Flight Freeze at 50 feet radio altitude and check the following:
(10) Scene content.
(a) Visual ground segment.
Set WX to ''missed approach'' conditions, release Flight Freeze, re-select Flight Freeze at 15 feet radio altitude, and check the following:
(11) Scene content.
(a) Visual ground segment.
When on the ground, stop the aircraft. Set 0 feet RVR, ensure strobe/beacon lights are switched on and check the following:
(12) Scene content.
(a) Visual effect of strobe and beacon.

Reposition to final approach, set weather to ''Clear,'' continue approach for an automatic landing, and check the following:

(13) Scene content.

(a) Visual cues during flare to assess sink rate.

(b) Visual cues during flare to assess Depth perception.

(c) Cockpit height above ground.

p. After Landing Operations.

(1) After Landing Checks.

(2) Taxi back to gate (Check the following:)

(a) Visual model satisfactory.

(b) Parking brake operation satisfactory.

(3) Shutdown Checks.

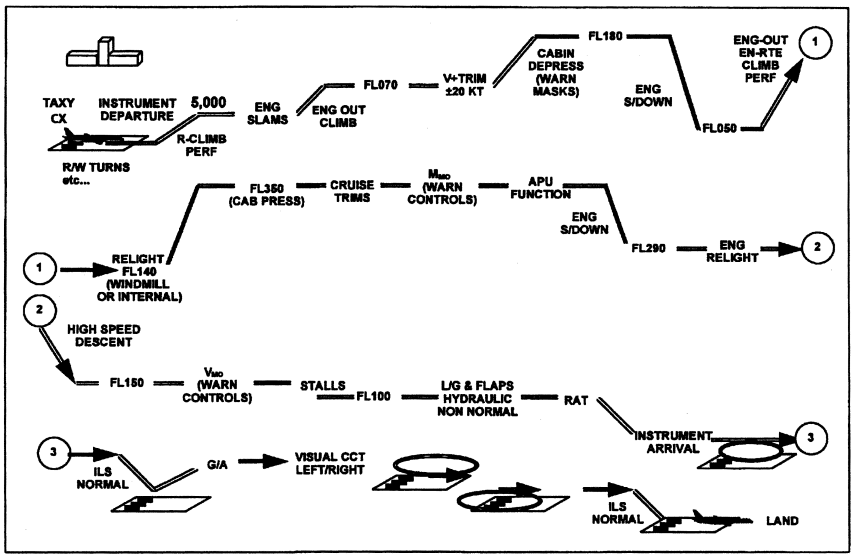
q. Crash Function.

(1) Gear-up Crash.

(2) Excessive rate of descent Crash.

(3) Excessive bank angle Crash.

Typical Subjective Continuing Qualification Evaluation Profile (2 hours)



End Information

ATTACHMENT 4 TO APPENDIX A TO PART 60—SAMPLE DOCUMENTS

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ATTACHMENT 4 TO APPENDIX A TO PART 60—
Figure A4A – Sample Letter , Request for Initial, Upgrade, or Reinstatement Evaluation
INFORMATION

Date _____

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

Dear Dr. Cook:

RE: Request for Initial/Upgrade Evaluation Date

This is to advise you of our intent to request an (initial or upgrade) evaluation of our (FSTD Manufacturer), (Aircraft Type/Level) Flight Simulation Training Device (FSTD), (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 FSTD will be sponsored by (Name of Training Center/Air Carrier), FAA Designator (4 Letter Code). The FSTD will be sponsored under the following options: (Select One)

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

☐ The FSTD will be used for dry lease only in accordance with Paragraph 3b, FSTD Guidance Bulletin 03-08.

We agree to provide the formal request for the evaluation (*Ref: Appendix 4, AC 120-40B*) 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:

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

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

(The sponsor should add additional comments as necessary).

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

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

Sincerely,

Attachment: FSTD Information Form
cc: POI/TCPM

ATTACHMENT 4 TO APPENDIX A TO PART 60—
Figure A4B – Sample Letter , Request for Initial, Upgrade, or Reinstatement Evaluation
Attachment: FSTD Information Form
INFORMATION

Date: ____			
Section 1. FSTD Information and Characteristics			
Sponsor Name:	____	**FSTD Location:**	
Address:	____ ____	**Physical Address:**	____ ____
City:	____	**City:**	____
State:	____	**State:**	____
Country:	____	**Country:**	____
ZIP:	____	**ZIP:**	____
Manager	____		
Sponsor ID No: *(Four Letter FAA Designator)*	____	**Nearest Airport:** *(Airport Designator)*	____

Type of Evaluation Requested:			☐ **Initial** ☐ **Upgrade** ☐ **Recurrent** ☐ **Special** ☐ **Reinstatement**		
Qualification Basis: ____	☐ **A**	☐ **B**	☐ **Interim C**	☐ **C**	☐ **D**
	☐ **6**	☐ **7**	☐ **Provisional Status**		
Initial Qualification: (If Applicable)	**Date:** ____ **Level** ____		**Manufacturer's Identification/Serial No:**	____	
Upgrade Qualification: (If Applicable)	**Date:** ____ **Level** ____ MM/DD/YYYY		☐ **eQTG**		

Other Technical Information:			
FAA FSTD ID No: (If Applicable)	____	**FSTD Manufacturer:**	____
Convertible FSTD:	☐**Yes:**	**Date of Manufacture:**	____ MM/DD/YYYY
Related FAA ID No. (If Applicable)	____ ____ ____	**Sponsor FSTD ID No:** ____	
Airplane model/series: ____		**Source of aerodynamic model:** ____	
Engine model(s) and data revision: ____		**Source of aerodynamic coefficient data:** ____	
FMS identification and revision level: ____		**Aerodynamic data revision number:** ____	
Visual system manufacturer/model: ____		**Visual system display:** ____	
Flight control data revision: ____		**FSTD computer(s) identification:** ____	
Motion system manufacturer/type: ____			

National Aviation Authority (NAA): (If Applicable)	____		____

ATTACHMENT 4 TO APPENDIX A TO PART 60—
Figure A4B – Sample Letter , Request for Initial, Upgrade, or Reinstatement Evaluation
Attachment: FSTD Information Form
INFORMATION

Visual System Manufacturer and Type:	____	**Motion System Manufacturer and Type:**	____
Aircraft Make/Model/Series:	____	**FSTD Seats Available:**	____

Aircraft Equipment	**ENGINE TYPE(S):** ____	**Flight Instrumentation:** ☐ **EFIS** ☐ **HUD** ☐ **HGS** ☐ **EFVS** ☐ **TCAS** ☐ **GPWS** ☐ **Plain View** ☐ **GPS** ☐ **FMS Type:** ____ ☐ **WX Radar** ☐ **Other:** ____	Engine Instrumentation: ☐ **EICAS** ☐ **FADEC** ☐ **Other:** ____

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

Section 2. Supplementary Information

FAA Training Program Approval Authority:		☐ **POI** ☐ **TCPM** ☐ **Other:** ____	
Name:	____	**Office:**	____
Tel:	____	**Fax:**	____
Email:	____		

FSTD Scheduling Person:			
Name:	____		
Address 1:	____	**Address 2**	____
City:	____	**State:**	____
ZIP:	____	**Email:**	____
Tel:	____	**Fax:**	____

FSTD Technical Contact:			
Name:	____		
Address 1:	____	**Address 2**	____
City:	____	**State:**	____
ZIP:	____	**Email:**	____
Tel:	____	**Fax:**	____

Section 3. Training, Testing and Checking Considerations

Area/Function/Maneuver	**Requested**	**Remarks**
Private Pilot - Training / Checks: (142)	☐	____
Commercial Pilot - Training /Checks:(142)	☐	____
Multi-Engine Rating - Training / Checks (142)	☐	____
Instrument Rating -Training / Checks (142)	☐	____
Type Rating - Training / Checks (135/121/142)	☐	____
Proficiency Checks (135/121/142)	☐	____

ATTACHMENT 4 TO APPENDIX A TO PART 60—
Figure A4B – Sample Letter , Request for Initial, Upgrade, or Reinstatement Evaluation
Attachment: FSTD Information Form
INFORMATION

Section 3. Training, Testing and Checking Considerations		
Area/Function/Maneuver	**Requested**	**Remarks**
Private Pilot - Training / Checks: (142)	☐	____
Commercial Pilot - Training /Checks:(142)	☐	____
Multi-Engine Rating - Training / Checks (142)	☐	____
Instrument Rating -Training / Checks (142)	☐	____
Type Rating - Training / Checks (135/121/142)	☐	____
Proficiency Checks (135/121/142)	☐	____
CAT I: (RVR 2400/1800 ft. DH200 ft)	☐	____
CAT II: (RVR 1200 ft. DH 100 ft)	☐	____
CAT III * (lowest minimum) _____ RVR _____ ft. ** State CAT III (≤ 700 ft.), CAT IIIb (≤ 150 ft.), or CAT IIIc (0 ft.)*	☐	____
Circling Approach	☐	____
Windshear Training: (FSTD GB 03-05)	☐	____
Windshear Training IAW 121.409d (121 Turbojets Only) (FSTD GB 03-05)	☐	____
Generic Unusual Attitudes and Recoveries within the Normal Flight Envelope (FSTD GB 04-03)	☐	____
Specific Unusual Attitudes Recoveries (HBAT 95-10) (FSTD GB 04-03)	☐	____
Auto-coupled Approach/Auto Go Around	☐	____
Auto-land / Roll Out Guidance	☐	____
TCAS/ACAS I / II	☐	____
WX-Radar	☐	____
HUD (FSTD GB 03-02)	☐	____
HGS (FSTD GB 03-02)	☐	
EFVS (FSTD GB 03-03)	☐	
Future Air Navigation Systems (HBAT 98-16A)	☐	____
GPWS / EGPWS	☐	____
ETOPS Capability	☐	____
GPS	☐	____
SMGCS	☐	____
Helicopter Slope Landings	☐	____
Helicopter External Load Operations	☐	____
Helicopter Pinnacle Approach to Landings	☐	____
Helicopter Night Vision Maneuvers	☐	____
Helicopter Category A Takeoffs	☐	____

ATTACHMENT 4 TO APPENDIX A TO PART 60—
Figure A4C – Sample Qualification Test Guide Cover Page
INFORMATION

SPONSOR NAME

SPONSOR ADDRESS

FAA QUALIFICATION TEST GUIDE

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

(Type of Simulator)

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

(Simulator Level)

(Qualification Performance Standard Used)

(Simulator Location)

FAA Initial Evaluation

Date: _____

_____ Date: _____
(Sponsor)

_____ Date: _____
Manager, National
Simulator Program, FAA

ATTACHMENT 4 TO APPENDIX A TO PART 60—
Figure A4D – Sample Statement of Qualification - Certificate

INFORMATION

Federal Aviation Administration
National Simulator Program

Statement of Qualification

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

Go-Fast Airlines
Farnsworth Z-100 Full Flight Simulator
FAA Identification Number 999

And found it to meet the standards set forth in
AC 120-40B

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

Level D

Until January 31, 2009

Unless sooner rescinded or extended by the National Simulator Program Manager

December 15, 2007 — (date)

I. B. Checkin, Jr. — (for the NSPM)

ATTACHMENT 4 TO APPENDIX A TO PART 60—

Figure A4E – Sample Statement of Qualification; Configuration List

INFORMATION

STATEMENT of QUALIFICATION
CONFIGURATION LIST

Date: ____			
Section 1. FSTD Information and Characteristics			
Sponsor Name:	____	**FSTD Location:**	
Address:	____ ____	**Physical Address:**	____ ____
City:	____	**City:**	____
State:	____	**State:**	____
Country:	____	**Country:**	____
ZIP:	____	**ZIP:**	____
Manager	____		
Sponsor ID No: *(Four Letter FAA Designator)*	____	**Nearest Airport:** *(Airport Designator)*	____

Type of Evaluation Requested:			☐ **Initial** ☐ **Upgrade** ☐ **Recurrent** ☐ **Special** ☐ **Reinstatement**		
Qualification Basis: ____	☐ **A**	☐ **B**	☐ **Interim C**	☐ **C**	☐ **D**
	☐ **6**	☐ **7**	☐ **Provisional Status**		

Initial Qualification: (If Applicable)	**Date:** ____ **Level** ____	**Manufacturer's Identification/Serial No:**	____
Upgrade Qualification: (If Applicable)	**Date:** ____ **Level** ____ MM/DD/YYYY	☐ **eQTG**	

Other Technical Information:			
FAA FSTD ID No: (If Applicable)	____	**FSTD Manufacturer:**	____
Convertible FSTD:	☐**Yes**:	**Date of Manufacture:**	____ MM/DD/YYYY
Related FAA ID No. (If Applicable)	____ ____ ____	**Sponsor FSTD ID No:** ____	
Aircraft model/series: ____		**Source of aerodynamic model:** ____	
Engine model(s) and data revision: ____		**Source of aerodynamic coefficient data:** ____	
FMS identification and revision level: ____		**Aerodynamic data revision number:** ____	
Visual system manufacturer/model: ____		**Visual system display:** ____	
Flight control data revision: ____		**FSTD computer(s) identification:** ____	
Motion system manufacturer/type: ____			

ATTACHMENT 4 TO APPENDIX A TO PART 60—

Figure A4E – Sample Statement of Qualification; Configuration List

INFORMATION

NAA Qualification Basis:	____		
Visual System Manufacturer and Type:	____	**Motion System Manufacturer and Type:**	____
Aircraft Make/Model/Series:	____	**FSTD Seats Available:**	____

Aircraft Equipment	**ENGINE TYPE(S):** ____	**Flight Instrumentation:** ☐ **EFIS** ☐ **HUD** ☐ **HGS** ☐ **EFVS** ☐ **TCAS** ☐ **GPWS** ☐ **Plain View** ☐ **GPS** ☐ **FMS Type:** ____ ☐ **WX Radar** ☐ **Other:** ____	Engine Instrumentation: ☐ **EICAS** ☐ **FADEC** ☐ **Other:**

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

Section 2. Supplementary Information

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

Section 3. Training, Testing and Checking Considerations

Area/Function/Maneuver	Requested	Remarks
Private Pilot - Training / Checks: (142)	☐	____
Commercial Pilot - Training /Checks:(142)	☐	____
Multi-Engine Rating - Training / Checks (142)	☐	____
Instrument Rating -Training / Checks (142)	☐	____
Type Rating - Training / Checks (135/121/142)	☐	____

ATTACHMENT 4 TO APPENDIX A TO PART 60—

Figure A4E – Sample Statement of Qualification; Configuration List

INFORMATION

ZIP:	____	**Email:**	____
Tel:	____	**Fax:**	____

Section 3. Training, Testing and Checking Considerations

Area/Function/Maneuver	Requested	Remarks
Private Pilot - Training / Checks: (142)	☐	____
Commercial Pilot - Training /Checks:(142)	☐	____
Multi-Engine Rating - Training / Checks (142)	☐	____
Instrument Rating -Training / Checks (142)	☐	____
Type Rating - Training / Checks (135/121/142)	☐	____
Proficiency Checks (135/121/142)	☐	____
CAT I: (RVR 2400/1800 ft. DH200 ft)	☐	____
CAT II: (RVR 1200 ft. DH 100 ft)	☐	____
CAT III * (lowest minimum) _____ RVR _____ ft. ** State CAT III (≤ 700 ft.), CAT IIIb (≤ 150 ft.), or CAT IIIc (0 ft.)*	☐	____
Circling Approach	☐	____
Windshear Training: (FSTD GB 03-05)	☐	____
Windshear Training IAW 121.409d (121 Turbojets Only) (FSTD GB 03-05)	☐	____
Generic Unusual Attitudes and Recoveries within the Normal Flight Envelope (FSTD GB 04-03)	☐	____
Specific Unusual Attitudes Recoveries (HBAT 95-10) (FSTD GB 04-03)	☐	____
Auto-coupled Approach/Auto Go Around	☐	____
Auto-land / Roll Out Guidance	☐	____
TCAS/ACAS I / II	☐	____
WX-Radar	☐	____
HUD (FSTD GB 03-02)	☐	____
HGS (FSTD GB 03-02)	☐	
EFVS (FSTD GB 03-03)	☐	
Future Air Navigation Systems (HBAT 98-16A)	☐	____
GPWS / EGPWS	☐	____
ETOPS Capability	☐	____
GPS	☐	____
SMGCS	☐	____
Helicopter Slope Landings	☐	____
Helicopter External Load Operations	☐	____
Helicopter Pinnacle Approach to Landings	☐	____
Helicopter Night Vision Maneuvers	☐	____
Helicopter Category A Takeoffs	☐	____

ATTACHMENT 4 TO APPENDIX A TO PART 60—

Figure A4F – Sample Statement of Qualification – List of Qualified Tasks

INFORMATION

STATEMENT of QUALIFICATION
List of Qualified Tasks
Go Fast Airline Training -- Farnsworth Z-100 -- Level D -- FAA ID# 999

The FSTD is qualified to perform all of the Maneuvers, Procedures, Tasks, and Functions Listed in Appendix A, Attachment 1, Table A1B, Minimum FSTD Requirements In Effect on [mm/dd/yyyy] except for the following listed Tasks or Functions.

Qualified for all tasks in Table A1B, for which the sponsor has requested qualification, except for the following: 3.e(1)(i) NDB approach 3.f. Recovery from Unusual Attitudes 4.3. Circling Approach
Additional tasks for which this FSTD is qualified (i.e., in addition to the list in Table A1B) 1. Enhanced Visual System 2. Windshear Training IAW Section 121.409(d).
The airport visual models evaluated for qualification at this level are: 1. Atlanta Hartsfield International Airport (KATL) 2. Miami International Airport (KMIA) 3. Dallas/Ft.Worth Regional Airport (KDFW)

Attachment 4 to Appendix A to Part 60—
Figure A4G – Sample Continuing Qualification Evaluation Requirements Page
INFORMATION

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

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

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

(Repeat as Necessary)

Attachment 4 to Appendix A to Part 60—
Figure A4H –Sample MQTG Index of Effective FSTD Directives
INFORMATION

Index of Effective FSTD Directives Filed in this Section

Notification Number	Received From: (TPAA/NSPM)	Date of Notification	Date of Modification Completion

Continue as Necessary....

ATTACHMENT 5 TO APPENDIX A TO PART 60—SIMULATOR QUALIFICATION REQUIREMENTS FOR WINDSHEAR TRAINING PROGRAM USE

1. APPLICABILITY

BEGIN QPS REQUIREMENTS

This attachment applies to all simulators, regardless of qualification level, that are used to satisfy the training requirements of an FAA-approved low-altitude windshear flight training program, or any FAA-approved training program that addresses windshear encounters.

END QPS REQUIREMENTS

2. STATEMENT OF COMPLIANCE AND CAPABILITY (SOC)

BEGIN QPS REQUIREMENTS

a. The sponsor must submit an SOC confirming that the aerodynamic model is based on flight test data supplied by the airplane manufacturer or other approved data provider. The SOC must also confirm that any change to environmental wind parameters, including variances in those parameters for windshear conditions, once inserted for computation, result in the correct simulated performance. This statement must also include examples of environmental wind parameters currently evaluated in the simulator (such as crosswind takeoffs, crosswind approaches, and crosswind landings).

b. For simulators without windshear warning, caution, or guidance hardware in the original equipment, the SOC must also state that the simulation of the added hardware and/or software, including associated cockpit displays and annunciations, replicates the system(s) installed in the airplane. The statement must be accompanied by a block diagram depicting the input and output signal flow, and comparing the signal flow to the equipment installed in the airplane.

END QPS REQUIREMENTS

3. MODELS

BEGIN QPS REQUIREMENTS

The windshear models installed in the simulator software used for the qualification evaluation must do the following:

a. Provide cues necessary for recognizing windshear onset and potential performance degradation requiring a pilot to initiate recovery procedures. The cues must include all of the following, as may be appropriate for the appropriate portion of the flight envelope:

(1) Rapid airspeed change of at least ±15 knots (kts).

(2) Stagnation of airspeed during the takeoff roll.

(3) Rapid vertical speed change of at least ±500 feet per minute (fpm).

(4) Rapid pitch change of at least ±5°.

b. Be adjustable in intensity (or other parameter to achieve an intensity effect) to at least two (2) levels so that upon encountering the windshear the pilot may identify its presence and apply the recommended procedures for escape from such a windshear.

(1) If the intensity is lesser, the performance capability of the simulated airplane in the windshear permits the pilot to maintain a satisfactory flightpath; and

(2) If the intensity is greater, the performance capability of the simulated airplane in the windshear does not permit the pilot to maintain a satisfactory flightpath (crash).

NOTE: The means used to accomplish the ''nonsurvivable'' scenario of paragraph 3.b.(2) of this attachment, that involve operational elements of the simulated airplane, must reflect the dispatch limitations of the airplane.

c. Be available for use in the FAA-approved windshear flight training program.

END QPS REQUIREMENTS

4. DEMONSTRATIONS

BEGIN QPS REQUIREMENTS

a. The sponsor must identify one survivable takeoff windshear training model and one survivable approach windshear training model. The wind components of the survivable models must be presented in graphical format so that all components of the windshear are shown, including initiation point, variance in magnitude, and time or distance correlations. The simulator must be operated at the same gross weight, airplane configuration, and initial airspeed in all of the following situations:

(1) Takeoff—through calm air.

(2) Takeoff—through the first selected survivable windshear.

(3) Approach—through calm air.

(4) Approach—through the second selected survivable windshear.

b. In each of these four situations, at an ''initiation point'' (i.e., where windshear onset is or should be recognized), the recommended procedures for windshear recovery are applied and the results are recorded as specified in paragraph 5 of this attachment.

c. These recordings are made without inserting programmed random turbulence. Turbulence that results from the windshear model is to be expected, and no attempt may be made to neutralize turbulence from this source.

d. The definition of the models and the results of the demonstrations of all four (4) cases described in paragraph 4.a of this attachment, must be made a part of the MQTG.

END QPS REQUIREMENTS

5. RECORDING PARAMETERS

BEGIN QPS REQUIREMENTS

a. In each of the four MQTG cases, an electronic recording (time history) must be made of the following parameters:

(1) Indicated or calibrated airspeed.

(2) Indicated vertical speed.

(3) Pitch attitude.

(4) Indicated or radio altitude.

(5) Angle of attack.

(6) Elevator position.

(7) Engine data (thrust, N1, or throttle position).

(8) Wind magnitudes (simple windshear model assumed).

b. These recordings must be initiated at least 10 seconds prior to the initiation point, and continued until recovery is complete or ground contact is made.

END QPS REQUIREMENTS

6. EQUIPMENT INSTALLATION AND OPERATION

BEGIN QPS REQUIREMENTS

All windshear warning, caution, or guidance hardware installed in the simulator must operate as it operates in the airplane. For example, if a rapidly changing wind speed and/or direction would have caused a windshear warning in the airplane, the simulator must respond equivalently without instructor/evaluator intervention.

END QPS REQUIREMENTS

7. QUALIFICATION TEST GUIDE

BEGIN QPS REQUIREMENTS

a. All QTG material must be forwarded to the NSPM.

b. A simulator windshear evaluation will be scheduled in accordance with normal procedures. Recurrent evaluation schedules will be used to the maximum extent possible.

c. During the on-site evaluation, the evaluator will ask the operator to run the performance tests and record the results. The

results of these on-site tests will be compared to those results previously approved and placed in the QTG or MQTG, as appropriate.

d. QTGs for new (or MQTGs for upgraded) simulators must contain or reference the information described in paragraphs 2, 3, 4, and 5 of this attachment.

END QPS REQUIREMENTS

---

8. SUBJECTIVE EVALUATION

BEGIN INFORMATION

The NSPM will fly the simulator in at least two of the available windshear scenarios to subjectively evaluate simulator performance as it encounters the programmed windshear conditions.

a. One scenario will include parameters that enable the pilot to maintain a satisfactory flightpath.

b. One scenario will include parameters that will not enable the pilot to maintain a satisfactory flightpath (crash).

c. Other scenarios may be examined at the NSPM's discretion.

END INFORMATION

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9. QUALIFICATION BASIS

BEGIN INFORMATION

The addition of windshear programming to a simulator in order to comply with the qualification for required windshear training does not change the original qualification basis of the simulator.

END INFORMATION

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10. DEMONSTRATION REPEATABILITY

BEGIN INFORMATION

For the purposes of demonstration repeatability, it is recommended that the simulator be flown by means of the simulator's autodrive function (for those simulators that have autodrive capability) during the demonstrations.

END INFORMATION

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

BEGIN INFORMATION

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

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1. Introduction
2. Applicability (§ 60.1) and Applicability of sponsor rules to persons who are not sponsors and who are engaged in certain unauthorized activities (§ 60.2)
3. Definitions (60.3)
4. Qualification Performance Standards (§ 60.4)
5. Quality Management System (§ 60.5)
6. Sponsor Qualification Requirements (§ 60.7)
7. Additional Responsibilities of the Sponsor (§ 60.9)
8. FSTD Use (§ 60.11)
9. FSTD Objective Data Requirements (§ 60.13)
10. Special Equipment and Personnel Requirements for Qualification of the FTD (§ 60.14)
11. Initial (and Upgrade) Qualification Requirements (§ 60.15)
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19. Automatic Loss of Qualification and Procedures for Restoration of Qualification (§ 60.27)
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Attachment 1 to Appendix B to Part 60—General FTD Requirements
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Attachment 3 to Appendix B to Part 60—Flight Training Device (FTD) Subjective Evaluation
Attachment 4 to Appendix B to Part 60—Sample Documents

END INFORMATION

1. INTRODUCTION

BEGIN INFORMATION

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

b. 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) Advisory Circular (AC) 120–28C, Criteria for Approval of Category III Landing Weather Minima.
(11) AC 120–29, Criteria for Approving Category I and Category II Landing Minima for part 121 operators.
(12) AC 120–35B, Line Operational Simulations: Line-Oriented Flight Training, Special Purpose Operational Training, Line Operational Evaluation.
(13) AC 120–41, Criteria for Operational Approval of Airborne Wind Shear Alerting and Flight Guidance Systems.
(14) AC 120–57A, Surface Movement Guidance and Control System (SMGS).
(15) AC 150/5300–13, Airport Design.
(16) AC 150/5340–1G, Standards for Airport Markings.
(17) AC 150/5340–4C, Installation Details for Runway Centerline Touchdown Zone Lighting Systems.
(18) AC 150/5340–19, Taxiway Centerline Lighting System.
(19) AC 150/5340–24, Runway and Taxiway Edge Lighting System.
(20) AC 150/5345–28D, Precision Approach Path Indicator (PAPI) Systems.
(21) International Air Transport Association document, ''Flight Simulator Design and Performance Data Requirements,'' as amended.
(22) AC 25–7, as amended, Flight Test Guide for Certification of Transport Category Airplanes.
(23) AC 23–8A, as amended, Flight Test Guide for Certification of Part 23 Airplanes.
(24) International Civil Aviation Organization (ICAO) Manual of Criteria for the Qualification of Flight Simulators, as amended.
(25) Airplane Flight Simulator Evaluation Handbook, Volume I, as amended and Volume II, as amended, The Royal Aeronautical Society, London, UK.
(26) FAA Publication FAA–S–8081 series (Practical Test Standards for Airline Transport Pilot Certificate, Type Ratings, Commercial Pilot, and Instrument Ratings).
(27) The FAA Aeronautical Information Manual (AIM). An electronic version of the AIM is on the internet at *http://www.faa.gov/atpubs*.

END INFORMATION

2. APPLICABILITY (§§ 60.1 & 60.2)

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

3. DEFINITIONS (§ 60.3)

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

4. QUALIFICATION PERFORMANCE STANDARDS (§ 60.4)

There is no additional regulatory or informational material that applies to § 60.4, Qualification Performance Standards.

5. QUALITY MANAGEMENT SYSTEM (§ 60.5)

BEGIN INFORMATION

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

END INFORMATION

6. SPONSOR QUALIFICATION REQUIREMENTS (§ 60.7)

BEGIN INFORMATION

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

b. The following examples describe acceptable operational practices:

(1) Example One.

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

(i) If the FTD was qualified prior to October 30, 2007 the 12-month period begins on the date of the first continuing qualification evaluation conducted in accordance with § 60.19 after October 30, 2007 and continues for each subsequent 12-month period;

(ii) A device qualified on or after October 30, 2007 will be required to undergo an initial or upgrade evaluation in accordance with § 60.15. Once the initial or upgrade evaluation is complete, the first continuing qualification evaluation will be conducted within 6 months. The 12 month continuing qualification evaluation cycle begins on that date and continues for each subsequent 12-month period.

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

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

(2) Example Two.

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

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

OR

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

OR

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

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

(3) Example Three.

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

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

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

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

OR

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

END INFORMATION

7. ADDITIONAL RESPONSIBILITIES OF THE SPONSOR (§ 60.9)

BEGIN INFORMATION

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

END INFORMATION

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8. FSTD USE (§60.11)

There is no additional regulatory or informational material that applies to §60.11, FSTD use.

9. FTD OBJECTIVE DATA REQUIREMENTS (§60.13)

BEGIN QPS REQUIREMENTS

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

(1) A flight test plan consisting of:

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

(b) For each maneuver or procedure—

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

(ii) The atmospheric and environmental conditions.

(iii) The initial flight conditions.

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

(v) The data to be gathered.

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

(2) Appropriately qualified flight test personnel.

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

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

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

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

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

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

(4) With any necessary guidance information provided; and

(5) Without alteration, adjustments, or bias; however the data may be re-scaled, digitized, or otherwise manipulated to fit the desired presentation.

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

d. As required by §60.13(f), the sponsor must notify the NSPM when it becomes aware that an addition to or a revision of the flight related data or airplane systems related data is available if this data is used to program and operate a qualified FTD. The data referred to in this sub-section are those data that are used to validate the performance, handling qualities, or other characteristics of the aircraft, including data related to any relevant changes occurring after the type certification is issued. This notification must be made within 10 working days.

END QPS REQUIREMENTS

BEGIN INFORMATION

e. 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.

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

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

h. 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, Attachment 2 requires the sponsor or other data provider to ensure that a steady state condition exists at the instant of time captured by the ''snapshot.'' This is often verified by showing that a steady state condition existed from some period of time during which the snap shot is taken. The time period most frequently used is 5 seconds prior through 2 seconds following the instant of time captured by the snap shot. This paragraph is primarily addressing the source data and the method by which the data provider ensures that the steady state condition for the snap shot is representative.

i. The NSPM will consider, on a case-by-case basis, whether or not to approve supplemental validation data derived from flight data recording systems such as a Quick Access Recorder or Flight Data Recorder.

END INFORMATION

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

BEGIN INFORMATION

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

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

END INFORMATION

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

BEGIN QPS REQUIREMENT

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

(1) Meet the general requirements listed in Attachment 1;

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

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

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 qualification test guide (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 applicable QPS.

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

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

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

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

(1) Parameters, tolerances, and flight conditions;

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

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

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

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

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

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

(2) A continuing qualification evaluation requirements page. This page will be used by the NSPM to establish and record the frequency with which continuing qualification evaluations must be conducted and any subsequent changes that may be determined by the NSPM in accordance with §60.19. See Attachment 4, Figure B4G, for a sample Continuing Qualification Evaluation Requirements page.

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

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

(b) The airplane model and series being simulated.

(c) The aerodynamic data revision number or reference.

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

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

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

(g) The FTD model and manufacturer.

(h) The date of FTD manufacture.

(i) The FTD computer identification.

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

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

(4) A Table of Contents.

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

(6) List of all relevant data references.

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

(8) Statements of compliance and capability (SOCs) with certain requirements. SOCs must provide references to the sources of information that show the capability of the FTD to comply with the requirement, a rationale explaining how the referenced material is used, mathematical equations and parameter values used, and the conclusions reached; *i.e.*, that the FTD complies with the requirement. Refer to the ''General FTD Requirements'' column, Table B1A, in Attachment 1, or in the ''Alternative Data Sources, Procedures, and Instrumentation'' column, Table B2F, in Attachment 2, to see when SOCs are required.

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

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

(a) Name of the test.

(b) Objective of the test.

(c) Initial conditions.

(d) Manual test procedures.

(e) Automatic test procedures (if applicable).

(f) Method for evaluating FTD objective test results.

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

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

(i) Tolerances for relevant parameters.

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

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

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

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

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

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

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

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

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

(5) Tests involving time histories, data sheets (or transparencies thereof) and FTD test results must be clearly marked with appropriate reference points to ensure an accurate comparison between FTD and airplane

with respect to time. Time histories recorded via a line printer are to be clearly identified for cross-plotting on the airplane data. Overplots must 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 October 30, 2013 must have an electronic MQTG (eMQTG) including all objective data obtained from airplane testing, or another approved source (reformatted or digitized), together with correlating objective test results obtained from the performance of the FTD (reformatted or digitized) as prescribed in this appendix. The eMQTG must also contain the general FTD performance or demonstration results (reformatted or digitized) prescribed in this appendix, and a description of the equipment necessary to perform the initial qualification evaluation and the continuing qualification evaluations. The eMQTG must include the original validation data used to validate FTD performance and handling qualities in either the original digitized format from the data supplier or an electronic scan of the original time-history plots that were provided by the data supplier. A copy of the eMQTG must be provided to the NSPM.

k. All other FTDs (not covered in subparagraph ''j'') must have an electronic copy of the MQTG by and after October 30, 2013. A copy of the eMQTG 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.

END QPS REQUIREMENTS

BEGIN INFORMATION

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

m. 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, the objective tests listed in Attachment 2, and the subjective tests listed in Attachment 3 of this appendix. The evaluations described herein will include, but not necessarily be limited to the following:

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

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

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

(4) Cockpit configuration (see Attachment 1 of this appendix);

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

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

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

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

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

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

(2) Subjective tests provide a basis for:

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

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

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

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

o. 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.

p. 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.

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

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

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

r. After an FTD is successfully evaluated, the NSPM issues a statement of qualification (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. However, it is the sponsor's responsibility to obtain TPAA approval prior to using the FTD in an FAA-approved flight training program.

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

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

u. 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).

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

END INFORMATION

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

There is no additional regulatory or informational material that applies to §60.16, Additional Qualifications for a Currently Qualified FTD.

13. PREVIOUSLY QUALIFIED FTDS (§60.17)

BEGIN QPS REQUIREMENTS

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

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

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

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

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

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

b. FTDs qualified prior to October 30, 2007, 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.

c. [Reserved]

END QPS REQUIREMENTS

BEGIN INFORMATION

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

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

f. The intent of the requirement listed in § 60.17(b), for each FTD to have a Statement of Qualification 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.

g. Downgrading of an FTD is a permanent change in qualification level and will necessitate the issuance of a revised Statement of Qualification 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 on-going 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.

h. 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.

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

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

END INFORMATION

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

BEGIN QPS REQUIREMENT

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

b. The description of the functional preflight inspection 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.

END QPS REQUIREMENTS

BEGIN INFORMATION

d. 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.

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

f. 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 (⅓) 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 (⅔) of the allotted FTD time.

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

g. 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)

There is no additional regulatory or informational material that applies to §60.20. Logging FTD Discrepancies.

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

BEGIN INFORMATION

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

END INFORMATION

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17. MODIFICATIONS TO FTDS (§60.23)

BEGIN QPS REQUIREMENTS

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

b. Prior to using the modified FTD:

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

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

END QPS REQUIREMENTS

BEGIN INFORMATION

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

END INFORMATION

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

BEGIN INFORMATION

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

b. 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.

c. 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)

BEGIN INFORMATION

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

END INFORMATION

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

BEGIN INFORMATION

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

END INFORMATION

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21. RECORDKEEPING AND REPORTING (§ 60.31)

BEGIN QPS REQUIREMENTS

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

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

END QPS REQUIREMENTS

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

There are no additional QPS requirements or informational material that apply to § 60.33, Applications, Logbooks, Reports, and Records: Fraud, Falsification, or Incorrect Statements.

23. [RESERVED]

24. LEVELS OF FTD

BEGIN INFORMATION

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

(1) *Level 4*. A device that may have an open airplane-specific flight deck area, or an enclosed airplane-specific cockpit and at least one operating system with air/ground logic (no aerodynamic programming required).

(2) *Level 5*. A device that may have an open airplane-specific flight deck area, or an enclosed airplane-specific cockpit and a generic aerodynamic program with at least one operating system and control loading that is representative of the simulated airplane only at an approach speed and configuration.

(3) *Level 6*. A device that has an enclosed airplane-specific cockpit and aerodynamic program with all applicable airplane systems operating and control loading that is representative of the simulated airplane throughout its ground and flight envelope and significant sound representation.

END INFORMATION

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

BEGIN INFORMATION

There are no additional QPS requirements or informational material that apply to § 60.37, FSTD Qualification on the Basis of a Bilateral Aviation Safety Agreement (BASA).

END INFORMATION

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

BEGIN QPS REQUIREMENTS

1. REQUIREMENTS

a. Certain requirements included in this appendix must be supported with a Statement of Compliance and Capability (SOC), which may include objective and subjective tests. The SOC will confirm that the requirement was satisfied, and describe how the requirement was met. The requirements for SOCs and tests are indicated in the ''General FTD Requirements'' column in Table B1A of this appendix.

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

END QPS REQUIREMENTS

BEGIN INFORMATION

2. DISCUSSION

a. This attachment describes the general requirements for qualifying Level 4 through Level 6 FTDs. The sponsor should also consult the objectives tests in Attachment 2 and the examination of functions and subjective tests listed in Attachment 3 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 Cockpit Configuration.
(2) Programming.
(3) Equipment Operation.
(4) Equipment and facilities for instructor/evaluator functions.
(5) Motion System.
(6) Visual System.
(7) Sound System.

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

END INFORMATION

TABLE B1A—MINIMUM FTD REQUIREMENTS

<<<QPS requirements>>>		FTD level			<<Information>> Notes
No.	General FTD requirements	4	5	6	
1. General Cockpit Configuration					
1.a	The FTD must have a cockpit that is a replica of the airplane simulated with controls, equipment, observable cockpit indicators, circuit breakers. and bulkheads properly located, functionally accurate and replicating the airplane. The direction of movement of controls and switches must be identifical to that in the airplane. Pilot seat(s) must afford the capability for the occupant to be able to achieve the design ''eye position''.			X	For FTD purposes, the cockpit consists of all that space forward of a cross section of the fuselage at the most extreme aft setting of the pilots' seats including additional, required flight crewmember duty stations and those required bulkheads aft of the pilot seats. For clarification, bulkheads containing only item such as leanding gear pin storage compartments, fire axes or extinguishers, spare light bulbs, aircraft documents pouches are not considered essential and may be omitted.
1.b	The FTS must have equipment (e.g., instruments, panels, systems, circuit breakers, and controls) simulated sufficiently for the authorized training/checking events to be accomplished. The installed equipment must be located in a spatially correct location and may be in a cockpit or an open flight deck area. Actuation of equipment must replicate the appropriate function in the airplane.	X	X		
2. Programming					

TABLE B1A—MINIMUM FTD REQUIREMENTS—Continued

<<<QPS requirements>>>		FTD level			<<Information>> Notes
No.	General FTD requirements	4	5	6	
2.a	The FTD must provide the proper effect of aerodynamic changes for the combinations of drag and thrust normally encountered in flight. This must include the effect of change in airplane attitude, thrust, drag, altitude, temperature, and configuration. Level 6 additionally requires the effects of changes in gross weight and center of gravity. Level 5 requires only generic aerodynamic programming.		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.	X	X	X	
2.c	Relative responses of the cockpit instruments must be measured by latency tests, or transport delay tests, and may not exceed 300 milliseconds. The instruments must respond to abrupt input at the pilot's position within the allotted time, but not before the time when the airplane would respond under the same conditions. • Latency: The FTD instrument and, if applicable, the motion system and the visual system response must not be prior to that time when the airplane responds and may respond up to 300 milliseconds after that time under the same conditions. • Transport Delay: As an alternative to the Latency requirement, a transport delay objective test may be used to demonstrate that the FTD system does not exceed the specified limit. The sponsor must measure all the delay encountered by a step signal migrating from the pilot's control through all the simulation software modules in the correct order, using a handshaking protocol, finally through the normal output interfaces to the instrument display and, if applicable, the motion system, and the visual system.		X	X	The intent is to verify that the FTD provides instrument cues that are, within the stated time delays, like the airplane responses. For airplane response, acceleration in the appropriate, corresponding rotational axis is preferred. Additional information regarding Latency and Transport Delay testing may be found in appendix A, Attachment 2, paragraph 14.
3. Equipment Operations					
3.a	All relevant instrument indications involved in the simulation of the airplane must automatically respond to control movement or external disturbances to the simulated airplane; e.g., turbulence or winds.		X	X	
3.b	Navigation equipment must be installed and operate within the tolerances applicable for the airplane. Levels 6 must also include communication equipment (inter-phone and air/ground) like that in the airplane and, if appropriate to the operation being conducted, an oxygen mask microphone system. Level 5 need have only that navigation equipment necessary to fly an instrument approach.		X	X	

TABLE B1A—MINIMUM FTD REQUIREMENTS—Continued

<<<QPS requirements>>>		FTD level			<<Information>> Notes
No.	General FTD requirements	4	5	6	
3.c	Installed systems must simulate the applicable airplane system operation, both on the ground and in flight. Installed systems must be operative to the extent that applicable normal, abnormal, and emergency operating procedures included in the sponsor's training programs can be accomplished. Level 6 must simulate all applicable airplane flight, navigation, and systems operation. Level 5 must have at least functional flight and navigational controls, displays, and instrumentation. Level 4 must have at least one airplane system installed and functional.	X	X	X	
3.d	The lighting environment for panels and instruments must be sufficient for the operation being conducted.			X	
3.e	The FTD must provide control forces and control travel that correspond to the airplane being simulated. Control forces must react in the same manner as in the airplane under the same flight conditions.		X		
3.f	The FTD must provide control forces and control travel of sufficient precision to manually fly an instrument approach.		X		
4. Instructor or Evaluator Facilities					
4.a	In addition to the flight crewmember stations, suitable seating arrangements for an instructor/check airman and FAA Inspector must be available. These seats must provide adequate view of crewmember's panel(s).	X	X	X	These seats need not be a replica of an aircraft seat and may be as simple as an office chair placed in an appropriate position.
4.b	The FTD must have instructor controls that permit activation of normal, abnormal, and emergency conditions as may be appropriate. Once activated, proper system operation must result from system management by the crew and not require input from the instructor controls.	X	X	X	
5. Motion System (not required)					
5.a.	The FTD may have a motion system, if desired, although it is not required. If a motion system is installed and additional training, testing, or checking credits are being sought on the basis of having a motion system, the motion system operation must not be distracting and must be coupled closely to provide integrated sensory cues. The motion system must also respond to abrupt input at the pilot's position within the allotted time, but not before the time when the airplane would respond under the same conditions. A Subjective Test is required.		X	X	The motion system standards set out in part 60, appendix A for at least Level A simulators is acceptable.
6. Visual System (not required)					
6.a.	The FTD may have a visual system, if desired, although it is not required. If a visual system is installed, it must not be distracting.	X	X	X	

TABLE B1A—MINIMUM FTD REQUIREMENTS—Continued

<<<QPS requirements>>>		FTD level			<<Information>> Notes
No.	General FTD requirements	4	5	6	
6.b.	If a visual system is installed and additional training, testing, or checking credits are being sought on the basis of having a visual system, the visual system must meet the following criteria:				
6.b.1	The visual system must respond to abrupt input at the pilot's position. An SOC is required. A Subjective Test is required.	X	X	X	
6.b.2	The visual system must be at least a single channel, non-collimated display?. An SOC is required. A Subjective Test is required.	X	X	X	
6.b.3	The visual system must provide at least a field of view of 18° vertical/24° horizontal for the pilot flying.. An SOC is required.	X	X	X	
6.b.4	The visual system must provide for a maximum parallax of 10° per pilot. An SOC is required.	X	X	X	
6.b.5	The visual scene content may not be distracting. An SOC is required. A Subjective Test is required.	X	X	X	
6.b.6	The minimum distance from the pilot's eye position to the surface of a direct view display may not be less than the distance to any front panel instrument. An SOC is required.	X	X	X	
6.b.7	The visual system must provide for a minimum resolution of 5 arc-minutes for both computed and displayed pixel size. An SOC is required.	X	X	X	
7. Sound System					
7.a	The FTD must simulate significant cockpit sounds resulting from pilot actions that correspond to those heard in the airplane.			X	

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

BEGIN INFORMATION

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

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

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

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

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

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

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

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

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

2. The format for numbering the objective tests in appendix A, Attachment 2, Table A2A, and the objective tests in appendix B, Attachment 2, Table B2A, is identical. However, each test required for FFSs is not necessarily required for FTDs. Also, each test required for FTDs is not necessarily required

for FFSs. Therefore, when a test number (or series of numbers) is not required, the term ''Reserved'' is used in the table at that location. Following this numbering format provides a degree of commonality between the two tables and substantially reduces the potential for confusion when referring to objective test numbers for either FFSs or FTDs.

3. The QPS Requirements section imposes a duty on the sponsor or other data provider to ensure that a steady state condition exists at the instant of time captured by the ''snapshot'' for cases where the objective test results authorize a ''snapshot test'' or a ''series of snapshot tests'' results in lieu of a time-history. This is often verified by showing that a steady state condition existed from some period prior to, through some period following, the snap shot. The time period most frequently used is from 5 seconds prior through 2 seconds following the instant of time captured by the snap shot. Other time periods may be acceptable as authorized by the NSPM.

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

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

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

END INFORMATION

BEGIN QPS REQUIREMENTS

1. TEST REQUIREMENTS

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

b. Table B2A in this attachment sets out the test results required, including the parameters, tolerances, and flight conditions for FTD validation. Tolerances are provided for the listed tests because mathematical modeling and acquisition and development of reference data are often inexact. All tolerances listed in the following tables are applied to FTD performance. When two tolerance values are given for a parameter, the less restrictive may be used unless otherwise indicated.

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

d. When operational or engineering judgment is used in making assessments for flight test data applications for FTD validity, such judgment 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 airplane data throughout a time history, differences must be justified by providing a comparison of other related variables for the condition being assessed.

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

(1) The airplane weight and CG envelope;

(2) The operational envelope; and

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

f. When comparing the parameters listed to those of the airplane, sufficient data must

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

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

h. 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.''

i. 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.

j. FTDs are evaluated and qualified with an engine model simulating the airplane data supplier's flight test engine. For qualification of alternative engine models (either variations of the flight test engines or other manufacturer's engines) additional tests with the alternative engine models may be required. This Attachment contains guidelines for alternative engines.

k. Testing Computer Controlled Airplane (CCA) simulators, or other highly augmented airplane simulators, flight test data is required for the Normal (N) and/or Non-normal (NN) control states, as indicated in this Attachment. Where test results are independent of control state, Normal or Non-normal control data may be used. All tests in Table A2A require test results in the Normal control state unless specifically noted otherwise in the Test Details section following the CCA designation. The NSPM will determine what tests are appropriate for airplane simulation data. When making this determination, the NSPM may require other levels of control state degradation for specific airplane tests. Where Non-normal control states are required, test data must be provided for one or more Non-normal control states, and must include the least augmented state. Where applicable, flight test data must record Normal and Non-normal states for:

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

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

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

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

END QPS REQUIREMENTS

TABLE B2A—FLIGHT TRAINING DEVICE (FTD) OBJECTIVE TESTS

<<< QPS Requirements >>>							<< Information >>
Test		Tolerances	Flight conditions	Test details	FTD level		Notes
Number	Title				5	6	
1. Performance							
1.a	(Reserved).						
1.b	Takeoff.						
1.b.1	Ground Acceleration Time	±5% time or ±1 sec	Takeoff	Record acceleration time for a minimum of 80% of the segment from brake release to V_R. Preliminary aircraft certification data may be used.		X	This test is required only if RTO training credit is sought.
1.b.2. through 1.b.6.	(Reserved)						
1.b.7	Rejected Takeoff	±3% time or ±1 second	Dry Runway	Record time for at least 80% of the segment from initiation of the Rejected Takeoff to full stop.		X	
1.b.8	(Reserved)						
1.c	Climb						
1.c.1	Normal Climb all engines operating.	±3 kt airspeed, ±5% or ±100 ft/min (0.5 m/sec) climb rate.	Clean	Flight test data or airplane performance manual data may be used. Record at nominal climb speed and at nominal altitude. May be a snapshot test result.	X	X	
1.c.2. through 1.c.4.	(Reserved)						
1.d	(Reserved)						
1.e	(Reserved)						

1.f	Engines						
1.f.1	Acceleration	±10% T_t, ±1 sec for Level 5	Approach or Landing	Record engine power (N_1, N_2, EPR, Torque, Manifold Pressure) from idle to maximum takeoff power for a rapid (slam) throttle movement.	X	X	T_t is the total time from initial throttle movement to reaching 90% of go around power.
1.f.2	Deceleration	±10% T_t, or ±1 sec for Level 5	Ground	Record engine power (N_1, N_2, EPR, Torque, Manifold Pressure) from maximum takeoff power to idle for a rapid (slam) throttle movement.	X	X	T_t is the total time from initial throttle movement to reaching 90% decay of maximum takeoff power.
2. Handling Qualities							
	(3) For FTDs requiring Static tests at the controls (i.e., column, wheel, rudder pedal), special test fixtures will not be required during initial or upgrade evaluations if the sponsor's QTG/MQTG shows both test fixture results*and* the results of an alternative approach, such as computer plots produced concurrently, that show satisfactory agreement. Repeat of the alternative method during the initial or upgrade evaluation would then satisfy this test requirement						Testing of position versus force is not applicable if forces are generated solely by use of airplane hardware in the FTD.
2.a	(3) Static Control Tests						
2.a.1.a	Pitch Controller Position vs. Force and Surface Position Calibration.	±2 lb (0.9 daN) breakout, ±10% or ±5 lb (2.2 daN) force, ±2° elevator.	Ground	Record results for an uninterrupted control sweep to the stops.		X	
2.a.1.b	Pitch Controller Position vs. Force.	±2 lb (0.9 daN) breakout, ±10% or ±5 lb (2.2 daN) force.	Ground	Record results for an uninterrupted control sweep to the stops.	X		Applicable only on continuing qualification evaluations. The intent is to design the control feel for Level 5 to be able to manually fly an instrument approach; and not to compare results to flight test or other such data.
2.a.2.a	Roll Controller Position vs. Force and Surface Position Calibration.	±2 lb (0.9 daN) breakout, ±10% or ±3 lb (1.3 daN) force, ±2° aileron, ±3° spoiler angle.	Ground	Record results for an uninterrupted control sweep to the stops.		X	

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

<<< QPS Requirements >>>							<< Information >>
Test		Tolerances	Flight conditions	Test details	FTD level		Notes
Number	Title				5	6	
2.a.2.b	Roll Controller Position vs. Force.	±2 lb (0.9 daN) breakout, ±10% or ±3 lb (1.3 daN) force.	Ground	Record results for an uninterrupted control sweep to the stops.	X		Applicable only on continuing qualification evaluations. The intent is to design the control feel for Level 5 to be able to manually fly an instrument approach; and not to compare results to flight test or other such data.
2.a.3.a	Rudder Pedal Position vs. Force and Surface Position Calibration.	±5 lb (2.2 daN) breakout, ±10% or ±5 lb (2.2 daN) force, ±2° rudder angle.	Ground	Record results for an uninterrupted control sweep to the stops.		X	
2.a.3.b	Rudder Pedal Position vs. Force.	±5 lb (2.2 daN) breakout, ±10% or ±5 lb (2.2 daN) force.	Ground	Record results for an uninterrupted control sweep to the stops.	X		Applicable only on continuing qualification evaluations. The intent is to design the control feel for Level 5 to be able to manually fly an instrument approach; and not to compare results to flight test or other such data.
2.a.4	Nosewheel Steering Controller Force.	±2 lb (0.9 daN) breakout, ±10% or ±3 lb (1.3 daN) force.	Ground			X	
2.a.5	Rudder Pedal Steering Calibration.	±2° nosewheel angle	Ground			X	
2.a.6	Pitch Trim Indicator vs. Surface Position Calibration.	±0.5° of computed trim surface angle	Ground			X	The purpose of the test is to compare the FTD against design data or equivalent.
2.a.7	(Reserved).						

2.a.8	Alignment of Cockpit Throttle Lever vs. Selected Engine Parameter.	±5° of throttle lever angle ±0.8 in (2 cm) for power control without angular travel.	Ground	Requires simultaneous recording for all engines. The tolerances apply against airplane data and between engines. In the case of propeller powered airplanes, if a propeller lever is present, it must also be checked.		X	
2.a.9	Brake Pedal Position vs. Force.	±5 lb (2.2 daN) or 10% force	Ground	Two data points are required: zero and maximum deflection. Computer output results may be used to show compliance.		X	Test not required unless RTO credit is sought.
2.b	(Reserved)						
2.c	Longitudinal Control Tests						
	Power setting is that required for level flight unless otherwise specified						
2.c.1	Power Change Force	±5 lb (2.2 daN) or, ±20% force	Cruise or Approach	May be a series of snapshot test results. Power change dynamics test as described in test 2.c.1 of Table A2A of this part will be accepted.	X	X	
2.c.2	Flap/Slat Change Force	±5 lb (2.2 daN) or, ±20% force	Takeoff through initial flap retraction, and approach to landing.	May be a series of snapshot test results. Flap/Slat change dynamics test as described in test 2.c.2 of Table A2A of this part will be accepted.	X	X	
2.c.3	(Reserved)						
2.c.4	Gear Change Force	±5 lb (2.2 daN) or, ±20% force	Takeoff (retraction) and Approach (extension).	May be a series of snapshot test results. Gear change dynamics test as described in test 2.c.4 of Table A2A of this part will be accepted.	X	X	

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

<<< QPS Requirements >>>							<< Information >>
Test		Tolerances	Flight conditions	Test details	FTD level		Notes
Number	Title				5	6	
2.c.5	Longitudinal Trim	±0.5° trim surface angle ±1° elevator ±1° pitch angle ±5% net thrust or equivalent.	Cruise, Approach, and Landing.	May be a series of snapshot tests. Level 5 may use equivalent stick and trim controllers in lieu of elevator and trim surface.	X	X	
2.c.6	Longitudinal Maneuvering Stability (Stick Force/g).	±5 lb (±2.2 daN) or ±10% pitch controller force.	Cruise, Approach and Landing.	May be a series of snapshot test results.		X	
2.c.7	Longitudinal Static Stability	±5 lb (±2.2 daN) or ±10% pitch controller force.	Approach	May be a series of snapshot test results. Level 5 must exhibit positive static stability, but need not comply with the numerical tolerance.	X	X	
2.c.8	Stall Warning (actuation of stall warning device).	±3 kts. airspeed, ±2° bank	Second Segment Climb, and Approach or Landing.	Record the stall warning signal.	X	X	The stall maneuver may be entered with thrust at or near idle power and wings level (1g).
2.c.9.a	Phugoid Dynamics	±10% period, ±10% of time to ½ or double amplitude or ±.02 of damping ratio.	Cruise	The test must include whichever is less of the following: Three full cycles (six overshoots after the input is completed), or the number of cycles sufficient to determine time to ½ or double amplitude.		X	
2.c.9.b	Phugoid Dynamics	±10% period, Representative damping	Cruise	The test must include whichever is less of the following: Three full cycles (six overshoots after the input is completed), or the number of cycles sufficient to determine representative damping.	X		

2.c.10	Short Period Dynamics	±1.5° pitch angle or ±2°/sec pitch rate, ±0.10g acceleration.	Cruise			X	
2.d	(3) Lateral Directional Tests						
	(3) Power setting is that required for level flight unless otherwise specified.						
2.d.1	(Reserved).						
2.d.2	Roll Response (Rate)	±10% or ±2°/sec roll rate	Cruise, and Approach or Landing.		X	X	Results should be recorded for normal roll controller deflection (about one-third of maximum roll controller travel). May be combined with step input of flight deck roll controller test (2.d.3.).
2.d.3	Roll Response to Cockpit Roll Controller Step Input.	±10% or ±2° bank angle	Approach or Landing			X	May be combined with roll response (rate) test (2.d.2.).
2.d.4.a	Spiral Stability	Correct trend and ±3° or ±10% bank angle in 20 seconds.	Cruise			X	Airplane data averaged from multiple tests in same direction may be used.
2.d.4.b	Spiral Stability	Correct trend	Cruise		X		Airplane data averaged from multiple tests in same direction may be used.
2.d.5	(Reserved)						
2.d.6.a	Rudder Response	±2°/sec or ±10% yaw rate.	Approach or Landing	Not required if rudder input and response is shown in Dutch Roll Test (test 2.d.7).		X	A rudder step input of 20%–30% rudder pedal throw may be used.
2.d.6.b	Rudder Response	Roll rate ±2°/sec, bank angle ±3°	Approach or Landing	May be roll response to a given rudder deflection.	X		

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

<<< QPS Requirements >>>							<< Information >>
Test		Tolerances	Flight conditions	Test details	FTD level		Notes
Number	Title				5	6	
2.d.7	Dutch, Roll, (Yaw Damper OFF).	±0.5 sec or ±10% of period, ±10% of time to ½ or double amplitude or ±.02 of damping ratio.	Cruise, and Approach or Landing.	Record results for at least 6 complete cycles with stability augmentation OFF, or the number of cycles sufficient to determine time to ½ or double amplitude.		X	
2.d.8	Steady State Sideslip	For given rudder position ±2° bank angle, ±1° sideslip angle, ±10% or ±2° aileron, ±10% or ±5° spoiler or equivalent roll, controller position or force.	Approach or Landing	May be a series of snapshot test results. Propeller driven airplanes must test in each direction.	X	X	Sideslip angle is matched for repeatability on continuing qualification evaluations.
2.e. through 2.h ..	(Reserved)	.....	.....	.....	.....	.....	
3	(Reserved)	.....	.....	.....	.....	.....	
4	(Reserved)	.....	.....	.....	.....	.....	
5	(Reserved)	.....	.....	.....	.....	.....	
6. FTD System Response Time							
6a.	Latency.						
		300 ms (or less) after airplane response.	Take-off cruise, and approach or landing.	One test is required in each axis (pitch, roll and yaw) for each of the three conditions (take-off, cruise, and approach or landing).	X	X	
	Transport Delay. If Transport Delay is chosen to demonstrate response time than Latency, it is expected that when reviewing those existing tests where latency can be identified (e.g., short period, roll response, rudder response) the sponsor and the NSPM will apply additional scrutiny to ensure proper FTD response.						
		300 ms (or less) after controller movement.	N/A	A separate test is required in each axis (pitch, roll, and yaw).	X	X	

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

- Control Dynamics, paragraph 3.
- Motion System, paragraph 5.
- Sound System, paragraph 6.
- Engineering Simulator Validation Data, paragraph 8.
- Approval Guidelines for Engineering Simulator Validation Data, paragraph 9.
- Validation Test Tolerances, paragraph 10.
- Validation Data Road Map, paragraph 11.
- Acceptance Guidelines for Alternative Engines Data, paragraph 12.
- Acceptance Guidelines for Alternative Avionics, paragraph 13.
- Transport Delay Testing, paragraph 14.
- Continuing Qualification Evaluation Validation Data Presentation, paragraph 15.

4. ALTERNATIVE OBJECTIVE DATA FOR FTD LEVEL 5.

BEGIN QPS REQUIREMENTS

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

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

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

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

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

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

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

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

<<< QPS requirement >>>		
Applicable test		Authorized performance range
No.	Title and procedure	
1. Performance		
1.c	Climb.	
1.c.1	Normal climb with nominal gross weight, at best rate-of-climb airspeed.	Climb rate = 500–1200 fpm (2.5–6 m/sec).
1.f	Engines.	
1.f.1	Acceleration; idle to takeoff power	2–4 Seconds.
1.f.2	Deceleration; takeoff power to idle	2–4 Seconds.
2. Handling Qualities		
2.c	Longitudinal Tests.	
2.c.1	Power change force	

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

<<< QPS requirement >>>		
Applicable test		Authorized performance range
No.	Title and procedure	
	(a) Trim for straight and level flight at 80% of normal cruise airspeed with necessary power. Reduce power to flight idle. Do not change trim or configuration. After stabilization, record column force necessary to maintain original airspeed.	5–15 lbs (2.2–6.6 daN) of force (Pull).
	OR	
	(b) Trim for straight and level flight at 80% of normal cruise airspeed with necessary power. Add power to maximum setting. Do not change trim or configuration. After stabilized, record column force necessary to maintain original airspeed.	5–15 lbs (2.2–6.6 daN) of force (Push).
2.c.2	Flap/slat change force.	
	(a) Trim for straight and level flight with flaps fully retracted at a constant airspeed within the flaps- extended airspeed range. Do not adjust trim or power. Extend the flaps to 50% of full flap travel. After stabilized, record stick force necessary to maintain original airspeed.	5–15 lbs (2.2–6.6 daN) of force (Pull).
	OR	
	(b) Trim for straight and level flight with flaps extended to 50% of full flap travel, at a constant airspeed within the flaps-extended airspeed range. Do not adjust trim or power. Retract the flaps to zero. After stabilized, record stick force necessary to maintain original airspeed.	5–15 lbs (2.2–6.6 daN) of force (Push).
2.c.4	Gear change force	
	(a) Trim for straight and level flight with landing gear retracted at a constant airspeed within the landing gear-extended airspeed range. Do not adjust trim or power. Extend the landing gear. After stabilized, record stick force necessary to maintain original airspeed.	2–12 lbs (0.88–5.3 daN) of force (Pull).
	OR	
	(b) Trim for straight and level flight with landing gear extended, at a constant airspeed within the landing gear-extended airspeed range. Do not adjust trim or power. Retract the landing gear. After stabilized, record stick force necessary to maintain original airspeed.	2–12 lbs (0.88–5.3 daN) of force (Push).
2.c.5	Longitudinal trim	Must be able to trim longitudinal stick force to "zero" in each of the following configurations: cruise; approach; and landing.
2.c.7	Longitudinal static stability	Must exhibit positive static stability.
2.c.8	Stall warning (actuation of stall warning device) with nominal gross weight; wings level; and a deceleration rate of approximately one (1) knot per second.	
	(a) Landing configuration	40–60 knots; ± 5° of bank.
	(b) Clean configuration	Landing configuration speed + 10–20%.
2.c.9.b	Phugoid dynamics	Must have a phugoid with a period of 30–60 seconds. May not reach ½ or double amplitude in less than 2 cycles.

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

<<< QPS requirement >>>		
Applicable test		Authorized performance range
No.	Title and procedure	
2.d	Lateral Directional Tests.	
2.d.2	Roll response ..... Roll rate must be measured through at least 30 degrees of roll. Aileron control must be deflected ½ (50 percent) of maximum travel.	Must have a roll rate of 6–40 degrees/second.
2.d.4.b	Spiral stability ..... Cruise configuration and normal cruise airspeed. Establish a 20–30 degree bank. When stabilized, neutralize the aileron control and release. Must be completed in both directions of turn.	Initial bank angle (± 5 degrees) after 20 seconds.
2.d.6.b	Rudder response ..... Use 50 percent of maximum rudder deflection. (Applicable to approach or landing configuration.).	6–12 degrees/second yaw rate.
2.d.7	Dutch roll, yaw damper off ..... (Applicable to cruise and approach configurations.).	A period of 2–5 seconds; and ½–2 cycles.
2.d.8	Steady state sideslip ..... Use 50 percent rudder deflection. (Applicable to approach and landing degrees of configurations.).	2–10 degrees of bank; 4–10 degrees of sideslip; and 2–10 degrees of aileron.
6	FTD System Response Time.	
6.a	Cockpit instrument systems response to an abrupt pilot controller input. One test is required in each axis (pitch, roll, yaw).	300 milliseconds or less.

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

<<< QPS requirement >>>		
Applicable test		Authorized performance range
Number	Title and procedure	
1. Performance		
1.c	Climb	
1.c.1	Normal climb with nominal gross weight, at best rate-of-climb airspeed.	Climb airspeed = 95–115 knots. Climb rate = 500–1500 fpm (2.5–7.5 m/sec).
1.f.	Engines	
1.f.1	Acceleration; idle to takeoff power	2–5 Seconds
1.f.2	Deceleration; takeoff power to idle	2–5 Seconds
2. Handling Qualities		
2.c Longitudinal Tests		
2.c.1	Power change force	
	a) Trim for straight and level flight at 80% of normal cruise airspeed with necessary power. Reduce power to flight idle. Do not change trim or configuration. After stabilized, record column force necessary to maintain original airspeed.	10–25 lbs (2.2–6.6 daN) of force (Pull).
	OR	

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

<<< QPS requirement >>>		
Applicable test		Authorized performance range
Number	Title and procedure	
	b) Trim for straight and level flight at 80% of normal cruise airspeed with necessary power. Add power to maximum setting. Do not change trim or configuration. After stabilized, record column force necessary to maintain original airspeed.	5–15 lbs (2.2–6.6 daN) of force (Push).
2.c.2	Flap/slat change force	
	a) Trim for straight and level flight with flaps fully retracted at a constant airspeed within the flaps-extended airspeed range. Do not adjust trim or power. Extend the flaps to 50% of full flap travel. After stabilized, record stick force necessary to maintain original airspeed.	5–15 lbs (2.2–6.6 daN) of force (Pull).
	OR	
	b) Trim for straight and level flight with flaps extended to 50% of full flap travel, at a constant airspeed within the flaps-extended airspeed range. Do not adjust trim or power. Retract the flaps to zero. After stabilized, record stick force necessary to maintain original airspeed.	5–15 lbs (2.2–6.6 daN) of force (Push).
2.c.4	Gear change force	
	a) Trim for straight and level flight with landing gear retracted at a constant airspeed within the landing gear-extended airspeed range. Do not adjust trim or power. Extend the landing gear. After stabilized, record stick force necessary to maintain original airspeed.	2–12 lbs (0.88–5.3 daN) of force (Pull).
	OR	
	b) Trim for straight and level flight with landing gear extended, at a constant airspeed within the landing gear-extended airspeed range. Do not adjust trim or power. Retract the landing gear. After stabilized, record stick force necessary to maintain original airspeed.	2–12 lbs (0.88–5.3 daN) of force (Push).
2.c.4	Longitudinal trim	Must be able to trim longitudinal stick force to ''zero'' in each of the following configurations: cruise; approach; and landing.
2.c.7	Longitudinal static stability	Must exhibit positive static stability.
2.c.8	Stall warning (actuation of stall warning device) with nominal gross weight; wings level; and a deceleration rate of approximately one (1) knot per second.	
	a) Landing configuration:	60–90 knots; ± 5° of bank.
	b) Clean configuration:	Landing configuration speed + 10–20%.
2.c.9.b	Phugoid dynamics	Must have a phugoid with a period of 30–60 seconds. May not reach ½ or double amplitude in less than 2 cycles.
2.d	Lateral Directional Tests	
2.d.2	Roll response ..... Roll rate must be measured through at least 30 degrees of roll.. Aileron control must be deflected ½ (50 percent) of maximum travel.	Must have a roll rate of 6–40 degrees/second.

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

<<< QPS requirement >>>		
Applicable test		Authorized performance range
Number	Title and procedure	
2.d.4.b	Spiral stability ..... Cruise configuration and normal cruise airspeed. Establish a 20–30 degree bank. When stabilized, neutralize the aileron control and release. Must be completed in both directions of turn.	Initial bank angle (± 5 degrees) after 20 seconds.
2.d.6.b	Rudder response ..... Use 50 percent of maximum rudder deflection. (Applicable to approach or landing configuration.).	6–12 degrees/second yaw rate.
2.d.7	Dutch roll, yaw damper off (Applicable to cruise and approach configurations.).	A period of 2–5 seconds; and ½-2 cycles.
2.d.8	Steady state sideslip ..... Use 50 percent rudder deflection. (Applicable to approach and landing configurations.).	2–10 degrees of bank; 4–10 degrees of sideslip; and 2–10 degrees of aileron.
6. FTD System Response Time		
6.a	Cockpit instrument systems response to an abrupt pilot controller input. One test is required in each axis (pitch, roll, yaw).	300 milliseconds or less.

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

<<< QPS requirement >>>		
Applicable test		Authorized performance range
Number	Title and procedure	
1. Performance		
1.c	Climb	
1.c.1	Normal climb with nominal gross weight, at best rate-of-climb airspeed.	Climb airspeed = 95–115 knots, Climb rate = 800–1800 fpm (4–9 m/sec).
1.f	Engines	
1.f.1	Acceleration; idle to takeoff power	4–8 Seconds
1.f.2	Deceleration; takeoff power to idle	3–7 Seconds
2. Handling Qualities		
2.c Longitudinal Tests		
2.c.1	Power change force	
	a) Trim for straight and level flight at 80% of normal cruise airspeed with necessary power. Reduce power to flight idle. Do not change trim or configuration. After stabilized, record column force necessary to maintain original airspeed.	8 lbs (3.5 daN) of Push force—8 lbs (3.5 daN) of Pull force
	OR	
	b) Trim for straight and level flight at 80% of normal cruise airspeed with necessary power. Add power to maximum setting. Do not change trim or configuration. After stabilized, record column force necessary to maintain original airspeed.	12–22 lbs (5.3–9.7 daN) of force (Push)

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

<<< QPS requirement >>>		
Applicable test		Authorized performance range
Number	Title and procedure	
2.c.2	Flap/slat change force	
	a) Trim for straight and level flight with flaps fully retracted at a constant airspeed within the flaps-extended airspeed range. Do not adjust trim or power. Extend the flaps to 50% of full flap travel. After stabilized, record stick force necessary to maintain original airspeed.	5–15 lbs (2.2–6.6 daN) of force (Pull).
	OR	
	b) Trim for straight and level flight with flaps extended to 50% of full flap travel, at a constant airspeed within the flaps-extended airspeed range. Do not adjust trim or power. Retract the flaps to zero. After stabilized, record stick force necessary to maintain original airspeed.	5–15 lbs (2.2–6.6 daN) of force (Push)
2.c.4	Gear change force	
	a) Trim for straight and level flight with landing gear retracted at a constant airspeed within the landing gear-extended airspeed range. Do not adjust trim or power. Extend the landing gear. After stabilized, record stick force necessary to maintain original airspeed.	2–12 lbs (0.88–5.3 daN) of force (Pull)
	OR	
	b) Trim for straight and level flight with landing gear extended, at a constant airspeed within the landing gear-extended airspeed range. Do not adjust trim or power. Retract the landing gear. After stabilized, record stick force necessary to maintain original airspeed.	2–12 lbs (0.88– 5.3 daN) of force (Push)
2.b.5	Longitudinal trim	Must be able to trim longitudinal stick force to ''zero'' in each of the following configurations: cruise; approach; and landing.
2.c.7	Longitudinal static stability	Must exhibit positive static stability.
2.c.8	Stall warning (actuation of stall warning device) with nominal gross weight; wings level; and a deceleration rate of approximately one (1) knot per second.	
	a) Landing configuration:	60–90 knots; ±5° of bank.
	b) Clean configuration:	Landing configuration speed + 10–20%.
2.c.8.b	Phugoid dynamics	Must have a phugoid with a period of 30–60 seconds. May not reach ½ or double amplitude in less than 2 cycles.
2.d	Lateral Directional Tests	
2.d.2	Roll response ..... Roll rate must be measured through at least 30 degrees of roll. Aileron control must be deflected ½ (50 percent) of maximum travel.	Must have a roll rate of 6–40 degrees/second.
2.d.4.b	Spiral stability ..... Cruise configuration and normal cruise airspeed. Establish a 20–30 degree bank. When stabilized, neutralize the aileron control and release. Must be completed in both directions of turn.	Initial bank angle (± 5 degrees) after 20 seconds.
2.d.6.b	Rudder response	6–12 degrees/second yaw rate.

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

<<< QPS requirement >>>		
Applicable test		Authorized performance range
Number	Title and procedure	
	Use 50 percent of maximum rudder deflection. (Applicable to approach or landing configuration.).	
2.d.7	Dutch roll, yaw damper off ..... (Applicable to cruise and approach configurations.).	A period of 2–5 seconds; and 1.2–3 cycles.
2.d.8	Steady state sideslip ..... Use 50 percent rudder deflection. (Applicable to approach and landing degrees of configurations.).	2–10 degrees of bank; 4–10 degrees of sideslip; and 2–10 degrees of aileron.
6. FTD System Response Time		
6.a	Cockpit instrument systems response to an abrupt pilot controller input. One test is required in each axis (pitch, roll, yaw).	300 milliseconds or less.

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

<<< QPS requirement >>>		
Applicable test		Authorized performance range
No.	Title and procedure	
1. Performance		
1.c	Climb	
1.b.1	Normal climb with nominal gross weight, at best rate-of-climb airspeed	Climb airspeed= 120–140 knots. Climb rate= 1000–3000 fpm (5–15 m/sec).
1.f	Engines	
1.f.1	Acceleration; idle to takeoff power	2–6 Seconds.
1.f.2	Deceleration; takeoff power to idle	1–5 Seconds.
2. Handling Qualities		
2.c Longitudinal Tests		
2.c.1	Power change force	
	a) Trim for straight and level flight at 80% of normal cruise airspeed with necessary power. Reduce power to flight idle. Do not change trim or configuration. After stabilized, record column force necessary to maintain original airspeed	8 lbs (3.5 daN) of Push force to 8 lbs (3.5 daN) of Pull force.
	OR	
	b) Trim for straight and level flight at 80% of normal cruise airspeed with necessary power. Add power to maximum setting. Do not change trim or configuration. After stabilized, record column force necessary to maintain original airspeed	12–22 lbs (5.3–9.7 daN) of force (Push).
2.c.2	Flap/slat change force	

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

<<< QPS requirement >>>		
Applicable test		Authorized performance range
No.	Title and procedure	
	a) Trim for straight and level flight with flaps fully retracted at a constant airspeed within the flaps-extended airspeed range. Do not adjust trim or power. Extend the flaps to 50% of full flap travel. After stabilized, record stick force necessary to maintain original airspeed	5–15 lbs (2.2–6.6 daN) of force (Pull).
	OR	
	b) Trim for straight and level flight with flaps extended to 50% of full flap travel, at a constant airspeed within the flaps-extended airspeed range. Do not adjust trim or power. Retract the flaps to zero. After stabilized, record stick force necessary to maintain original airspeed	5–15 lbs (2.2–6.6 daN) of force (Push).
2.c.4	Gear change force	
	a) Trim for straight and level flight with landing gear retracted at a constant airspeed within the landing gear-extended airspeed range. Do not adjust trim or power. Extend the landing gear. After stabilized, record stick force necessary to maintain original airspeed	2–12 lbs (0.88–5.3 daN) of force (Pull).
	OR	
	b) Trim for straight and level flight with landing gear extended, at a constant airspeed within the landing gear-extended airspeed range. Do not adjust trim or power. Retract the landing gear. After stabilized, record stick force necessary to maintain original airspeed	2–12 lbs (0.88–5.3 daN) of force (Push).
2.b.5	Longitudinal trim	Must be able to trim longitudinal stick force to ''zero'' in each of the following configurations; cruise; approach; and landing.
2.c.7	Longitudinal static stability	Must exhibit positive static stability.
2.c.8	Stall warning (actuation of stall warning device) with nominal gross weight; wings level; and a deceleration rate of approximately one (1) knot per second	
	a) Landing configuration	80–100 knots; ± 5° of bank.
	b) Clean configuration	Landing configuration speed + 10–20%
2.c.8.b	Phugoid dynamics	Must have a phugoid with a period of 30–60 seconds. May not reach ½ or double amplitude in less than 2 cycles.
2.d Lateral Directional Test		
2.d.2	Roll response ..... Roll rate must be measured through at least 30 degrees of roll. Aileron control must be deflected approximately ½ (50 percent) of maximum travel	Must have a roll rate of 6–40 degrees/second.
2.d.4.b	Spiral stability ..... Cruise configuration and normal cruise airspeed. Establish a 20–30 degree bank. When stabilized, neutralize the aileron control and release. Must be completed in both directions of turn	Initial bank angle (±5 degrees) after 20 seconds.

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

<<< QPS requirement >>>		
Applicable test		Authorized performance range
No.	Title and procedure	
2.d.6.b	Rudder response ..... Use 50 percent of maximum rudder deflection (Applicable to approach or landing configuration.)	6–12 degrees/second yaw rate.
2.d.7	Dutch roll, yaw damper off (Applicable to cruise and approach configurations.)	A period of 2–5 seconds; and ½–3 cycles.
2.d.8	Steady state sideslip ..... Use 50 percent rudder deflection ..... (Applicable to approach and landing configurations.)	2–10 degrees of bank; 4–10 degrees of sideslip; and 2–10 degrees of aileron.
6. FTD System Response Time		
6.a	Cockpit instrument systems response to an abrupt pilot controller input. One test is required in each axis (pitch, roll, yaw)	300 milliseconds or less.

END QPS REQUIREMENTS

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

BEGIN INFORMATION

a. In recent years, considerable progress has been made by highly experienced aircraft and FTD manufacturers in improvement of aerodynamic modeling techniques. In conjunction with increased accessibility to very high powered computer technology, these techniques have become quite sophisticated. Additionally, those who have demonstrated success in combining these modeling techniques with minimal flight testing have incorporated the use of highly mature flight controls models and have had extensive experience in comparing the output of their effort with actual flight test data—and they have been able to do so on an iterative basis over a period of years.

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

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

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

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

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

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

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

level, unaccelerated, and trimmed flight, and the results should be compared with the flight test pitch angle.

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

c. This table is *not* applicable to Computer Controlled Aircraft FTDs.

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

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

END INFORMATION

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

Objective test reference number and title	Alternative data sources, procedures, and instrumentation	Notes and reminders
1.b.1 Performance Takeoff Ground acceleration time.	Data may be acquired through a synchronized video recording of a stop watch and the calibrated airplane airspeed indicator. Hand-record the flight conditions and airplane configuration.	This test is required only if RTO is sought.
1.b.7 Performance Takeoff Rejected takeoff.	Data may be acquired through a synchronized video recording of a stop watch and the calibrated airplane airspeed indicator. Hand-record the flight conditions and airplane configuration.	This test is required only if RTO is sought.
1.c.1 Performance Climb Normal climb all engines operating.	Data may be acquired with a synchronized video of calibrated airplane instruments and engine power throughout the climb range.	
1.f.1 Performance Engines Acceleration.	Data may be acquired with a synchronized video recording of engine instruments and throttle position.	
1.f.2 Performance Engines Deceleration.	Data may be acquired with a synchronized video recording of engine instruments and throttle position.	
2.a.1.a Handling qualities Static control tests Pitch controller position vs. force and surface position calibration.	Surface position data may be acquired from flight data recorder (FDR) sensor or, if no FDR sensor, at selected, significant column positions (encompassing significant column position data points), acceptable to the NSPM, using a control surface protractor on the ground (for airplanes with reversible control systems, this function should be accomplished with winds less than 5 kt). Force data may be acquired by using a hand held force gauge at the same column position data points.	
2.a.2.a Handling qualities Static control tests Wheel position vs. force and surface position calibration.	Surface position data may be acquired from flight data recorder (FDR) sensor or, if no FDR sensor, at selected, significant column positions (encompassing significant column position data points), acceptable to the NSPM, using a control surface protractor on the ground (for airplanes with reversible control systems, this function should be accomplished with winds less than 5 kt). Force data may be acquired by using a hand held force gauge at the same column position data points.	

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

Objective test reference number and title	Alternative data sources, procedures, and instrumentation	Notes and reminders
2.a.3.a Handling qualities Static control tests Rudder pedal position vs. force and surface position calibration.	Surface position data may be acquired from flight data recorder (FDR) sensor or, if no FDR sensor, at selected, significant column positions (encompassing significant column position data points), acceptable to the NSPM, using a control surface protractor on the ground (for airplanes with reversible control systems, this function should be accomplished with winds less than 5 kt). Force data may be acquired by using a hand held force gauge at the same column position data points.	
2.a.4 Handling qualities Static control tests Nosewheel steering force.	Breakout data may be acquired with a hand held force gauge. The remainder of the force to the stops may be calculated if the force gauge and a protractor are used to measure force after breakout for at least 25% of the total displacement capability.	
2.a.5 Handling qualities Static control tests Rudder pedal steering calibration.	Data may be acquired through the use of force pads on the rudder pedals and a pedal position measurement device, together with design data for nose wheel position.	
2.a.6 Handling qualities Static control tests Pitch trim indicator vs. surface position calibration.	Data may be acquired through calculations.	
2.a.8 Handling qualities Static control tests Alignment of power lever angle vs. selected engine parameter (e.g., EPR, N_1, Torque).	Data may be acquired through the use of a temporary throttle quadrant scale to document throttle position. Use a synchronized video to record steady state instrument readings or hand-record steady state engine performance readings.	
2.a.9 Handling qualities Static control tests Brake pedal position vs. force.	Use of design or predicted data is acceptable. Data may be acquired by measuring deflection at ''zero'' and at ''maximum.''.	
2.c.1 Handling qualities. Longitudinal control tests Power change force.	Data may be acquired by using an inertial measurement system and a synchronized video of the calibrated airplane instruments, throttle position, and the force/position measurements of cockpit controls.	Power change dynamics test is acceptable using the same data acquisition methodology.
2.c.2 Handling qualities Longitudinal control tests Flap/slat change force.	Data may be acquired by using an inertial measurement system and a synchronized video of calibrated airplane instruments, flap/slat position, and the force/position measurements of cockpit controls.	Flap/slat change dynamics test is acceptable using the same data acquisition methodology.
2.c.4 Handling qualities Longitudinal control tests Gear change force.	Data may be acquired by using an inertial measurement system and a synchronized video of the calibrated airplane instruments, gear position, and the force/position measurements of cockpit controls.	Gear change dynamics test is acceptable using the same data acquisition methodology.
2.c.5 Handling qualities Longitudinal control tests Longitudinal trim.	Data may be acquired through use of an inertial measurement system and a synchronized video of the cockpit controls position (previously calibrated to show related surface position) and the engine instrument readings.	
2.c.6 Handling qualities Longitudinal control tests Longitudinal maneuvering stability (stick force/g).	Data may be acquired through the use of an inertial measurement system and a synchronized video of the calibrated airplane instruments; a temporary, high resolution bank angle scale affixed to the attitude indicator; and a wheel and column force measurement indication.	

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

Objective test reference number and title	Alternative data sources, procedures, and instrumentation	Notes and reminders
2.c.7 ..... Handling qualities Longitudinal control tests Longitudinal static stability.	Data may be acquired through the use of a synchronized video of the airplane flight instruments and a hand held force gauge.	
2.c.8 ..... Handling qualities Longitudinal control tests Stall Warning (activation of stall warning device).	Data may be acquired through a synchronized video recording of a stop watch and the calibrated airplane airspeed indicator. Hand-record the flight conditions and airplane configuration.	Airspeeds may be cross checked with those in the TIR and AFM.
2.c.9.a ..... Handling qualities Longitudinal control tests Phugoid dynamics.	Data may be acquired by using an inertial measurement system and a synchronized video of the calibrated airplane instruments and the force/position measurements of cockpit controls.	
2.c.10 ..... Handling qualities Longitudinal control tests Short period dynamics.	Data may be acquired by using an inertial measurement system and a synchronized video of the calibrated airplane instruments and the force/position measurements of cockpit controls.	
2.c.11 ..... Handling qualities Longitudinal control tests Gear and flap/slat operating times.	May use design data, production flight test schedule, or maintenance specification, together with an SOC.	
2.d.2 ..... Handling qualities Lateral directional tests Roll response (rate).	Data may be acquired by using an inertial measurement system and a synchronized video of the calibrated airplane instruments and the force/position measurements of cockpit lateral controls.	
2.d.3 ..... Handling qualities Lateral directional tests (a) Roll overshoot OR (b) Roll response to cockpit roll controller step input.	Data may be acquired by using an inertial measurement system and a synchronized video of the calibrated airplane instruments and the force/position measurements of cockpit lateral controls.	
2.d.4 ..... Handling qualities Lateral directional tests Spiral stability.	Data may be acquired by using an inertial measurement system and a synchronized video of the calibrated airplane instruments; the force/position measurements of cockpit controls; and a stop watch.	
2.d.6.a ..... Handling qualities Lateral directional tests Rudder response.	Data may be acquired by using an inertial measurement system and a synchronized video of the calibrated airplane instruments; the force/position measurements of rudder pedals.	
2.d.7 ..... Handling qualities Lateral directional tests Dutch roll, (yaw damper OFF).	Data may be acquired by using an inertial measurement system and a synchronized video of the calibrated airplane instruments and the force/position measurements of cockpit controls.	
2.d.8 ..... Handling qualities Lateral directional tests Steady state sideslip.	Data may be acquired by using an inertial measurement system and a synchronized video of the calibrated airplane instruments and the force/position measurements of cockpit controls.	

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

1. DISCUSSION

BEGIN INFORMATION

a. The subjective tests provide a basis for evaluating the capability of the FTD to perform over a typical utilization period. The items listed in the Table of Functions and

Subjective Tests are used to determine whether the FTD competently simulates each required maneuver, procedure, or task; and verifying correct operation of the FTD controls, instruments, and systems. The tasks do not limit or exceed the authorizations for use of a given level of FTD as described on the Statement of Qualification or as may be approved by the TPAA. All items in the following paragraphs are subject to examination.

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

e. 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 Line Oriented Flight Training (LOFT) scenario or special emphasis items in the sponsor's training program. Unless directly related to a requirement for the qualification level, the results of such an evaluation would not affect the qualification of the FTD.

END INFORMATION

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

<<< QPS requirement >>>	No.
	Tasks in this table are subject to evaluation if appropriate for the airplane system or systems simulated as indicated in the SOQ Configuration List as defined in appendix B, Attachment 2 of this part.
1. Preflight	
	Accomplish a functions check of all installed switches, indicators, systems, and equipment at all crewmembers' and instructors' stations, and determine that the cockpit (or flight deck area) design and functions replicate the appropriate airplane.
2. Surface Operations (pre-takeoff)	
2.a	Engine start:
2.a.1	Normal start.
2.a.2	Alternative procedures start.
2.a.3	Abnormal procedures start/shut down.
2.b	Pushback/Powerback (powerback requires visual system).
3. Takeoff (requires appropriate visual system as set out in Table B1A, item 6.b.; appendix B, Attachment 1.)	
3.a	Instrument takeoff:
3.a.1	Engine checks (e.g., engine parameter relationships, propeller/mixture controls).
3.a.2	Acceleration characteristics.
3.a.3	Nosewheel/rudder steering.
3.a.4	Landing gear, wing flap, leading edge device operation.
3.b	Rejected takeoff:
3.b.1	Deceleration characteristics.
3.b.2	Brakes/engine reverser/ground spoiler operation.
3.b.3	Nosewheel/rudder steering.
4. In-Flight Operations	
4.a	Normal climb.
4.b	Cruise:

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

<<< QPS requirement >>>	No.
4.b.1	Demonstration of performance characteristics (speed vs. power).
4.b.2	Normal turns.
4.b.3	Demonstration of high altitude handling.
4.b.4	Demonstration of high airspeed handling/overspeed warning.
4.b.5	Demonstration of Mach effects on control and trim.
4.b.6	Steep turns.
4.b.10	In-Flight engine shutdown (procedures only).
4.b.11	In-Flight engine restart (procedures only).
4.b.13	Specific flight characteristics.
4.b.14	Response to loss of flight control power.
4.b.15	Response to other flight control system failure modes.
4.b.19	Operations during icing conditions.
4.b.20	Effects of airframe/engine icing.
4.c	Other flight phase:
4.c.1	Approach to stalls in the following configurations:
4.c.1.a	Cruise.
4.c.1.b	Takeoff or approach.
4.c.1.c	Landing.
4.c.2	High angle of attack maneuvers in the following configurations:
4.c.2.a	Cruise.
4.c.2.b	Takeoff or approach.
4.c.2.c	Landing.
4.c.3	Slow flight.
4.c.4	Holding.
5.a.1	Non-precision Instrument Approaches:
5.a.1.a.1 ...	With use of autopilot and autothrottle, as applicable.
5.a.1.a.2 ...	Without use of autopilot and autothrottle, as applicable.
5.a.1.b.1 ...	With 10 knot tail wind.
5.a.1.b.2 ...	With 10 knot crosswind.
5.a.2	Precision Instrument Approaches:
5.a.2.a.1 ...	With use of autopilot, autothrottle, and autoland, as applicable.
5.a.2.a.2 ...	Without use of autopilot, autothrottle, and autoland, as applicable.
5.a.2.b.1 ...	With 10 knot tail wind.
5.a.2.b.2 ...	With 10 knot crosswind.
6. Missed Approach	
6.a	Manually controlled.

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

<<< QPS requirement >>>	No.
6.b	Automatically controlled (if applicable).
7. Any Flight Phase, as appropriate	
7.a	Normal system operation (installed systems).
7.b	Abnormal/Emergency system operation (installed systems).
7.c	Flap operation.
7.d	Landing gear operation.
7.e	Engine Shutdown and Parking.
7.e.1	Systems operation.
7.e.2	Parking brake operation.
8. Instructor Operating Station (IOS), as appropriate	
	Functions in this section are subject to evaluation only if appropriate for the airplane and/or installed on the specific FTD involved.
8.a	Power Switch(es).
8.b	Airplane conditions.
8.b.1	Gross weight, center of gravity, and fuel loading and allocation.
8.b.2	Airplane systems status.
8.b.3	Ground crew functions (e.g., external power, push back).
8.c	Airports.
8.c.1	Selection.
8.c.2	Runway selection.
8.c.3	Preset positions (e.g., ramp, over FAF).
8.d	Environmental controls.
8.d.1	Temperature.
8.d.2	Climate conditions (e.g., ice, rain).
8.d.3	Wind speed and direction.
8.e	Airplane system malfunctions.
8.e.1	Insertion/deletion.
8.e.2	Problem clear.
8.f	Locks, Freezes, and Repositioning.
8.f.1	Problem (all) freeze/release.
8.f.2	Position (geographic) freeze/release.
8.f.3	Repositioning (locations, freezes, and releases).
8.f.4	Ground speed control.
8.f.5	Remote IOS, if installed.
9. Sound Controls. On/off/adjustment	

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

<<< QPS requirement >>>	No.
10. Control Loading System (as applicable) On/off/ emergency stop	
11. Observer Stations	
11.a	Position.
11.b	Adjustments.

END QPS REQUIREMENTS

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

<<< QPS Requirements >>>	
No.	Operations tasks
	Tasks in this table are subject to evaluation if appropriate for the airplane system or systems simulated as indicated in the SOQ Configuration List as defined in appendix B, Attachment 2 of this part.
1. Preflight	
	Accomplish a functions check of all installed switches, indicators, systems, and equipment at all crewmembers' and instructors' stations, and determine that the cockpit (or flight deck area) design and functions replicate the appropriate airplane.
2. Surface Operations (pre-takeoff)	
2.a	Engine start (if installed):
2.a.1	Normal start.
2.a.2	Alternative procedures start.
2.a.3	Abnormal/Emergency procedures start / shut down.
3. In-Flight Operations	
3.a	Normal climb.
3.b	Cruise:
3.b.1	Performance characteristics (speed vs. power).
3.b.2	Normal turns.
3.c	Normal descent.
4. Approaches	
4.a.	Coupled instrument approach maneuvers (as applicable for the systems installed).
5. Any Flight Phase	
5.a	Normal system operation (Installed systems).
5.b	Abnormal/Emergency system operation (installed systems).
5.c	Flap operation.
5.d	Landing gear operation.
5.e	Engine Shutdown and Parking (if installed).
5.e.1	Systems operation.
5.e.2	Parking brake operation.
6. Instructor Operating Station (IOS)	

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

<<< QPS Requirements >>>	
No.	Operations tasks
6.a	Power Switch(es).
6.b	Preset positions—ground, air.
6.c	Airplane system malfunctions (Installed systems).
6.c.1	Insertion/deletion.
6.c.2	Problem clear.

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

<<< QPS Requirements >>>	
No.	Operations tasks
	Tasks in this table are subject to evaluation if appropriate for the airplane system or systems simulated as indicated in the SOQ Configuration List as defined in appendix B, Attachment 2 of this part.
1	Level 4 FTDs are required to have at least one system. However, the NSP will accomplish a functions check of all installed systems, switches, indicators, and equipment at all crewmembers' and instructors' stations, and determine that the cockpit (or flight deck area) design and functions replicate the appropriate airplane.

ATTACHMENT 4 TO APPENDIX B TO PART 60—SAMPLE DOCUMENTS

BEGIN INFORMATION

TABLE OF CONTENTS

Title of Sample

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

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

Date _____

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

Dear Dr. Cook:

RE: Request for Initial/Upgrade Evaluation Date

This is to advise you of our intent to request an (initial or upgrade) evaluation of our (FSTD Manufacturer), (Aircraft Type/Level) Flight Simulation Training Device (FSTD), (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 FSTD will be sponsored by (Name of Training Center/Air Carrier), FAA Designator (4 Letter Code). The FSTD will be sponsored under the following options: (Select One)

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

☐ The FSTD will be used for dry lease only in accordance with Paragraph 3b, FSTD Guidance Bulletin 03-08.

We agree to provide the formal request for the evaluation (*Ref: Appendix 4, AC 120-40B*) 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:

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

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

(The sponsor should add additional comments as necessary).

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

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

Sincerely,

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

ATTACHMENT 4 TO APPENDIX A TO PART 60—
Figure B4B – Sample Letter , Request for Initial, Upgrade, or Reinstatement Evaluation
Attachment: FSTD Information Form
INFORMATION

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

ATTACHMENT 4 TO APPENDIX A TO PART 60—
Figure B4B – Sample Letter , Request for Initial, Upgrade, or Reinstatement Evaluation
Attachment: FSTD Information Form
INFORMATION

Visual System Manufacturer and Type:	____	**Motion System Manufacturer and Type:**	____
Aircraft Make/Model/Series:	____	**FSTD Seats Available:**	____

Aircraft Equipment	**ENGINE TYPE(S):** ____	**Flight Instrumentation:** ☐ **EFIS** ☐ **HUD** ☐ **HGS** ☐ **EFVS** ☐ **TCAS** ☐ **GPWS** ☐ **Plain View** ☐ **GPS** ☐ **FMS Type:** ____ ☐ **WX Radar** ☐ **Other:** ____	Engine Instrumentation: ☐ **EICAS** ☐ **FADEC** ☐ **Other:**

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

Section 2. Supplementary Information

FAA Training Program Approval Authority:		☐ **POI** ☐ **TCPM** ☐ **Other:** ____	
Name:	____	**Office:**	____
Tel:	____	**Fax:**	____
Email:	____		

FSTD Scheduling Person:			
Name:	____		
Address 1:	____	**Address 2**	____
City:	____	**State:**	____
ZIP:	____	**Email:**	____
Tel:	____	**Fax:**	____

FSTD Technical Contact:			
Name:	____		
Address 1:	____	**Address 2**	____
City:	____	**State:**	____
ZIP:	____	**Email:**	____
Tel:	____	**Fax:**	____

Section 3. Training, Testing and Checking Considerations

Area/Function/Maneuver	Requested	Remarks
Private Pilot - Training / Checks: (142)	☐	____
Commercial Pilot - Training /Checks:(142)	☐	____
Multi-Engine Rating - Training / Checks (142)	☐	____
Instrument Rating -Training / Checks (142)	☐	____
Type Rating - Training / Checks (135/121/142)	☐	____
Proficiency Checks (135/121/142)	☐	____

ATTACHMENT 4 TO APPENDIX A TO PART 60—
Figure B4B – Sample Letter , Request for Initial, Upgrade, or Reinstatement Evaluation
Attachment: FSTD Information Form
INFORMATION

Section 3. Training, Testing and Checking Considerations		
Area/Function/Maneuver	**Requested**	**Remarks**
Private Pilot - Training / Checks: (142)	☐	____
Commercial Pilot - Training /Checks:(142)	☐	____
Multi-Engine Rating - Training / Checks (142)	☐	____
Instrument Rating -Training / Checks (142)	☐	____
Type Rating - Training / Checks (135/121/142)	☐	____
Proficiency Checks (135/121/142)	☐	____
CAT I: (RVR 2400/1800 ft. DH200 ft)	☐	____
CAT II: (RVR 1200 ft. DH 100 ft)	☐	____
CAT III * (lowest minimum) _____ RVR _____ ft. * *State CAT III (≤ 700 ft.), CAT IIIb (≤ 150 ft.), or CAT IIIc (0 ft.)*	☐	____
Circling Approach	☐	____
Windshear Training: (FSTD GB 03-05)	☐	____
Windshear Training IAW 121.409d (121 Turbojets Only) (FSTD GB 03-05)	☐	____
Generic Unusual Attitudes and Recoveries within the Normal Flight Envelope (FSTD GB 04-03)	☐	____
Specific Unusual Attitudes Recoveries (HBAT 95-10) (FSTD GB 04-03)	☐	____
Auto-coupled Approach/Auto Go Around	☐	____
Auto-land / Roll Out Guidance	☐	____
TCAS/ACAS I / II	☐	____
WX-Radar	☐	____
HUD (FSTD GB 03-02)	☐	____
HGS (FSTD GB 03-02)	☐	
EFVS (FSTD GB 03-03)	☐	
Future Air Navigation Systems (HBAT 98-16A)	☐	____
GPWS / EGPWS	☐	____
ETOPS Capability	☐	____
GPS	☐	____
SMGCS	☐	____
Helicopter Slope Landings	☐	____
Helicopter External Load Operations	☐	____
Helicopter Pinnacle Approach to Landings	☐	____
Helicopter Night Vision Maneuvers	☐	____
Helicopter Category A Takeoffs	☐	____

ATTACHMENT 4 TO APPENDIX B TO PART 60—
Figure B4C – Sample Qualification Test Guide Cover Page
INFORMATION

SPONSOR NAME

SPONSOR ADDRESS

FAA QUALIFICATION TEST GUIDE

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

(Type of FTD)

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

(FTD Level)

(Qualification Performance Standard Used)

(FTD Location)

FAA Initial Evaluation

Date: _____

_____ Date: _____
(Sponsor)

_____ Date: _____
Manager, National
Simulator Program, FAA

ATTACHMENT 4 TO APPENDIX B TO PART 60—
Figure B4D – Sample Statement of Qualification - Certificate

INFORMATION

Federal Aviation Administration
National Simulator Program

Statement of Qualification

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

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

And found it to meet the standards set forth in
AC 120-45A

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

Level 6

Until December 31, 2008

Unless sooner rescinded or extended by the National Simulator Program Manager

November 15, *2007* — (date)

I. B. Checkin, Jr. — (for the NSPM)

ATTACHMENT 4 TO APPENDIX B TO PART 60—
Figure B4E – Sample Statement of Qualification; Configuration List
INFORMATION

STATEMENT of QUALIFICATION
CONFIGURATION LIST

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

ATTACHMENT 4 TO APPENDIX B TO PART 60—
Figure B4E – Sample Statement of Qualification; Configuration List
INFORMATION

Visual System Manufacturer and Type:	____	**Motion System Manufacturer and Type:**	____
Aircraft Make/Model/Series:	____	**FSTD Seats Available:**	____

Aircraft Equipment	**ENGINE TYPE(S):** ____	**Flight Instrumentation:** ☐ **EFIS** ☐ **HUD** ☐ **HGS** ☐ **EFVS** ☐ **TCAS** ☐ **GPWS** ☐ **Plain View** ☐ **GPS** ☐ **FMS Type:** ____ ☐ **WX Radar** ☐ **Other:** ____	Engine Instrumentation: ☐ **EICAS** ☐ **FADEC** ☐ **Other:** ____

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

Section 2. Supplementary Information

FAA Training Program Approval Authority:		☐ **POI** ☐ **TCPM** ☐ **Other:** ____	
Name:	____	**Office:**	____
Tel:	____	**Fax:**	____
Email:	____		

FSTD Scheduling Person:			
Name:	____		
Address 1:	____	**Address 2**	____
City:	____	**State:**	____
ZIP:	____	**Email:**	____
Tel:	____	**Fax:**	____

FSTD Technical Contact:			
Name:	____		
Address 1:	____	**Address 2**	____
City:	____	**State:**	____
ZIP:	____	**Email:**	____
Tel:	____	**Fax:**	____

Section 3. Training, Testing and Checking Considerations

Area/Function/Maneuver	**Requested**	**Remarks**
Private Pilot - Training / Checks: (142)	☐	____
Commercial Pilot - Training /Checks:(142)	☐	____
Multi-Engine Rating - Training / Checks (142)	☐	____
Instrument Rating -Training / Checks (142)	☐	____
Type Rating - Training / Checks (135/121/142)	☐	____
Proficiency Checks (135/121/142)	☐	____
CAT I: (RVR 2400/1800 ft. DH200 ft)	☐	____

ATTACHMENT 4 TO APPENDIX B TO PART 60—
Figure B4E – Sample Statement of Qualification; Configuration List
INFORMATION

Commercial Pilot - Training /Checks:(142)	☐	____
Multi-Engine Rating - Training / Checks (142)	☐	____
Instrument Rating -Training / Checks (142)	☐	____
Type Rating - Training / Checks (135/121/142)	☐	____
Proficiency Checks (135/121/142)	☐	____
CAT I: (RVR 2400/1800 ft. DH200 ft)	☐	____
CAT II: (RVR 1200 ft. DH 100 ft)	☐	____
CAT III * (lowest minimum) ____ RVR ____ ft. ** State CAT III (≤ 700 ft.), CAT IIIb (≤ 150 ft.), or CAT IIIc (0 ft.)*	☐	____
Circling Approach	☐	____
Windshear Training: (FSTD GB 03-05)	☐	____
Windshear Training IAW 121.409d (121 Turbojets Only) (FSTD GB 03-05)	☐	____
Generic Unusual Attitudes and Recoveries within the Normal Flight Envelope (FSTD GB 04-03)	☐	____
Specific Unusual Attitudes Recoveries (HBAT 95-10) (FSTD GB 04-03)	☐	____
Auto-coupled Approach/Auto Go Around	☐	____
Auto-land / Roll Out Guidance	☐	____
TCAS/ACAS I / II	☐	____
WX-Radar	☐	____
HUD (FSTD GB 03-02)	☐	____
HGS (FSTD GB 03-02)	☐	
EFVS (FSTD GB 03-03)	☐	
Future Air Navigation Systems (HBAT 98-16A)	☐	____
GPWS / EGPWS	☐	____
ETOPS Capability	☐	____
GPS	☐	____
SMGCS	☐	____
Helicopter Slope Landings	☐	____
Helicopter External Load Operations	☐	____
Helicopter Pinnacle Approach to Landings	☐	____
Helicopter Night Vision Maneuvers	☐	____
Helicopter Category A Takeoffs	☐	____

ATTACHMENT 4 TO APPENDIX B TO PART 60—
Figure B4F – Sample Statement of Qualification;– List of Qualified Tasks
INFORMATION

STATEMENT of QUALIFICATION
List of Qualified Tasks

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

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

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

except for the following:

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

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

NONE

Attachment 4 to Appendix B to Part 60—
Figure B4G – Sample Continuing Qualification Evaluation Requirements Page Information

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

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

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

(Repeat as Necessary)

Attachment 4 to Appendix B to Part 60—
Figure B4H – Sample MQTG Index of Effective FSTD Directives

Index of Effective FSTD Directives Filed in this Section

Notification Number	Received From: (TPAA/NSPM)	Date of Notification	Date of Modification Completion

Continue as Necessary....

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

BEGIN INFORMATION

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

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7. Additional Responsibilities of the Sponsor (§ 60.9).
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9. Simulator Objective Data Requirements (§ 60.13).
10. Special Equipment and Personnel Requirements for Qualification of the Simulator (§ 60.14).
11. Initial (and Upgrade) Qualification Requirements (§ 60.15).
12. Additional Qualifications for a Currently Qualified Simulator (§ 60.16).
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14. Inspection, Continuing Qualification Evaluation, and Maintenance Requirements (§ 60.19).
15. Logging Simulator Discrepancies (§ 60.20).
16. Interim Qualification of Simulators for New Helicopter Types or Models (§ 60.21).
17. Modifications to Simulators (§ 60.23).
18. Operations with Missing, Malfunctioning, or Inoperative Components (§ 60.25).
19. Automatic Loss of Qualification and Procedures for Restoration of Qualification (§ 60.27).
20. Other Losses of Qualification and Procedures for Restoration of Qualification (§ 60.29).
21. Record Keeping and Reporting (§ 60.31).
22. Applications, Logbooks, Reports, and Records: Fraud, Falsification, or Incorrect Statements (§ 60.33).
23. [Reserved]
24. [Reserved]

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

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

Attachment 2 to Appendix C to Part 60—Simulator Objective Tests.

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

Attachment 4 to Appendix C 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. 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 120–35B, Line Operational Simulations: Line-Oriented Flight Training, Special Purpose Operational Training, Line Operational Evaluation.

(11) AC 120–57A, Surface Movement Guidance and Control System (SMGS).

(12) AC 150/5300–13, Airport Design.

(13) AC 150/5340–1G, Standards for Airport Markings.

(14) AC 150/5340–4C, Installation Details for Runway Centerline Touchdown Zone Lighting Systems.

(15) AC 150/5340–19, Taxiway Centerline Lighting System.

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

(17) AC 150/5345–28D, Precision Approach Path Indicator (PAPI) Systems.

(18) AC 150/5390–2B, Heliport Design.

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

(20) AC 29–2B, Flight Test Guide for Certification of Transport Category Rotorcraft.

(21) AC 27–1A, Flight Test Guide for Certification of Normal Category Rotorcraft.

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

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

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

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

END INFORMATION

2. APPLICABILITY (§§ 60.1 & 60.2)

BEGIN INFORMATION

There is no additional regulatory or informational material that 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

3. DEFINITIONS (§ 60.3)

BEGIN INFORMATION

See appendix F for a list of definitions and abbreviations from part 1 and part 60, including the appropriate appendices of part 60.

END INFORMATION

4. QUALIFICATION PERFORMANCE STANDARDS (§ 60.4)

BEGIN INFORMATION

There is no additional regulatory or informational material that applies to § 60.4, Qualification Performance Standards.

END INFORMATION

5. QUALITY MANAGEMENT SYSTEM (§ 60.5)

BEGIN INFORMATION

See appendix E for additional regulatory and informational material regarding Quality Management Systems.

END INFORMATION

6. SPONSOR QUALIFICATION REQUIREMENTS (§ 60.7)

BEGIN INFORMATION

a. The intent of the language in § 60.7(b) is to have a specific FFS, 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 FFS may change from one 12-month period to the next 12-month period as long as that sponsor sponsors and uses at least one FFS at least once during the prescribed period. There is no minimum number of hours or minimum FFS periods required.

b. The following examples describe acceptable operational practices:

(1) Example One.

(a) A sponsor is sponsoring a single, specific FFS for its own use, in its own facility or elsewhere—this single FFS forms the basis for the sponsorship. The sponsor uses that FFS 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 FFS was qualified prior to October 30, 2007 the 12-month period begins on the date of the first continuing qualification evaluation conducted in accordance with § 60.19 after October 30, 2007 and continues for each subsequent 12-month period;

(ii) A device qualified on or after October 30, 2007 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 FFS use required.

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

(2) Example Two.

(a) A sponsor sponsors an additional number of FFSs, in its facility or elsewhere. Each additionally sponsored FFS 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 FFS or another FFS, during the preceding 12-month period) stating that the subject FFS'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 FFS 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 FFSs 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 FFSs in the Chicago and Moscow centers) because —

(i) Each FFS in the Chicago center and each FFS 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 FFS or another FFS during the preceding 12-month period) stating that the performance and handling qualities of each FFS in the Chicago and Moscow centers represents the helicopter (as described in § 60.7(d)(2)).

END INFORMATION

7. ADDITIONAL RESPONSIBILITIES OF THE SPONSOR (§ 60.9)

BEGIN INFORMATION

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

END INFORMATION

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8. FSTD USE (§60.11)

BEGIN INFORMATION

There is no additional regulatory or informational material that applies to §60.11, FSTD Use.

END INFORMATION

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9. SIMULATOR OBJECTIVE DATA REQUIREMENTS (§60.13)

BEGIN QPS REQUIREMENTS

a. Flight test data used to validate FFS 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 FFS.

(2) Appropriately qualified flight test personnel.

(3) An understanding of the accuracy of the data to be gathered using appropriate alternative data sources, procedures, and instrumentation that is traceable to a recognized standard as described in Attachment 2, Table C2D.

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

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

(1) in a format that supports the FFS 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 C2A of this appendix.

(4) with any necessary instructions or other details provided, such as yaw damper or throttle position; and

(5) without alteration, adjustments, or bias; however the 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 FFS 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, an amendment to, or a revision of data that may relate to FFS performance or handling characteristics is available. The data referred to in this paragraph are those data that are used to validate the performance, handling qualities, or other characteristics of the aircraft, including data related to any relevant changes occurring after the type certificate was issued. This notification must be made within 10 working days.

END QPS REQUIREMENTS

BEGIN INFORMATION

e. The FFS 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 FFS in order to facilitate the notification required by §60.13(f).

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

from data requirements. The aircraft manufacturer may provide this document.

g. 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 FFS evaluation. It is for this reason that the NSPM recommends that any data supplier not previously experienced in this area review the data necessary for programming and for validating the performance of the FFS, and discuss the flight test plan anticipated for acquiring such data with the NSPM well in advance of commencing the flight tests.

h. 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, Attachment 2 requires the sponsor or other data provider to ensure that a steady state condition exists at the instant of time captured by the ''snapshot.'' This is often verified by showing that a steady state condition existed from some period of time during which the snapshot is taken. The time period most frequently used is 5 seconds prior through 2 seconds following the instant of time captured by the snapshot. This paragraph is primarily addressing the source data and the method by which the data provider ensures that the steady state condition for the snapshot is representative.

i. The NSPM will consider, on a case-by-case basis, whether or not 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 SIMULATOR (§ 60.14)

BEGIN INFORMATION

a. In the event that the NSPM determines that special equipment or specifically qualified persons will be required to conduct an evaluation, the NSPM will make every attempt to notify the sponsor at least one (1) week, but in no case less than 72 hours, in advance of the evaluation. Examples of special equipment include spot photometers, flight control measurement devices, and sound analyzers. 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 FFS is moved, at the request of the TPAA, or as a result of comments received from FFS that raise questions regarding the continued qualification or use of the FFS.

END INFORMATION

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

BEGIN QPS REQUIREMENTS

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

(1) Meet the general requirements listed in Attachment 1;

(2) Meet the objective testing requirements listed in Attachment 2; and

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

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

(1) A statement that the FFS 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) A qualification test guide (QTG), acceptable to the NSPM, that includes all of the following:

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

(ii) Correlating objective test results obtained from the performance of the FFS as prescribed in the applicable QPS.

(iii) The result of FFS subjective tests prescribed in the applicable QPS.

(iv) 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 simulator objective tests in Attachment 2, Table C2A 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 the conduct of automatic and manual tests;

(3) A means of comparing the FFS 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 FFS.

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 C4C, for a sample QTG cover page).

(2) A continuing qualification evaluation schedule 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 C4G, for a sample Continuing Qualification Evaluation Requirements page.

(3) An FFS information page that provides the information listed in this paragraph (see Attachment 4, Figure C4B, for a sample FFS information page). For convertible FFSs, the sponsor must submit a separate page for each configuration of the FFS.

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

(b) The helicopter model and series being simulated.

(c) The aerodynamic data revision number or reference.

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

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

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

(g) The FFS model and manufacturer.

(h) The date of FFS manufacture.

(i) The FFS computer identification.

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

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

(4) A Table of Contents.

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

(6) List of all relevant data references.

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

(8) Statements of compliance and capability (SOCs) with certain requirements. SOCs must provide references to the sources of information that show the capability of the FFS to comply with the requirements. SOCs must also provide a rationale explaining how the referenced material is used, the mathematical equations and parameter values used, and the conclusions reached. Refer to the ''Additional Details'' column in Attachment 1, Table C1A, ''Simulator Standards,'' or in the ''Test Details'' column in Attachment 2, Table C2A, ''Simulator Objective Tests,'' to see when SOCs are required.

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

(10) The following information for each objective test designated in Attachment 2, Table C2A, 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 FFS objective test results.

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

(h) List of all relevant parameters driven or constrained during the manually conducted 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) Simulator 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 FFS is addressed as a separate FFS for each model and series helicopter to which it will be converted and for the FAA qualification level sought. If a sponsor seeks qualification for two or more models of a helicopter type using a convertible FFS, the sponsor must submit a QTG for each helicopter model, or a supplemented QTG for each helicopter model. The NSPM will conduct evaluations for each helicopter model.

g. Form and manner of presentation of objective test results in the QTG:

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

(2) FFS 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 C2A of this appendix.

(5) Tests involving time histories, data sheets (or transparencies thereof) and FFS test results must be clearly marked with appropriate reference points to ensure an accurate comparison between the FFS and the 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 must 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 FFS 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 FFS 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 FFS location.

j. All FFSs for which the initial qualification is conducted after October 30, 2013 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 FFS (reformatted or digitized) as prescribed in this appendix. The eMQTG must also contain the general FFS 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 FFS 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 FFSs not covered in subparagraph ''j'' must have an electronic copy of the MQTG by October 30, 2013. A copy of the eMQTG 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.

END QPS REQUIREMENTS

BEGIN INFORMATION

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

m. The NSPM will conduct an evaluation for each configuration, and each FFS must be evaluated as completely as possible. To ensure a thorough and uniform evaluation, each FFS is subjected to the general simulator requirements in Attachment 1, the objective tests listed in Attachment 2, 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) Cockpit 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) FFS systems and sub-systems, including force cueing (motion), visual, and aural (sound) systems, as appropriate (see Attachment 1 and Attachment 2 of this appendix); and

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

n. The NSPM administers the objective and subjective tests, which includes an examination of functions. The tests include a qualitative assessment of the FFS 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 FFS performance and determining compliance with the requirements of this part.

(2) Subjective tests provide a basis for:

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

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

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

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

o. The tolerances for the test parameters listed in Attachment 2 of this appendix reflect the range of tolerances acceptable to the NSPM for FFS validation and are not to be confused with design tolerances specified for FFS 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.

p. In addition to the scheduled continuing qualification evaluation, each FFS 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 FFS for the conduct of objective and subjective tests and an examination of functions) if the FFS is not being used for flight crewmember training, testing, or checking. However, if the FFS were being used, the evaluation would be conducted in a non-exclusive manner. This non-exclusive evaluation will be conducted by the FFS evaluator accompanying the check airman, instructor, Aircrew Program Designee (APD), or FAA inspector aboard the FFS along with the student(s) and observing the operation of the FFS during the training, testing, or checking activities.

q. 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 level requested but do support a lower level, the NSPM may qualify the FFS at that lower level. For example, if a Level D evaluation is requested and the FFS fails to meet sound test tolerances, it could be qualified at Level C.

r. After an FFS is successfully evaluated, the NSPM issues a statement of qualification (SOQ) to the sponsor. The NSPM recommends the FFS to the TPAA, who will approve the FFS for use in a flight training program. The SOQ will be issued at the satisfactory conclusion of the initial or continuing qualification. However, it is the sponsor's responsibility to obtain TPAA approval prior to using the FSTD in an FAA-approved flight training program.

s. Under normal circumstances, the NSPM establishes a date for the initial or upgrade evaluation within ten (10) working days after determining that a complete QTG is acceptable. Unusual circumstances may warrant establishing an evaluation date before this determination is made. A sponsor may schedule an evaluation date as early as 6 months in advance. However, there may be a delay of 45 days or more in rescheduling and completing the evaluation if the sponsor is unable to meet the scheduled date. See Attachment 4, Figure C4A, Sample Request for Initial, Upgrade, or Reinstatement Evaluation.

t. The numbering system used for objective test results in the QTG should closely follow the numbering system set out in Attachment 2, FFS Objective Tests, Table C2A.

u. 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).

v. Examples of the exclusions for which the FFS 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 take-offs and landing from slopes and pinnacles.

END INFORMATION

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12. ADDITIONAL QUALIFICATIONS FOR A CURRENTLY QUALIFIED SIMULATOR (§60.16)

There is no additional regulatory or informational material that applies to §60.16, Additional Qualifications for a Currently Qualified FFS.

13. PREVIOUSLY QUALIFIED SIMULATORS (§60.17)

BEGIN QPS REQUIREMENTS

a. In instances where a sponsor plans to remove a FFS 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 FFS will be inactive;

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

(3) The NSPM will remove the FFS from the list of qualified FSTDs 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 FFS 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. Simulators qualified prior to October 30, 2007, are not required to meet the general simulation requirements, the objective test requirements, and the subjective test requirements of attachments 1, 2, and 3, respectively, of this appendix.

c. [Reserved]

END QPS REQUIREMENTS

BEGIN INFORMATION

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

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

f. The intent of the requirement listed in § 60.17(b), for each FFS to have a Statement of Qualification 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 FFS 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 FFS.

g. Downgrading of an FFS is a permanent change in qualification level and will necessitate the issuance of a revised Statement of Qualification to reflect the revised qualification level, as appropriate. If a temporary restriction is placed on an FFS because of a missing, malfunctioning, or inoperative component or on-going 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.

h. It is not the intent of the NSPM to discourage the improvement of existing simulation (*e.g.*, the ''updating'' of a visual system to a newer model, 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.

i. The NSPM will determine the evaluation criteria for an FSTD that has been removed from active status. 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 FFS 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 FFS was stored, whether parts were removed from the FFS and whether the FFS was disassembled.

j. The FFS 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 requalification under the standards in effect and current at the time of requalification.

END INFORMATION

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

BEGIN QPS REQUIREMENTS

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

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

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

END QPS REQUIREMENTS

BEGIN INFORMATION

d. 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 FFS systems.

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

tests include latencies, control dynamics, sounds and vibrations, motion, and/or some visual system tests.

f. The continuing qualification evaluations, described in §60.19(b), will normally require 4 hours of FFS 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 FFS. 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 FFS time.

(3) A subjective evaluation of the FFS 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 FFS time.

(4) An examination of the functions of the FFS may include the motion system, visual system, sound system, 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.

g. The requirement established in §60.19(b)(4) regarding the frequency of NSPM-conducted continuing qualification evaluations for each FFS 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 SIMULATOR DISCREPANCIES (§60.20)

There is no additional regulatory or informational material that applies to §60.20. Logging FFS Discrepancies.

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

There is no additional regulatory or informational material that applies to §60.21, Interim Qualification of FFSs for New Helicopter Types or Models.

17. MODIFICATIONS TO SIMULATORS (§60.23)

BEGIN QPS REQUIREMENTS

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

b. Prior to using the modified FFS:

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

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

END QPS REQUIREMENTS

BEGIN INFORMATION

FSTD Directives are considered modifications of an FFS. See Attachment 4 for a sample index of effective FSTD Directives.

END INFORMATION

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

BEGIN INFORMATION

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

b. 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.

c. 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 FFS. Repairs having a larger impact on FFS capability 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)

BEGIN INFORMATION

If the sponsor provides a plan for how the FFS 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 FFS is to be maintained) there is a greater likelihood that the NSPM will be able to determine the amount of testing required for requalification.

END INFORMATION

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

BEGIN INFORMATION

If the sponsor provides a plan for how the FFS 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 FFS is to be maintained) there is a greater likelihood that the NSPM will be able to determine the amount of testing required for requalification.

END INFORMATION

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21. RECORDKEEPING AND REPORTING (§ 60.31)

BEGIN QPS REQUIREMENTS

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

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

END QPS REQUIREMENTS

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

There are no additional QPS requirements or informational material that apply to § 60.33, Applications, Logbooks, Reports, and Records: Fraud, Falsification, or Incorrect Statements.

23. [RESERVED]

24. [RESERVED]

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

There are no additional QPS requirements or informational material that apply to § 60.37, FSTD Qualification on the Basis of a Bilateral Aviation Safety Agreement (BASA).

ATTACHMENT 1 TO APPENDIX C TO PART 60—GENERAL SIMULATOR REQUIREMENTS

BEGIN QPS REQUIREMENTS

1. REQUIREMENTS.

a. Certain requirements included in this appendix must be supported with a Statement of Compliance and Capability (SOC), which may include objective and subjective tests. The SOC will confirm that the requirement was satisfied, and describe how the requirement was met, such as gear modeling approach or coefficient of friction sources. The requirements for SOCs and tests are indicated in the ''General Simulator Requirements'' column in Table C1A of this appendix.

b. Table C1A describes the requirements for the indicated level of FFS. Many devices include operational systems or functions that exceed the requirements outlined in this section. However, 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 simulator requirements for qualifying a helicopter FFS. The sponsor should also consult the objective tests in Attachment 2 and the examination of functions and subjective tests listed in Attachment 3 to determine the complete requirements for a specific level simulator.

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

(1) General cockpit configuration.
(2) Simulator programming.
(3) Equipment operation.
(4) Equipment and facilities for instructor/evaluator functions.
(5) Motion system.
(6) Visual system.
(7) Sound system.

c. Table C1A provides the standards for the General Simulator Requirements.

END INFORMATION

TABLE C1A— MINIMUM SIMULATOR REQUIREMENTS

QPS requirements		Simulator levels				Information Notes
No.	General simulator requirements	A	B	C	D	
1. General Cockpit Configuration						
1.a	The simulator must have a cockpit that is a replica of the helicopter simulated with controls, equipment, observable cockpit indicators, circuit breakers, and bulkheads properly located, functionally accurate and replicating the helicopter. The direction of movement of controls and switches must be identical to that in the helicopter. Pilot seats must afford the capability for the occupant to be able to achieve the design ''eye position'' established for the helicopter being simulated. Equipment for the operation of the cockpit windows must be included, but the actual windows need not be operable. Fire axes, extinguishers, spare light bulbs, etc., must be available in the FFS but may be relocated to a suitable location as near as practical to the original position. Fire axes, landing gear pins, and any similar purpose instruments need only be represented in silhouette. An SOC is required.		X	X	X	For simulator purposes, the cockpit consists of all that space forward of a cross section of the fuselage at the most extreme aft setting of the pilots' seats including addiitonal, required flight crewmember duty stations and those required bulkheads aft of the pilot seats. For clarification, bulkheads containing only items such as landing gear pin storage compartments, fire axes or extinguishers, spare light bulbs, aircraft documents pouches etc., are not considered essential and may be omitted.
1.b.	Those circuit breakers that affect procedures and/or result in observable cockpit indications must be properly located and functionally accurate. An SOC is required.		X	X	X	
2. Programming						
2.a.	A flight dynamics model that accounts for various combinations of drag and thrust normally encountered in flight must correspond to actual flight conditions, including the effect of change in helicopter attitude, thrust, drag, altitude, temperature, gross weight, moments of inertia, center of gravity location, and configuration. An SOC is required.		X	X	X	
2.b.	The simulator must have the computer capacity, accuracy, resolution, and dynamic response needed to meet the qualification level sought. An SOC is required.		X	X	X	
2.c	Ground handling and aerodynamic programming must include the following:					
2.c.1 ..	Ground effect ..... Level B does not require hover programming. An SOC is required.		X	X	X	Applicable areas include flare and touchdown from a running landing as well as for in-ground-effect (IGE) hover. A reasonable simulation of ground effect includes modeling of lift, drag, pitching moment, trim, and power while in ground effect.

TABLE C1A— MINIMUM SIMULATOR REQUIREMENTS—Continued

QPS requirements		Simulator levels				Information Notes
No.	General simulator requirements	A	B	C	D	
2.c.2 ..	Ground reaction ..... Level B does not require hover programming. An SOC is required.		X	X	X	Reaction of the helicopter upon contact with the landing surface during landing, (e.g., strut deflection, tire or skid friction, side forces) and may differ with changes in gross weight, airspeed, rate of descent on touchdown, and slide slip.
2.c.3 ..	Ground handling characteristics. Control inputs required during operations in crosswind, during braking and deceleration, and for turning radius.		X	X	X	
2.d	The simulator must provide for manual and automatic testing of simulator hardware and software programming to determine compliance with simulator objective tests as prescribed in Attachment 2. An SOC is required.			X	X	This may include an automated system, which could be used for conducting at least a portion of the QTG tests. Automatic ''flagging'' of out-of-tolerance situations is encouraged.
2.e	Relative responses of the motion system, visual system, and cockpit instruments, measured by latency tests or transport delay tests. Motion onset should occur before the start of the visual scene change (the start of the scan of the first video field containing different information) but must occur before the end of the scan of that video field. Instrument response may not occur prior to motion onset. Test results must be within the following limits:					The intent is to verify that the simulator provides instrument, motion, and visual cues that are like the helicopter responses within the stated time delays. For helicopter response, acceleration in the appropriate corresponding rotational axis is preferred.
2.e.1 ..	Response must be within 150 milliseconds of the helicopter response. Objective Tests are required. See Attachment 2 for Transport Delay and Latency Tests.		X			
2.e.2 ..	Response must be within 100 milliseconds of the helicopter response. Objective Tests are required. See Attachment 2 for Transport Delay and Latency Tests.			X	X	
2.f	The simulator must accurately reproduce the following runway conditions: (1) Dry; (2) Wet; (3) Icy; (4) Patchy Wet (5) Patchy Icy An SOC is required. Objective tests are required for dry, wet, and icy runway conditions. Subjective tests are required for patchy wet, patchy icy, and wet on rubber residue in touchdown zone conditions.			X	X	
2.g.	The simulator must simulate: (1) Brake and tire failure dynamics (including anti-skid failure). (2) Decreased brake efficiency due to high brake temperatures, if applicable. An SOC is required.			X	X	Simulator pitch, side loading, and directional control characteristics should be representative of the helicopter.

TABLE C1A— MINIMUM SIMULATOR REQUIREMENTS—Continued

QPS requirements		Simulator levels				Information Notes
No.	General simulator requirements	A	B	C	D	
2.h	The modeling in the simulator must include: (1) Ground effect, (2) Effects of airframe icing (if applicable), (3) Aerodynamic interference effects between the rotor wake and fuselage, (4) Influence of the rotor on control and stabilization systems, and (5) Representations of nonlinearities due to sideslip. An SOC is required and must include references to computations of aeroelastic representations and of nonlinearities due to sideslip. An SOC and a demonstration of icing effects (if applicable) are required.			X	X	See Attachment 2 for further information on ground effect.
2.i	The simulator must provide for realistic mass properties, including gross weight, center of gravity, and moments of inertia as a function of payload and fuel loading. An SOC is required and must include a range of tabulated target values to enable a subjective test of the mass properties model to be conducted from the instructor's station.		X	X	X	
3. Equipment Operation						
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; e.g., turbulence or windshear. Numerical values must be presented in the appropriate units. A subjective test is required.		X	X	X	
3.b	Communications, navigation, caution, and warning equipment must be installed and operate within the tolerances applicable for the helicopter being simulated. A subjective test is required.		X	X	X	See Attachment 3 for further information regarding long-range navigation equipment.
3.c	Simulated airplane systems must operate as the helicopter systems would operate under normal, abnormal, and emergency operating conditions on the ground and in flight. A subjective test is required.		X	X	X	
3.d	The simulator must provide pilot controls with control forces and control travel that correspond to the simulated helicopter. The simulator must also react in the same manner as in the helicopter under the same flight conditions. An objective test is required.		X	X	X	
4. Instructor / Evaluator Facilities						
4.a	In addition to the flight crewmember stations, the simulator must have at least two suitable seats for the instructor/check airman and FAA inspector. These seats must provide adequate vision to the pilot's panel and forward windows. All seats other than flight crew seats need not represent those found in the helicopter but must be adequately secured to the floor and equipped with similar positive restraint devices. A subjective test is required.		X	X	X	The NSPM will consider alternatives to this standard for additional seats based on unique cockpit configurations.

TABLE C1A— MINIMUM SIMULATOR REQUIREMENTS—Continued

QPS requirements		Simulator levels				Information Notes
No.	General simulator requirements	A	B	C	D	
4.b	The simulator must have controls that enable the instructor/evaluator to control all required system variables and insert all abnormal or emergency conditions into the simulated helicopter systems as described in the sponsor's FAA-approved training program, or as described in the relevant operating manual as appropriate. A subjective test is required.		X	X	X	
4.c	The simulator must have instructor controls for environmental conditions including wind speed and direction. A subjective test is required.		X	X	X	
4.d	The simulator must provide the instructor or evaluator the the ability to present ground and air hazards.			X	X	For example, another aircraft crossing the active runway and converging airborne traffic.
	A subjective test is required.					
5. Motion System						
5.a	The simulator must have motion (force) cues perceptible to the pilot that are representative of the motion in a helicopter. A subjective test is required.		X	X	X	For example, touchdown cues should be a function of the rate of descent (RoD) of the simulated helicopter.
5.b	The simulator must have a motion (force cueing) system with a minimum of three degrees of freedom (at least pitch, roll, and heave). An SOC is required.		X			
5.c	The simulator must have a motion (force cueing) system that produces cues at least equivalent to those of a six-degrees-of-freedom, synergistic platform motion system (i.e., pitch, roll, yaw, heave, sway, and surge). An SOC is required.			X	X	
5.d	The simulator must provide for the recording of the motion system response time. An SOC is required.		X	X	X	
5.e	The simulator must provide motion effects programming to include the following: (1) Runway rumble, oleo deflections, effects of ground speed, uneven runway, characteristics. (2) Buffets due to transverse flow effects. (3) Buffet during extension and retraction of landing gear. (4) Buffet due to retreating blade stall. (5) Buffet due to settling with power. (6) Representative cues resulting from touchdown. (7) Rotor vibrations. A subjective test is required for each.		X	X	X	
	(8) Tire failure dynamics. (9) Engine malfunction and engine damage. (10) Airframe ground strike. A subjective test is required for each.			X	X	
	(11) Motion vibrations that result from atmospheric disturbances.				X	For air turbulence, general purpose disturbance models that approximate demonstrable flight test data are acceptable.
5.f	The simulator must provide characteristic motion vibrations that result from operation of the helicopter, (for example, retreating blade stall, extended landing gear, settling with power) in so far as vibration marks an event or helicopter state, which can be sensed in the cockpit. A subjective test is required.				X	The simulator should be programmed and instrumented in such a manner that the characteristic buffet modes can be measured and compared to helicopter data.

TABLE C1A— MINIMUM SIMULATOR REQUIREMENTS—Continued

QPS requirements		Simulator levels				Information Notes
No.	General simulator requirements	A	B	C	D	
	An objective test is required.					
6. Visual System						
6.a	The simulator must have a visual system providing an out-of-the-cockpit view. A subjective test is required.		X	X	X	
6.b	The simulator must provide a continuous minimum collimated field of view of 75° horizontally and 30° vertically per pilot seat. Both pilot seat visual systems must be operable simultaneously. An SOC is required.		X			
6.c	The simulator must provide a continuous minimum collimated visual field of view of 150° horizontally and 40° vertically per pilot seat. Both pilot seat visual systems must be operable simultaneously. Horizontal field of view is centered on the zero degree azimuth line relative to the aircraft fuselange. An SOC is required.			X		Optimization of the visual field of view may be considered with respect to the specific helicopter cockpit cut-off angle.
6.d	The simulator must provide a continuous minimum collimated visual field of view of 180° horizontally and 60° vertically per pilot seat. Both pilot seat visual systems must be operable simultaneously. Horizontal field of view is centered on the zero degree azimuth line relative to the aircraft fuselage. An SOC is required. An objective test is required.				X	Optimization of the visual field of view may be considered with respect to the specific airplane cockpit cut-off angle.
6.e	The visual system must be free from optical discontinuities and artifacts that create non-realistic cues. A subjective test is required.		X	X	X	Non-realistic cues might include image ''swimming'' and image ''roll-off,'' that may lead a pilot to make incorrect assessments of speed, acceleration and/or situational awareness.
6.f	The simulator must have operational landing lights for night scenes. Where used, dusk (or twilight) scenes require operational landing lights. A subjective test is required.		X	X	X	
6.g	The simulator must have instructor controls for the following: (1) Cloudbase. (2) Visibility in statute miles (kilometers) and runway visual range (RVR) in ft. (meters). (3) Airport or landing area selection. (4) Airport or landing area lighting. A subjective test is required.		X	X	X	
6.h	Each airport scene displayed must include the following: 1. Airport runways and taxiways. 2. Runway definition: a. Runway surface and markings. b. Lighting for the runway in use, including runway threshold, edge, centerline, touchdown zone, VASI (or PAPI), and approach lighting of appropriate colors, as appropriate. c. Taxiway lights. A subjective test is required.		X	X	X	
6.i	The distances at which runway features are visible, as measured from runway threshold to a helicopter aligned with the runway on an extended 3° glide slope must not be less than listed below:		X	X	X	

TABLE C1A— MINIMUM SIMULATOR REQUIREMENTS—Continued

QPS requirements		Simulator levels				Information Notes
No.	General simulator requirements	A	B	C	D	
	1. Runway definition, strobe lights, approach lights, runway edge white lights and VASI or PAPI system lights from 5 statute miles (8 km) of the runway threshold. 2. Runway centerline lights and taxiway definition from 3 statute miles (4.8 km). 3. Threshold lights and touchdown zone lights from 2 statute miles (3.2 km). 4. Runway markings within range of landing lights for night scenes and as required by three (3) arc-minutes resolution on day scenes. A subjective test is required.					
6.j	The simulator must provide visual system compatibility with dynamic response programming. A subjective test is required.		X	X	X	
6.k	The simulator must show that the segment of the ground visible from the simulator cockpit is the same as from the airplane cockpit (within established tolerances) when at the correct airspeed, in the landing configuration, at a main wheel height of 100 feet (30 meters) above the touchdown zone. Data submitted must include at least the following: (1) Static helicopter dimensions as follows: (i) Horizontal and vertical distance from main landing gear (MLG) or landing skids to glideslope reception antenna. (ii) Horizontal and vertical distance from MLG or skids to pilot's eyepoint. (iii) Static cockpit 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. The QTG must contain appropriate calculations and a drawing showing the pertinent data used to establish the helicopter location and the segment of the ground that is visible considering the helicopter attitude (cockpit cut-off angle) and a runway visual range of 1,200 feet or 350 meters. Simulator performance must be measured against the QTG calculations. Sponsors must provide this data for each simulator (regardless of previous qualification standards) to qualify the simulator for all precision instrument approaches. At the near end of the visual ground segment, lights and ground objects computed to be visible from the helicopter cockpit must be visible in the FFS. The far end of the visual ground segment must be at the computed end of the segment ±20% of the computed visible segment distance. An SOC is required. An objective test is required.		X	X	X	The test should be conducted in the 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). This will show the modeling accuracy of RVR, glideslope, and localizer for a given weight, configuration and speed within the helicopter's operational envelope for a normal appraoch and landing. If non-homogenous fog is used, the vertical variation in horizontal visibility should be described and be included in the slant range visibility calculation used in the computations.
6.1	The simulator must provide visual cues necessary to assess rate of change of height, height AGL, as well as translational displacement and rates during takeoffs and landings. A subjective test is required.		X			

TABLE C1A— MINIMUM SIMULATOR REQUIREMENTS—Continued

QPS requirements		Simulator levels				Information Notes
No.	General simulator requirements	A	B	C	D	
6.m	The simulator must have night and dusk (or twilight) visual scene capability, including general terrain characteristics and significant landmarks, free from apparent quantization. Dusk (or twilight) scene must enable identification of a visible horizon and general terrain characteristics. A subjective test is required.			X	X	Examples of general terrain characteristics are fields, roads, and bodies of water.
6.n	The simulator must provide visual cues necessary to assess rate of change of height, height AGL, as well as translational displacement and rates during takeoff, low altitude/low airspeed maneuvering, hover, and landing. A subjective test is required.			X	X	
6.o.	The simulator must provide for accurate portrayal of the visual environment relating to the simulator attitude. A subjective test is required.		X	X	X	Visual attitude vs. simulator attitude is a comparison of pitch and roll of the horizon as displayed in the visual scene compared to the display on the attitude indicator.
6.p	The simulator must provide for quick confirmation of visual system color, RVR, focus, and intensity. An SOC is required. A subjective test is required.			X	X	
6.q	The simulator must provide a minimum of three airport scenes including the following: 1. Surfaces on runways, taxiways, and ramps. 2. Lighting of approriate color for all runways, including runway threshold, edge, centerline, VASI (or PAPI), and approach lighting for the runway in use. 3. Airport taxiway lighting. 4. Ramps and buildings that correspond to the sponsor's Line Oriented scenarios, as appropriate. A subjective test is required.			X	X	
6.r	The simulator must be capable of producing at least 10 levels of occulting.. A subjective test is required.			X	X	
6.s	The fog simulator must be able to provide weather representations including the following: (1) Variable cloud density. (2) Partial obscuration of ground scenes; i.e., the effect of a scattered to broken cloud deck. (3) Gradual breakout. (4) Patchy fog. (5) The effect of fog on airport lighting The weather representations must be provided at and below an altitude of 2,000 ft (610 m) height above the airport and within a radius of 10 miles (16 km) from the airport. A subjective test is required.			X	X	

TABLE C1A— MINIMUM SIMULATOR REQUIREMENTS—Continued

QPS requirements		Simulator levels				Information Notes
No.	General simulator requirements	A	B	C	D	
6.t	Night Visual Scenes. The simulator must provide night visual scenes with sufficient scene content to recognize the airport, the terrain, and major landmarks around the airport. The scene content must allow a pilot to successfully accomplish a visual landing. Night scenes, as a minimum, must provide presentations of sufficient surfaces with appropriate textural cues that include self-illuminated objects such as road networks, ramp lighting, and airport signage, to conduct a visual approach, a landing, and airport movement (taxi). Scenes must include a definable horizon and typical terrain characteristics such as fields, roads and bodies of water and surfaces illuminated by airplane landing lights.		X	X	X	
6.u	Dusk (Twilight) Visual Scenes. The simulator must provide dusk (or twilight) visual scenes with sufficient scene content to recognize the airport, the terrain, and major landmarks around the airport. The scene content must allow a pilot to successfully accomplish a visual landing. Dusk (or twilight) scenes, as a minimum, must provide full color presentations of reduced ambient intensity, sufficient surfaces with appropriate textural cues that include self-illuminated objects such as road networks, ramp lighting and airport signage, to conduct a visual approach, landing and airport movement (taxi). Scenes must include a definable horizon and typical terrain characteristics such as fields, roads and bodies of water and surfaces illuminated by representative aircraft lighting (e.g., landing lights). If provided, directional horizon lighting must have correct orientation and be consistent with surface shading effects. Total scene content must be comparable in detail to that produced by 10,000 visible textured surfaces and 15,000 visible lights with sufficient system capacity to display 16 simultaneously moving objects. An SOC is required.			X	X	
6.v	Night, Dusk (Twilight), and Daylight Visual Scenes. The simulator must have night, dusk (twilight), and daylight visual scenes with sufficient scene content to recognize the airport, the terrain, and major landmarks around the airport. The scene content must allow a pilot to successfully accomplish a visual landing. Any ambient lighting must not ''washout'' the displayed visual scene. Total scene content must be comparable in detail to that produced by 10,000 visible textured surfaces and 6,000 visible lights with sufficient system capacity to display 16 simultaneously moving objects. The visual display must be free of apparent quantization and other distracting visual effects while the simulator is in motion. **Note:** These requirements are applicable to any level of simulator equipped with a daylight visual system. An SOC is required. A subjective test is required. Objective tests are required.				X	
6.w	The simulator must provide operational visual scenes that portray physical relationships known to cause landing illusions to pilots.				X	For example: short runways, landing approaches over water, uphill or downhill runways, rising terrain on the approach path, unique topographic features.

TABLE C1A— MINIMUM SIMULATOR REQUIREMENTS—Continued

QPS requirements		Simulator levels				Information Notes
No.	General simulator requirements	A	B	C	D	
	A subjective test is required.					
6.x	The simulator must provide special weather representations of light, medium, and heavy precipitation near a thunderstorm on takeoff and during approach and landing. Representations need only be presented at and below an altitude of 2,000 ft. (610 m) above the airport surface and within 10 miles (16 km) of the airport. A subjective test is required.				X	
6.y.	The simulator must present visual scenes of wet and snow-covered runways, including runway lighting reflections for wet conditions, partially obsecured lights for snow conditions. A subjective test is required.				X	The NSPM will consider suitable alternative effects.
6.z	The simulator must present realistic color and directionality of all airport lighting. A subjective test is required.				X	
7. Sound System						
7.a	The simulator must provide cockpit sounds that result from pilot actions that correspond to those that occur in the helicopter.		X	X	X	
7.b	Volume control, if installed, must have an indication of the sound level setting.		X	X	X	
7.c	The simulator must accurately simulate the sound of precipitation, windshield wipers, and other significant helicopter noises perceptible to the pilot during normal and abnormal operations, and include the sound of a crash (when the simulator is landed in an unusual attitude or in excess of the structural gear limitations); normal engine sounds; and the sounds of gear extension and retraction. An SOC is required. A subjective test is required.			X	X	
7.d	The simulator must provide realistic amplitude and frequency of cockpit noises and sounds. Simulator performance must be recorded, compared to amplitude and frequency of the same sounds recorded in the helicopter, and made a part of the QTG.				X	

ATTACHMENT 2 TO APPENDIX C TO PART 60—SIMULATOR OBJECTIVE TESTS

BEGIN INFORMATION

1. DISCUSSION.

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

(b) The NSPM will not evaluate any simulator unless the required SOC indicates that the motion system is designed and manufactured to safely operate within the simulator's maximum excursion, acceleration, and velocity capabilities (see Motion System in the following table).

END INFORMATION

BEGIN QPS REQUIREMENTS

1. TEST REQUIREMENTS.

a. The ground and flight tests required for qualification are listed in Table of C2A, FFS Objective Tests. Computer generated simulator test results must be provided for each

test except where an alternative 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., an engine out missed approach for a single-engine helicopter, or a hover test for a Level B simulator). Each test result is compared against the validation data described in §60.13 and in this appendix. Although use of a driver program designed to automatically accomplish the tests is encouraged for all simulators and required for Level C and Level D simulators, each test must be able to be accomplished manually while recording all appropriate parameters. The results must be produced on an appropriate recording device acceptable to the NSPM and must include simulator 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 C2A. All results must be labeled using the tolerances and units given.

b. Table C2A sets out the test results required, including the parameters, tolerances, and flight conditions for simulator validation. Tolerances are provided for the listed tests because mathematical modeling and acquisition/development of reference data are often inexact. All tolerances listed in the following tables are applied to simulator performance. When two tolerance values are given for a parameter, the less restrictive may be used unless otherwise indicated.

c. Certain tests included in this attachment must be supported with a Statement of Compliance and Capability (SOC). In Table C2A, 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 simulator 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 selection. 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 simulator 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. It is not acceptable to program the FFS so that the mathematical modeling is correct only at the validation test points. Unless noted otherwise, simulator 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 helicopter data at one extreme weight or CG, another test supported by helicopter data at mid-conditions or as close as possible to the other extreme must be included, except as may be authorized by the NSPM. Certain tests that are relevant only at one extreme CG or weight condition need not be repeated at the other extreme. Tests of handling qualities must include validation of augmentation devices.

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 ±0.5 pound (0.22 daN) in 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. 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 simulator will be set up and operated for each test. Each simulator subsystem may be tested independently, but overall integrated testing of the simulator must be accomplished to assure that the total simulator system meets the prescribed standards. A manual test procedure with explicit and detailed steps for completing each test must also be provided.

h. 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.''

i. For previously qualified simulators, 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.

j. Motion System Tests:

(a) The minimum excursions, accelerations, and velocities for pitch, roll, and yaw must be measurable about a single, common reference point and must be achieved by driving one degree of freedom at a time.

(b) The minimum excursions, accelerations, and velocities for heave, sway, and surge may be measured about different but identifiable reference points and must also be achieved by driving one degree of freedom at a time.

k. Tests of handling qualities must include validation of augmentation devices. FFSs 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.

l. Some tests will not be required for helicopters using helicopter hardware in the simulator cockpit (*e.g.*, ''helicopter modular controller''). These exceptions are noted in Table C2A 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.

m. For objective test purposes, ''Near maximum'' gross weight is a weight chosen by the sponsor or data provider that is not less than the basic operating weight (BOW) of the helicopter being simulated plus 80% of the difference between the maximum certificated gross weight (either takeoff weight or landing weight, as appropriate for the test) and the BOW. ''Light'' gross weight is a weight chosen by the sponsor or data provider that is not more than 120% of the BOW of the helicopter being simulated or as limited by the minimum practical operating weight of the test helicopter. ''Medium'' gross weight is a weight chosen by the sponsor or data provider that is approximately ±10% of the average of the numerical values of the BOW and the maximum certificated gross weight. (Note: BOW is the empty weight of the aircraft plus the weight of the following: normal oil quantity; lavatory servicing fluid; potable water; required crewmembers and their baggage; and emergency equipment. (References: Advisory Circular 120–27, ''Aircraft Weight and Balance;'' and FAA–H–8083–1, ''Aircraft Weight and Balance Handbook.'').

END QPS REQUIREMENTS

BEGIN QPS REQUIREMENTS

TABLE C2A—FULL FLIGHT SIMULATOR (FFS) OBJECTIVE TESTS

<<<QPS requirements>>>									<<Information>>
Test		Tolerance(s)	Flight condition	Test details	Simulator level				Notes
No.	Title				A	B	C	D	
1. Performance									
1.a	Engine Assessment.								
1.a.1	Start Operations..								
1.a.1.a	Engine start and acceleration (transient).	Light Off Time — ±10% or ±1 sec., Torque — ±5%, Rotor Speed — ±3%, Fuel Flow — ±10%, Gas Generator Speed — ±5%, Power Turbine Speed — ±5%, Gas Turbine Temp. — ±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	X	
1.a.1.b	Steady State Idle and Operating RPM conditions.	Torque — ±3%, Rotor Speed — ±1.5%, Fuel Flow — ±5%, Gas Generator Speed — ±2%, Power Turbine Speed — ±2%, Turbine Gas Temp. — ±20 °C.	Ground	Record both steady state idle and operating RPM conditions.. May be a series of snapshot tests..		X	X	X	
1.a.2	Power Turbine Speed Trim.	±10% of total change of power turbine speed.	Ground	Record engine response to trim system actuation in both directions.		X	X	X	
1.a.3	Engine and Rotor Speed Governing.	Torque — ±5%, Rotor Speed — 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	X	

TABLE C2A—FULL FLIGHT SIMULATOR (FFS) OBJECTIVE TESTS—Continued

<<<QPS requirements>>>									<<Information>>
Test		Tolerance(s)	Flight condition	Test details	Simulator level				Notes
No.	Title				A	B	C	D	
1.b	Surface Operations.								
1.b.1	Minimum Radius Turn ..	±3 ft. (0.9m) or 20% of helicopter turn radius.	Ground	If brakes are used, brake force must be matched to the helicopter flight test value.		X	X	X	
1.b.2	Rate of Turn vs. Pedal Deflection or Nosewheel Angle.	±10% or ±2°/sec. Turn Rate ..	Ground Takeoff	.....		X	X	X	
1.b.3	Taxi	Pitch Angle — ±1.5°, Torque — ±3%, Longitudinal Control Position — ±5%, Lateral Control Position — ±5%, Dirrectional Control Position.	Ground	Record results for control position and pitch attitude during ground taxi for a specific ground speed, wind speed and direction, and density altitude.		X	X	X	
		±5%, Collective Control Position — ±5%.	.....	.....		X	X	X	
1.b.4	Brake Effectiveness	±10% of time and distance	Ground	.....		X	X	X	
1.c	Takeoff .								

1.c.1	All Engines	Airspeed — ±3 kt, Altitude — ±20 ft (6.1m), Torque — ±3%, Rotor Speed — ±1.5%, Vertical Velocity — ±100 fpm (0.50m/sec) or 10%, Pitch Attitude — ±1.5°, Bank Attitude — ±2°, Heading — ±2°, Longitudinal Control Position — ±10%, Lateral Control Position — ±10%, Directional Control Position — ±10%, Collective Control Position — ±10%.	Ground/Takeoff and Initial Segment of Climb.	Record results of takeoff flight path as appropriate to helicopter model simulated (running takeoff for Level B, takeoff from a hover for Level C and D). For Level B, 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 (61m) AGL.		X	X	X	
1.c.2	One Engine Inoperative	Airspeed — ±3 kt, Altitude — ±20 ft (6.1m), Torque — ±3%, Rotor Speed — ±1.5%, Vertical Velocity — ±100 fpm (0.50m/sec) or 10%, Pitch Attitude — ±1.5°, Bank Attitude — ±2°, Heading — ±2°, Longitudinal Control Position — ±10%, Lateral Control Position — ±10%, Directional Control Position — ±10%, Collective Control Position — ±10%.	Ground/Takeoff; and Initial Segment of Climb.	Record takeoff flight path as appropriate to helicopter model simulated. Results must be recorded from the initiation of the takeoff to at least 200 ft (61m) AGL.		X	X	X	
1.d	Hover.								

TABLE C2A—FULL FLIGHT SIMULATOR (FFS) OBJECTIVE TESTS—Continued

<<<QPS requirements>>>									<<Information>>
Test		Tolerance(s)	Flight condition	Test details	Simulator level				Notes
No.	Title				A	B	C	D	
	Performance	Torque — ±3%, Pitch Attitude — ±1.5°, Bank Attitude — ±1.5°, Longitudinal Control Position — ±5%, Lateral Control Position — ±5%, Directional Control Position — ±5%, Collective Control Position — ±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	X	X	
1.e	Vertical Climb.								
	Performance	Vertical Velocity — ±100 fpm (0.50 m/sec) or ±10%, Directional Control Position — ±5%, Collective Control Position — ±5%.	From OGE Hover ...	Record results for light and heavy gross weights. May be a series of snapshot tests.			X	X	
1.f	Level Flight.								
	Performance and Trimmed Flight Control Positions.	Torque — ±3%, Pitch Attitude — ±1.5°, Sideslip Angle — ±2°, Longitudinal Control Position — ±5%, Lateral Control Position — ±5%, Directional Control Position — ±5%, Collective Control Position — ±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.								

	Performance and Trimmed Flight Control Positions.	Vertical Velocity — ±100 fpm (6.1m/sec) or ±10%, Pitch Attitude — ±1.5°, Sideslip Angle — ±2°, Longitudinal Control Position — ±5%, Lateral Control Position — ±5%, Directional Control Position — ±5%, Collective Control Position — ±5%.	All engines operating; One engine inoperative; 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 — ±3%, Pitch Attitude — ±1.5°, Sideslip Angle — ±2°, Longitudinal Control Position — ±5%, Lateral Control Position — ±5%, Directional Control Position — ±5%, Collective Control Position — ±5%.	At or near 1,000 fpm rate of descent (RoD) at normal approach speed. Augmentation System(s) On and Off.	Results must be recorded 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.	Torque — ±3%, Pitch Attitude — ±1.5°, Sideslip Angle — ±2°, Longitudinal Control Position — ±5%, Lateral Control Position — ±5%, Directional Control Position — ±5%, Collective Control Position — ±5% Vertical Velocity ±100 fpm or 19%, Rotor Speed ±1.5%.	Steady descents. 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.) May be a series of snapshot tests.		X	X	X	
1.i	Autorotation.								

TABLE C2A—FULL FLIGHT SIMULATOR (FFS) OBJECTIVE TESTS—Continued

<<<QPS requirements>>>									<<Information>>
Test		Tolerance(s)	Flight condition	Test details	Simulator level				Notes
No.	Title				A	B	C	D	
	Entry	Rotor Speed—±3% Pitch Attitude ±2°Roll Attitude—±3° Yaw Attitude—±5° Airspeed—±5 kts. Vertical Velocity—±200 fpm (1.00 m/sec) or 10%.	Cruise or Climb	Record results of a rapid throttle reduction to idle. If the cruise condition is selected, comparison must be made for the maximum range airspeed. If the climb condition is selected, comparison must be made for the maximum rate of climb airspeed at or near maximum continuous power.		.....	X	X	
1.j	Landing.								

1.j.1	All Engines	Airspeed—±3 kts., Altitude—±20 ft. (6.1m), Torque—±3%, Rotor Speed—±1.5%, Pitch Attitude—±1.5°, Bank Attitude—±1.5°, Heading—±2°, Longitudinal Control Position—±10%, Lateral Control Position—±10%, Directional Control Position—±10%, Collective Control Position—±10%.	Approach	Record results of the approach and landing profile as appropriate to the helicopter model simulated (running landing for Level B, or approach to a hover for Level C and D). For Level B, the criteria apply only to those segments at airspeeds above effective translational lift.		X	X	X	
1.j.2	One Engine Inoperative	Airspeed—±3 kts., Altitude—±20 ft. (6.1m), Torque—±3%, Rotor Speed—±1.5%, Pitch Attitude—±1.5°, Bank Attitude—±1.5°, Heading—±2°, Longitudinal Control Position—±10%, Lateral Control Position—±10%, Directional Control Position—±10%, Collective Control Position—±10%.	Approach	Record results for both Category A and Category B approaches and landing as appropriate to helicopter model simulated. For Level B, the criteria apply only to those segments at airspeeds above effective translational lift.		X	X	X	

TABLE C2A—FULL FLIGHT SIMULATOR (FFS) OBJECTIVE TESTS—Continued

<<<QPS requirements>>>									<<Information>>
Test		Tolerance(s)	Flight condition	Test details	Simulator level				Notes
No.	Title				A	B	C	D	
1.j.3	Balked Landing	Airspeed—±3 kts., Altitude—±20 ft. (6.1 m), Torque—±3%, Rotor Speed—±1.5%, Pitch Attitude—±1.5°, Bank Attitude—±1.5°, Heading—±2°, Longitudinal Control Position—±10%, Lateral Control Position—±10%, Directional Control Position—±10%, Collective Control Position—±10%.	Approach	Record the results for the maneuver initiated from a stabilized approach at the landing decision point (LDP).		X	X	X	
1.j.4	Autorotational Landing	Torque—±3%, Rotor Speed—±3%, Vertical Velocity—±100 fpm (0.50 m/sec) or 10%, Pitch Attitude—±2°, Bank Attitude—±2°, Heading—±5°, Longitudinal Control Position—±10%, Lateral Control Position—±10%, Directional Control Position—±10%, Collective Control Position—±10%.	Landing	Record the results of an autorotational deceleration and landing from a stabilized autorotational descent, to touch down.			X	X	
2. Handling Qualities.									
2.a	Control System Mechanical Characteristic(s).								
	For simulators requiring Static or Dynamic tests at the controls (i.e., cyclic, collective, and pedal), special test fixtures will not be required during initial or upgrade evaluations if the sponsor's QTG/MQTG shows both test fixture results *and* the results of an alternative approach, such as computer plots produced concurrently showing satisfactory agreement. Repeat of the alternative method during the initial or upgrade evaluation would then satisfy this test requirement. For initial and upgrade evaluations, the control dynamic characteristics must be measured at and recorded directly from the cockpit controls, and must be accomplished in hover, climb, cruise, and autorotation.								Contact the NSPM for clarification of any issue regarding helicopters with reversible controls.

2.a.1	Cyclic	Breakout—±0.25 lbs. (0.112 daN) or 25%; Force—±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/Pedals	Breakout—±0.5 lb. (0.224 daN) or 25%; Force—±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.	±5 lbs. (2.224 daN) or 10% ...	Ground; Static conditions.	.....		X	X	X	
2.a.4	Trim System Rate (all applicable systems).	Rate—±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).	±10% of time for first zero crossing and ±10 (N+1)% of period thereafter, ±10% of amplitude of first overshoot, 20% of amplitude of 2nd and subsequent overshoots greater than 5% of initial displacement, ±1 overshoot.	Hover/Cruise, Trim On, Friction Off.	Results must be recorded for a normal control displacement in both directions in each axis.		.....	X	X	Typically, control displacement of 25% to 50% is necessary for proper excitation. Control Dynamics for irreversible control systems may be evaluated in a ground/static condition. Additional information on control dynamics is found later in this attachment. "N" is the sequential period of a full cycle of oscillation.

TABLE C2A—FULL FLIGHT SIMULATOR (FFS) OBJECTIVE TESTS—Continued

<<<QPS requirements>>>									<<Information>>
Test		Tolerance(s)	Flight condition	Test details	Simulator level				Notes
No.	Title				A	B	C	D	
2.a.6	Freeplay	±0.10 in	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—±3% Pitch Attitude—±1.5° Bank Attitude—±2° Longitudinal Control Position—±5% Lateral Control Position—±5% Directional Control Position—±5% Collective Control Position—±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	X	
2.b.2	Critical Azimuth	Torque—±3% Pitch Hover—Bank Attitude—±2°, Longitudinal Control Position—±5%, Lateral Control Position—±5%, Directional Control Position—±5%, Collective Control Position—±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	X	
2.b.3	Control Response.								
2.b.3.a	Longitudinal	Pitch Rate—±10% or ±2% sec. Pitch Attitude Change—±10% or 1.5°.	Hover. Agumentation On and Off.	Record results for a step control input. The Off-axis response must show correct trend for unaugmented cases.			X	X	

2.b.3.b	Lateral	Roll Rate—±10% or ±2% sec. Pitch Attitude Change—±10% or 1.5°.	Hover. Augmentation On and Off.	Record results for a step control input. The Off-axis response must show correct trend for unaugmented cases.			X	X	
2.b.3.c	Directional	Yaw Rate—±10% or ±2% sec. Heading Change—±10% or 2°.	Hover. Augmentation On and Off.	Record results for a step control input. The Off-axis response must show correct trend for unaugmented cases.			X	X	
2.b.3.d	Vertical	Normal Acceleration—±0.1 g	Hover control input. The Off-axis response must show correct trend for unaugmented cases.	Record results for a step.			X	X	
2.c	Longitudinal Handling Qualities.								
2.c.1	Control Response	Pitch Rate—±10% or ±2°/sec., Pitch Attitude Change—±10% or ±1.5°.	Cruise Augmentation 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 unaugmented cases.		X	X	X	

TABLE C2A—FULL FLIGHT SIMULATOR (FFS) OBJECTIVE TESTS—Continued

<<<QPS requirements>>>									<<Information>>
Test		Tolerance(s)	Flight condition	Test details	Simulator level				Notes
No.	Title				A	B	C	D	
2.c.2	Static Stability	Longitudinal Control Position: ±10% of change from trim or ±0.25 in. (6.3 mm) or Longitudinal Control Force: ±0.5 lb. (0.223 daN) or ±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 ..	±10% of calculated period, ±10% of time to ½ or double amplitude, or ±0.02 of damping ratio.	Cruise Augmentation On and Off.	Record results for three full cycles (6 overshoots after input completed) or that sufficient to determine time to ½ or double amplitude, whichever is less. For non-period responses, the time history must be matched.		X	X	X	
2.c.3.b	Short Term Response ..	±1.5° Pitch or ±2°/sec. Pitch Rate. ±0.1 g Normal Acceleration.	Cruise or Climb. Augmentation On and Off.	Record results for at least two airspeeds.		X	X	X	

2.c.4	Maneuvering Stability ...	Longitudinal Control Position—±10% of change from trim or ±0.25 in. (6.3mm) or Longitudinal Control Forces—±0.5 lb. (0.223 daN) or ±10%.	Cruise or Climb. Augmentation On and Off.	Record results for at least two airspeeds. The force may be shown as a cross plot for irreversible systems. May be a series of snapshot tests.		X	X	X	Typically, 30°–45° bank angle is necessary for adequate stability measurement.
2.c.5	Landing Gear Operating Times.	±1 sec	Takeoff (Retraction) Approach (Extension).		X	X	X	xl	
2.d	Lateral and Directional Handling Qualities.								
2.d.1	Control Response.								
2.d.1.a	Lateral	Roll Rate—±10% or ±3°/sec., Roll Attitude Change—±10% or ±3°.	Cruise Augmentation On and Off.	Record results for 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	

TABLE C2A—FULL FLIGHT SIMULATOR (FFS) OBJECTIVE TESTS—Continued

<<<QPS requirements>>>									<<Information>>
Test		Tolerance(s)	Flight condition	Test details	Simulator level				Notes
No.	Title				A	B	C	D	
2.d.1.b	Directional	Yaw Rate—±10% or ±2°/sec., Yaw Attitude Change—±10% or ±2°.	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—±10% of change from trim or ±0.25 in. (6.3mm) or Lateral Control Force—±0.5 lb. (0.223 daN) or 10%, Roll Attitude—±1.5, Directional Control Position—±10% of change from trim or ±0.25 in. (6.3mm) or Directional Control Force—±1 lb. (0.448 daN) or 10%., Longitudinal Control Position—±10% of change from trim or ±0.25 in. (6.3mm), Vertical Velocity—±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.
2.d.3	Dynamic Lateral and Directional Stability.								

2.d.3.a	Lateral-Directional Oscillations.	±0.5 sec. or ±10% of period, ±10% of time to ½ or double amplitude or ±0.02 of damping ratio, ±20% of ±1 sec. of time difference between peaks of bank and sideslip.	Cruise or Climb. Augmentation On/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 ½ or double amplitude, whichever is less. For nonperiodic response, the time history must be matched.		X	X	X	
2.d.3.b	Spiral Stability	Correct Trend, ±2° bank or ±10% in 20 sec.	Cruise or Climb. Augmentation On and Off.	Record the results of a release from pedal only or cyclic only turns. Results must be recorded from turns in both directions.		X	X	X	
2.d.3.c	Adverse/Proverse Yaw	Correct Trend, ±2° 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	
2. Handling Qualities.									

TABLE C2A—FULL FLIGHT SIMULATOR (FFS) OBJECTIVE TESTS—Continued

<<<QPS requirements>>>									<<Information>>
Test		Tolerance(s)	Flight condition	Test details	Simulator level				Notes
No.	Title				A	B	C	D	
2.a	Control System								
3. Motion System.									
3.a	Motion Envelope.								
3.a.1	Pitch.								
3.a.1.a	Displacement—TBD° ...	.....	.....	.....	.....	X			
	±25°	.....	.....	.....			X	X	
3.a.1.b	Velocity—TBD°/sec	.....	.....	.....		X			
	±20°/sec	.....	.....	.....			X	X	
3.a.1.c	Acceleration—TBD°/sec^2.	.....	.....	.....		X			
	±100°/sec^2	.....	.....	.....		X	X		
3.a.2 3.a.2.a	Displacement—TBD° ...	.....	.....	.....		X			
	±25°	.....	.....	.....			X	X	
3.a.2.b	Velocity—TBD°/sec	.....	.....	.....		X			
	±20°/sec	.....	.....	.....			X	X	
3.a.2.c	Acceleration—TBD°/sec^2.	.....	.....	.....		X	.....		
	±100°/sec^2	.....	.....	.....			X	X	
3.a.3	Yaw								

3.a.3.a	Displacement −±25° ...	.....	.....	.....			X	X	
3.a.3.b	Velocity—±20°/sec	.....	.....	.....			X	X	
3.a.3.c	Acceleration—±100°/ sec².	.....	.....	.....			X	X	
3.a.4	Vertical	.....	.....	.....					
3.a.4.a	Displacement—TBD in	.....	.....	.....		X			
	±34 in.	.....	.....	.....			X	X	
3.a.4.b	Velocity—TBD in	.....	.....	.....		X			
	±24 in	.....	.....	.....			X	X	
3.a.4.c	Acceleration—TBD g	.....	.....	.....		X	.....		
	±0.8 g	.....	.....	.....			X	X	
3.A.5	Lateral								
	Displacement: ±45 in ...	.....	.....	.....			X	X	
	Velocity: ±28 in/sec	.....	.....	.....			X	X	
	Acceleration: ±0.6 g	.....	.....	.....			X	X	
3.a.6	Longitudinal.								
	Displacement: ±34 in ...	.....	.....	.....			X	X	
	Velocity: ±28 in/sec	.....	.....	.....			X	X	
	Acceleration: ±0.6 g	.....	.....	.....			X	X	
3.a.7	Initial Rotational Acceleration Ratio								
	All axes: TBD°/sec²/sec	.....	.....	.....		X			
	All axes: 300°/ sec²/sec	.....	.....	.....			X	X	
3.a.8	Initial Linear Acceleration Ratio.								

TABLE C2A—FULL FLIGHT SIMULATOR (FFS) OBJECTIVE TESTS—Continued

<<<QPS requirements>>>									<<Information>>
Test		Tolerance(s)	Flight condition	Test details	Simulator level				Notes
No.	Title				A	B	C	D	
	Vertical: ±TBD g/sec	.....	.....	.....		X			
	±6g/sec	.....	.....	.....			X	X	
	Lateral: ±3g/sec	.....	.....	.....			X	X	
	Longitudinal: ±3g/sec ...	.....	.....	.....			X	X	
3.b	Frequency Response								
	Band, Hz Phase, deg. ..	Amplitude, Ratio, db, ...	.....	.....	.....	X	X	X	
	0.10 to 0.5 −15 to −20.	±2 ..... ±2	.....	.....	.....				
	0.51 to 1.0 −15 to −20.	±4, ... ±4	.....	.....	.....				
3.c	Leg Balance.								
	Leg Balance	1.5°	.....	The phase shift between a datum jack and any other jack must be measured using a heave (vertical) signal of 0.5 Hz. at ±0.25 g.	.....	X	X	X	
3.d	Turn Around.								

	Turn Around	0.05 g		The motion base must be driven sinusoidally in heave through a displacement of 6 inches (150mm) peak to peak at a frequency of 0.5 Hz. Deviation from the desired sinusoidal acceleration must be measured.		X	X	X	
4	Visual System Display Tests.								
4.a	Field of View.								
4.a.1	Continuous collimated visual field of view.	Minimum continuous collimated field of view providing 75° horizontal and 30° vertical field of view for each pilot simultaneously.	N/A	An SOC is required. Horizontal field of view is centered on the zero degree azimuth line relative to the aircraft fuselage.		X			A vertical field of view of 30° may be insufficient to meet visual ground segment requirements. Field of view may be measured using a visual test pattern filling the entire visual scene (all channels) with a matrix of black and white 5° squares. The installed alignment should be addressed in the SOC.

TABLE C2A—FULL FLIGHT SIMULATOR (FFS) OBJECTIVE TESTS—Continued

<<<QPS requirements>>>									<<Information>>
Test		Tolerance(s)	Flight condition	Test details	Simulator level				Notes
No.	Title				A	B	C	D	
4.a.2	Continuous collimated visual field of view.	Minimum continuous collimated field of view providing 150° horizontal and 40° vertical field of view for each pilot simultaneously.	N/A/	An SOC is required. Horizontal field of view is centered on the zero degree azimuth line relative to the aircraft fuselage.			X		Field of view may be measured using a visual test pattern filling the entire visual scene (all channels) with a matrix of black and white 5° squares. The installed alignment should be addressed in the SOC.
4.a.3	Continuous collimated visual field of view.	Minimum continuous collimated field of view providing 180° horizontal and 60° vertical field of view for each pilot simultaneously.	N/A	An SOC is required. Horizontal field of view is centered on the zero degree azimuth line relative to the aircraft fuselage.				X	Field of view may be measured using a visual test pattern filling the entire visual scene (all channels) with a matrix of black and white 5° squares. The installed alignment should be addressed in the SOC.

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/ms^2) 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 six (6) foot-lamberts (20 cd/m^2).	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; however, 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.

TABLE C2A—FULL FLIGHT SIMULATOR (FFS) OBJECTIVE TESTS—Continued

<<<QPS requirements>>>									<<Information>>
Test		Tolerance(s)	Flight condition	Test details	Simulator level				Notes
No.	Title				A	B	C	D	
4.e	Vernier resolution (surface resolution).	Not greater than 3 arc minutes.	N/A	An SOC is required and must include the appropriate calculations and an explanation of those calculations.			X	X	
4.f	Light point size	Not greater than six (6) arc-minutes..	N/A	An SOC is required and must include the relevant calculations and an explanation of those calculations.			X	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	Not less than 25:1	N/A	An SOC is required and must include the relevant calculations..			X	X	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.

BEGIN INFORMATION

2. CONTROL DYNAMICS.

a. General. 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 controls. Considerable effort is expended on helicopter feel system design so that pilots will be comfortable and will consider the helicopter desirable to fly. In order for a FFS to be representative, it should ''feel'' like the helicopter being simulated. Compliance with this requirement is determined by comparing a recording of the control feel dynamics of the FFS to actual helicopter measurements in the takeoff, cruise and landing configurations.

b. Recordings such as free response to an impulse or step function are classically used to estimate the dynamic properties of electromechanical systems. In any case, 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 FFS control loading system to the helicopter system is essential. The required dynamic control tests are described in Table C2A of this attachment.

c. For initial and upgrade evaluations, the QPS requires that control dynamics characteristics be measured and recorded directly from the flight controls (Handling Qualities—Table C2A). This procedure is usually accomplished by measuring the free response of the controls using a step or impulse input to excite the system. The procedure should be accomplished in the takeoff, cruise and landing flight conditions and configurations.

d. For helicopters with irreversible control systems, measurements may be obtained on the ground if proper pitot-static inputs are provided to represent airspeeds typical of those encountered in flight. Likewise, it may be shown that for some helicopters, hover, climb, cruise, and autorotation have like effects. Thus, one may suffice for another. If either or both considerations apply, engineering validation or helicopter manufacturer rationale should be submitted as justification for ground tests or for eliminating a configuration. For FFSs requiring static and dynamic tests at the controls, special test fixtures will not be required during initial and upgrade evaluations if the QTG shows both test fixture results and the results of an alternate approach (*e.g.*, computer plots that were produced concurrently and show satisfactory agreement). Repeat of the alternate method during the initial evaluation would satisfy this test requirement.

(1) Control Dynamics Evaluations. The dynamic properties of control systems are often stated in terms of frequency, damping, and a number of other classical measurements. In order to establish a consistent means of validating test results for FFS control loading, criteria are needed that will clearly define the measurement interpretation and the applied tolerances. Criteria are needed for underdamped, critically damped and overdamped systems. 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 are not readily measured from a response time history. Therefore, the following suggested measurements may be used:

(2) For Levels C and D simulators. Tests to verify that control feel dynamics represent the helicopter should show that the dynamic damping cycles (free response of the controls) match those of the helicopter within specified tolerances. The NSPM recognizes that several different testing methods may be used to verify the control feel dynamic response. The NSPM will consider the merits of testing methods based on reliability and consistency. One acceptable method of evaluating the response and the tolerance to be applied is described below for the underdamped and critically damped cases. A sponsor using this method to comply with the QPS requirements should perform the tests as follows:

e. Tolerances.

(1) Underdamped Response.

(a) 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 should 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 should be considered significant. The residual band, labeled $T(A_d)$ on Figure C2A is ±5 percent of the initial displacement amplitude A_d from the steady state value of the oscillation. Only oscillations outside the residual band are considered significant. When comparing FFS data to helicopter data, the process should begin by overlaying or aligning the FFS and airplane steady state values and then comparing amplitudes of oscillation peaks, the time of the first zero crossing, and individual

periods of oscillation. The FFS should show the same number of significant overshoots to within one when compared against the helicopter airplane data. The procedure for evaluating the response is illustrated in Figure C2A.

(2) Critically damped and Overdamped Response. overdamped response. Due to the nature of critically damped and overdamped responses (no overshoots), the time to reach 90 percent of the steady state (neutral point) value should be the same as the helicopter within ±10 percent. The simulator response must be critically damped also. Figure C2B illustrates the procedure.

(3) The following summarizes the tolerances:

$T(P_0)$ ±10% of P_0
$T(P_1)$ ±20% of P_1
$T(A)$ ±10% of A_1, ±20% of Subsequent Peaks
$T(A_d)$ ±10% of A_d = Residual Band
Overshoots ±1

(4) In the event the number of cycles completed outside of the residual band, and thereby significant, exceeds the number depicted in figure 1 of this attachment, the following tolerances (T) will apply:

$T(P_n)$ ±10%(n+1)% of P_n, where ''n'' is the next in sequence.

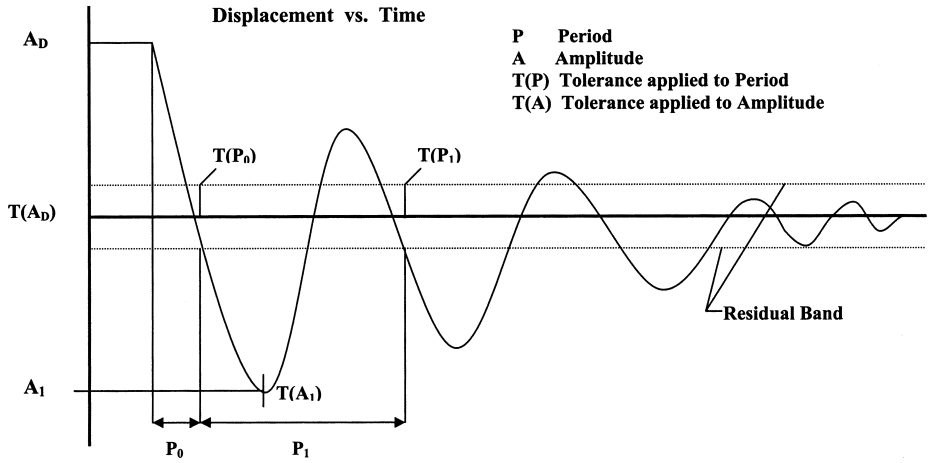


Figure C2A
Under-Damped Step Response

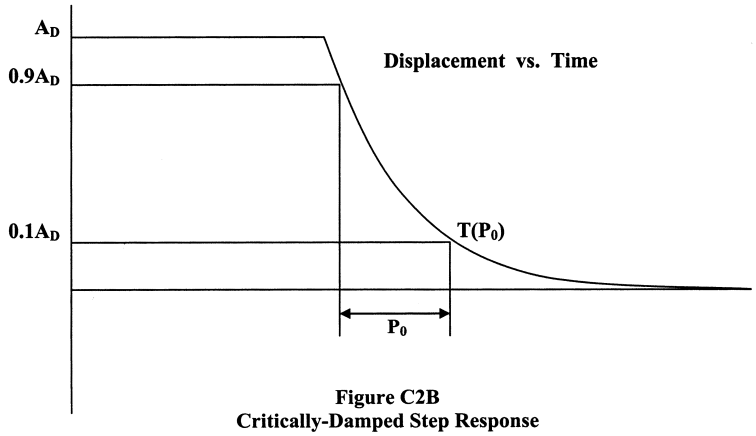


Figure C2B
Critically-Damped Step Response

3. MOTION CUE REPEATABILITY TESTING.

a. The motion system characteristics in the Table C2A address basic system capability, but not pilot cueing capability. Motion systems will continue to be ''tuned'' subjectively until there is an objective procedure for determining the motion cues necessary to support pilot tasks and stimulate the pilot response that occurs in a helicopter for the same tasks. When a motion system is tuned, it is important to test the system to ensure that it continues to perform as originally qualified. Any motion performance change from the initially qualified baseline can be measured objectively.

b. Motion performance change should be assessed at least annually. An assessment may be conducted as follows:

(1) Compare the current performance of the motion system to the initial recorded test data.

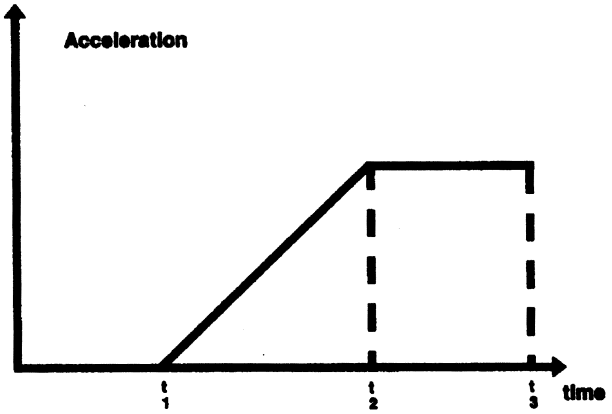
(2) Record the parameters of the motion drive algorithms and the jack position transducers.

(3) Insert the test input signals at an appropriate point prior to the integrations in

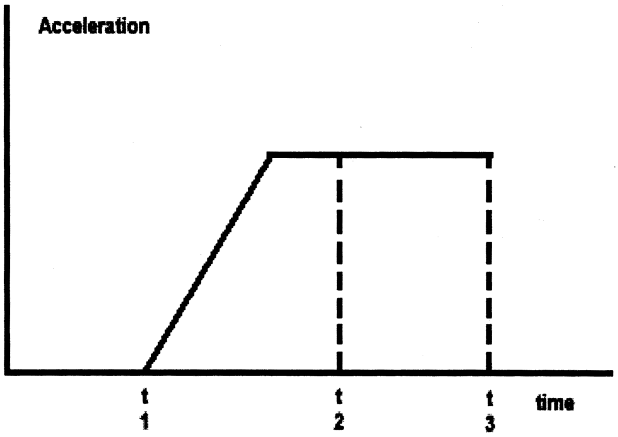
the equations of motion (see Figure C2C of this attachment).

(4) Adjust the characteristics of the test signal (see Figure C2D of this attachment) to ensure that the motion is exercised properly. Motion system manufactures suggest a range of approximately ⅔ of the maximum displacement capability in each axis with a time segment (T_0–T_1) of sufficient duration to ensure steady initial conditions.

Attachment 2 to Appendix C to Part 60—
Figure C2C. Acceleration Test Signals



Attachment 2 to Appendix C to Part 60—
Figure C2D. Test Signal Characteristics



NOTE: Motion system baseline performance repeatability tests should be rerun if the simulator weight changes for any reason (i.e., visual change, or structural change). The new results should be used for future comparison.

End Information

ATTACHMENT 3 TO APPENDIX C TO PART 60—SIMULATOR SUBJECTIVE EVALUATION

1. DISCUSSION

BEGIN INFORMATION

a. The subjective tests provide a basis for evaluating the capability of the simulator to perform over a typical utilization period; determining that the simulator competently simulates each required maneuver, procedure, or task; and verifying correct operation of the simulator controls, instruments, and systems. The items listed in the following Tables are for simulator evaluation purposes only. They must not be used to limit or exceed the authorizations for use of a given level of simulator as described on the Statement of Qualification or as may be approved by the TPAA. All items in the following paragraphs are subject to an examination.

b. The tests in Table A3A, Operations Tasks, in this attachment address pilot functions, including maneuvers and procedures (called flight tasks), and is divided by flight phases. The performance of these tasks by the NSPM includes an operational examination of the visual system and special effects. There are flight tasks included to address some features of advanced technology helicopters and innovative training programs.

c. The tests in Table A3A, Operations Tasks, and Table A3G, Instructor Operating Station, in this attachment addresses the overall function and control of the simulator including the various simulated environmental conditions; simulated helicopter system operation (normal, abnormal, and emergency); visual system displays; and special effects necessary to meet flight crew training, evaluation, or flight experience requirements.

d. 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 flight tasks or events within that flight phase. Simulated helicopter systems are listed separately under ''Any Flight Phase'' to ensure appropriate attention to systems checks. Operational navigation systems (including inertial navigation systems, global positioning systems, or other long-range systems) and the associated electronic display systems will be evaluated if installed. The NSP pilot will include in his report to the TPAA, the effect of the system operation and any system limitation.

e. Simulators demonstrating a satisfactory circling approach will be qualified for the circling approach maneuver and may be approved for such use by the TPAA in the sponsor's FAA-approved flight training program. To be considered satisfactory, the circling approach will be flown at maximum gross weight for landing, with minimum visibility for the helicopter approach category, and must allow proper alignment with a landing runway at least 90° different from the instrument approach course while allowing the pilot to keep an identifiable portion of the airport in sight throughout the maneuver (reference—14 CFR 91.175(e)).

f. At the request of the TPAA, the NSP Pilot may assess the simulator 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 Line Oriented Flight Training (LOFT) scenario or special emphasis items in the sponsor's training program. Unless directly related to a requirement for the qualification level, the results of such an evaluation would not affect the qualification of the simulator.

g. The NSPM acknowledges that there are previously qualified simulators with certain, early generation Computer Generated Image (CGI) visual systems, that are limited by either the capability of the Imgage Generator or the display system used. As a result, the NSPM has agreed to discuss the specific circumstances that may be determined to exist and has agreed to reach a mutually acceptable course of action to address these limitations beyond those that are listed in the QPS requirements of this table. The following are examples:

(1) Early CGI visual systems that are exempt from the necessity of including runway numbers as a part of the specific runway marking requirements are:

(a) Link NVS and DNVS.

(b) Novoview 2500 and 6000.

(c) FlightSafety VITAL series up to, and including, VITAL III, but not beyond.

(d) Redifusion SP1, SP1T, and SP2.

(2) Early CGI visual systems that are exempt from the necessity of including runway numbers except for those runways used for LOFT training sessions. These LOFT airport models require runway numbers but only for the specific runway end (one direction) used in the LOFT session. The systems required to display runway numbers only for LOFT scenes are:

(a) FlightSafety VITAL IV.

(b) Redifusion SP3 and SP3T.

(c) Link-Miles Image II.

(3) Previously qualified CGI and/or display systems that are incapable of generating blue lights, and therefore will not be required to have accurate taxi-way edge lighting are:

(a) Redifusion SP1 and SP1T.

(b) FlightSafety Vital IV.

(c) Link-Miles Image II and Image IIT

(d) XKD displays (even though the XKD image generator is capable of generating

blue colored lights, the display cannot accommodate that color).

END INFORMATION

TABLE C3A—FUNCTIONS AND SUBJECTIVE TESTS

<<< QPS requirements >>>					
No.	Operations tasks	Simulator level			
		A	B	C	D
Tasks in this table are subject to evaluation if appropriate for the helicopter simulated as indicated in the SOQ Configuration List and/or the level of simulator qualification involved. Items not installed or not functional on the simulator and, therefore, not appearing on the SOQ Configuration List, are not required to be listed as exceptions on the SOQ.					
1. Preparation For Flight					
1.a	Cockpit check: switches, indicators, systems, and equipment		X	X	X
2. APU/Engine start and run-up					
2.a	Normal start procedures		X	X	X
2.b	Alternate start procedures		X	X	X
2.c	Abnormal starts and shutdowns (e.g., hot start, hung start)		X	X	X
2.d	Rotor engagement		X	X	X
2.e	System checks		X	X	X
3. (Reserved)					
4. (Reserved)					
5. (Reserved)					
6. Take-off					
6.a	Normal		X	X	X
6.a.1	From ground		X	X	X
6.a.2	From hover		X	X	X
6.a.2.a	Cat A		X	X	X
6.a.2.b	Cat B		X	X	X
6.a.3	Running		X	X	X
6.a.4	Crosswind/tailwind		X	X	X
6.a.5	Maximum performance		X	X	X
6.a.6	Instrument		X	X	X
6.a.7	(Reserved).				
6.a.8	(Reserved).				
6.a.9	(Reserved).				
6.a.10	(Reserved).				
6.b	Abnormal/emergency procedures		X	X	X
6.b.1	Takeoff with engine failure after critical decision point (CDP)		X	X	X
6.b.1.a	Cat A		X	X	X
6.b.1.b	Cat B		X	X	X
6.c	(Reserved).				
7. Climb					

TABLE C3A—FUNCTIONS AND SUBJECTIVE TESTS—Continued

<<< QPS requirements >>>					
No.	Operations tasks	Simulator level			
		A	B	C	D
7.a	Normal		X	X	X
7.b	(Reserved).				
7.c	(Reserved).				
7.d	One engine inoperative		X	X	X
8. Cruise					
8.a	Performance		X	X	X
8.b	Flying qualities		X	X	X
8.c	Turns		X	X	X
8.c.1	Timed		X	X	X
8.c.2	Normal		X	X	X
8.c.3	Steep		X	X	X
8.d	Accelerations and decelerations		X	X	X
8.e	High speed vibrations		X	X	X
8.f	(Reserved).				
8.g	Abnormal/emergency procedures		X	X	X
8.g.1	Engine fire		X	X	X
8.g.2	Engine failure		X	X	X
8.g.3	Inflight engine shutdown and restart		X	X	X
8.g.4	Fuel governing system failures		X	X	X
8.g.5	Directional control malfunction		X	X	X
8.g.6	Hydraulic failure		X	X	X
8.g.7	Stability system failure		X	X	X
8.g.8	Rotor vibrations		X	X	X
9. Descent					
9.a	Normal		X	X	X
9.b	Maximum rate		X	X	X
9.c	(Reserved).				
10. Approach					
10.a	Non-precision		X	X	X
10.a.1	All engines operating		X	X	X
10.a.2	One or more engines inoperative		X	X	X
10.a.3	Approach procedures		X	X	X
10.a.3.a	NDB		X	X	X
10.a.3.b	VOR, RNAV, TACAN		X	X	X
10.a.3.c	ASR		X	X	X

TABLE C3A—FUNCTIONS AND SUBJECTIVE TESTS—Continued

<<< QPS requirements >>>					
No.	Operations tasks	Simulator level			
		A	B	C	D
10.a.3.d	(Reserved).				
10.a.3.e	Helicopter only		X	X	X
10.a.4	Missed approach		X	X	X
10.a.4.a	All engines operating		X	X	X
10.a.4.b	One or more engines inoperative		X	X	X
10.b	Precision		X	X	X
10.b.1	All engines operating		X	X	X
10.b.2	One or more engines inoperative		X	X	X
10.b.3	Approach procedures		X	X	X
10.b.3.a	PAR		X	X	X
10.b.3.b	MLS		X	X	X
10.b.3.c	ILS		X	X	X
10.b.3.c	(1) Manual (raw data)		X	X	X
10.b.3.c	(2) Flight director only		X	X	X
10.b.3.c	(3) Autopilot coupled		X	X	X
10.b.3.c	—Cat I		X	X	X
10.b.3.c	—Cat II		X	X	X
10.b.4	Missed approach.				
10.b.4.a	All engines operating		X	X	X
10.b.4.b	One or more engines inoperative		X	X	X
10.b.4.c	Stability system failure		X	X	X
10.c	(Reserved).				
11. (Reserved)					
12. Any Flight Phase					
12.a	Helicopter and powerplant systems operation.				
12.a.1	Air conditioning		X	X	X
12.a.2	Anti-icing/deicing		X	X	X
12.a.3	Auxiliary power-plant		X	X	X
12.a.4	Communications		X	X	X
12.a.5	Electrical		X	X	X
12.a.6	Fire detection and suppression		X	X	X
12.a.7	Stabilizer		X	X	X
12.a.8	Flight controls		X	X	X
12.a.9	Fuel and oil		X	X	X
12.a.10	Hydraulic		X	X	X

TABLE C3A—FUNCTIONS AND SUBJECTIVE TESTS—Continued

<<< QPS requirements >>>					
No.	Operations tasks	Simulator level			
		A	B	C	D
12.a.11	Landing gear		X	X	X
12.a.12	Oxygen		X	X	X
12.a.13	Pneumatic		X	X	X
12.a.14	Powerplant		X	X	X
12.a.15	Flight control computers		X	X	X
12.a.16	Stability and control augmentation		X	X	X
12.b	Flight management and guidance system.				
12.b.1	Airborne radar		X	X	X
12.b.2	Automatic landing aids		X	X	X
12.b.3	Autopilot		X	X	X
12.b.4	Collision avoidance system		X	X	X
12.b.5	Flight data displays		X	X	X
12.b.6	Flight management computers		X	X	X
12.b.7	Heads-up displays		X	X	X
12.b.8	Navigation systems		X	X	X
12.c	Airborne procedures.				
12.c.1	Holding		X	X	X
12.c.2	Air hazard avoidance		X	X	X
12.c.3	Retreating blade stall recovery		X	X	X
12.c.4	Mast bumping		X	X	X
13. Engine Shutdown and Parking					
13.a	Engine and systems operation		X	X	X
13.b	Parking brake operation		X	X	X
13.c	Rotor brake operation		X	X	X
13.d	Abnormal/emergency procedures		X	X	X

Table C3B [Reserved]

Table C3C [Reserved]

TABLE C3D—FUNCTIONS AND SUBJECTIVE TESTS

<<< QPS requirements >>>					
Number	Instructor Operating Station (IOS) (As appropriate)	Simulator level			
		A	B	C	D
Functions in this table are subject to evaluation only if appropriate for the helicopter and/or the system is installed on the specific simulator.					
1. Simulator Power Switch(es)			X	X	X

TABLE C3D—FUNCTIONS AND SUBJECTIVE TESTS—Continued

<<< QPS requirements >>>					
Number	Instructor Operating Station (IOS) (As appropriate)	Simulator level			
		A	B	C	D
2. Helicopter conditions					
2.a	Gross weight, center of gravity, fuel loading and allocation	....	X	X	X
2.b	Helicopter systems status	....	X	X	X
2.c.	Ground crew functions	....	X	X	X
3. Airports/Heliports					
3.a	Number and selection	....	X	X	X
3.b	Runway or landing area selection	....	X	X	X
3.c	Landing surface conditions (rough, smooth, icy, wet, dry, snow)	....	X	X	X
3.d	Preset positions	....	X	X	X
3.e	Lighting controls	....	X	X	X
4. Environmental controls					
4.a	(Reserved).				
4.b	(Reserved).				
4.c	Temperature	....	X	X	X
4.d	Climate conditions	....	X	X	X
4.e	Wind speed and direction	....	X	X	X
4.f	(Reserved)	....	....	....	
5. Helicopter system malfunctions (Insertion/deletion)		X	X	X	
6. Locks, Freezes, and Repositioning					
6.a	Problem (all) freeze/release	....	X	X	X
6.b	Position (geographic) freeze/release	....	X	X	X
6.c	Repositioning (locations, freezes, and releases)	....	X	X	X
6.d	Ground speed control	....	X	X	X
7. Remote IOS.		X	X	X	
8. Sound Controls. On/off/adjustment		X	X	X	
9. Motion/Control Loading System					
9.a	On/off/emergency stop	....	X	X	X
10. Observer Seats/Stations. Position/Adjustment/Positive restraint system		X	X	X	

ATTACHMENT 4 TO APPENDIX C TO PART 60—SAMPLE DOCUMENTS

TABLE OF CONTENTS

Title of Sample

Figure C4A—Sample Letter, Request for Initial, Upgrade, or Reinstatement Evaluation
Figure C4B—Attachment: FSTD Information Form
Figure C4C—Sample Qualification Test Guide Cover Page
Figure C4D—Sample Statement of Qualification—Certificate
Figure C4E—Sample Statement of Qualification—Configuration List
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Figure C4G—Sample Continuing Qualification Evaluation Requirements Page
Figure C4H—Sample MQTG Index of Effective FSTD Directives

ATTACHMENT 4 TO APPENDIX C TO PART 60—
Figure A4A – Sample Letter , Request for Initial, Upgrade, or Reinstatement Evaluation
INFORMATION

Date _____

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 (FSTD Manufacturer), (Aircraft Type/Level) Flight Simulation Training Device (FSTD), (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 FSTD will be sponsored by (Name of Training Center/Air Carrier), FAA Designator (4 Letter Code). The FSTD will be sponsored under the following options: (Select One)

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

☐ The FSTD will be used for dry lease only in accordance with Paragraph 3b, FSTD Guidance Bulletin 03-08.

We agree to provide the formal request for the evaluation (*Ref: Appendix 4, AC 120-40B*) to your staff as follows: (check one)

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

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

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

7. Sponsor's Letter of Request (*Company Compliance Letter*).
8. Principal Operations Inspector (POI) or Training Center Program Manager's (TCPM) endorsement.
9. 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: FSTD Information Form
cc: POI/TCPM

ATTACHMENT 4 TO APPENDIX C TO PART 60—
Figure A4B – Sample Letter , Request for Initial, Upgrade, or Reinstatement Evaluation
Attachment: FSTD Information Form
INFORMATION

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

ATTACHMENT 4 TO APPENDIX C TO PART 60—
Figure A4B – Sample Letter , Request for Initial, Upgrade, or Reinstatement Evaluation
Attachment: FSTD Information Form
INFORMATION

Visual System Manufacturer and Type:	____	**Motion System Manufacturer and Type:**	____
Aircraft Make/Model/Series:	____	**FSTD Seats Available:**	____

Aircraft Equipment	**ENGINE TYPE(S):** ____	**Flight Instrumentation:** ☐ **EFIS** ☐ **HUD** ☐ **HGS** ☐ **EFVS** ☐ **TCAS** ☐ **GPWS** ☐ **Plain View** ☐ **GPS** ☐ **FMS Type:** ____ ☐ **WX Radar** ☐ **Other:** ____	Engine Instrumentation: ☐ **EICAS** ☐ **FADEC** ☐ **Other:** ____

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

Section 2. Supplementary Information

FAA Training Program Approval Authority:		☐ **POI** ☐ **TCPM** ☐ **Other:** ____	
Name:	____	**Office:**	____
Tel:	____	**Fax:**	____
Email:	____		

FSTD Scheduling Person:			
Name:	____		
Address 1:	____	**Address 2**	____
City:	____	**State:**	____
ZIP:	____	**Email:**	____
Tel:	____	**Fax:**	____

FSTD Technical Contact:			
Name:	____		
Address 1:	____	**Address 2**	____
City:	____	**State:**	____
ZIP:	____	**Email:**	____
Tel:	____	**Fax:**	____

Section 3. Training, Testing and Checking Considerations

Area/Function/Maneuver	Requested	Remarks
Private Pilot - Training / Checks: (142)	☐	____
Commercial Pilot - Training /Checks:(142)	☐	____
Multi-Engine Rating - Training / Checks (142)	☐	____
Instrument Rating -Training / Checks (142)	☐	____
Type Rating - Training / Checks (135/121/142)	☐	____
Proficiency Checks (135/121/142)	☐	____
CAT I: (RVR 2400/1800 ft. DH200 ft)	☐	____

ATTACHMENT 4 TO APPENDIX C TO PART 60—
Figure A4B – Sample Letter , Request for Initial, Upgrade, or Reinstatement Evaluation
Attachment: FSTD Information Form
INFORMATION

CAT III * (lowest minimum) _____ RVR _____ ft. * *State CAT III (≤ 700 ft.), CAT IIIb (≤ 150 ft.), or CAT IIIc (0 ft.)*	☐	____
Circling Approach	☐	____
Windshear Training: (FSTD GB 03-05)	☐	____
Windshear Training IAW 121.409d (121 Turbojets Only) (FSTD GB 03-05)	☐	____
Generic Unusual Attitudes and Recoveries within the Normal Flight Envelope (FSTD GB 04-03)	☐	____
Specific Unusual Attitudes Recoveries (HBAT 95-10) (FSTD GB 04-03)	☐	____
Auto-coupled Approach/Auto Go Around	☐	____
Auto-land / Roll Out Guidance	☐	____
TCAS/ACAS I / II	☐	____
WX-Radar	☐	____
HUD (FSTD GB 03-02)	☐	____
HGS (FSTD GB 03-02)	☐	
EFVS (FSTD GB 03-03)	☐	
Future Air Navigation Systems (HBAT 98-16A)	☐	____
GPWS / EGPWS	☐	____
ETOPS Capability	☐	____
GPS	☐	____
SMGCS	☐	____
Helicopter Slope Landings	☐	____
Helicopter External Load Operations	☐	____
Helicopter Pinnacle Approach to Landings	☐	____
Helicopter Night Vision Maneuvers	☐	____
Helicopter Category A Takeoffs	☐	____

ATTACHMENT 4 TO APPENDIX C TO PART 60—
Figure A4C – Sample Qualification Test Guide Cover Page
INFORMATION

SPONSOR NAME

SPONSOR ADDRESS

FAA QUALIFICATION TEST GUIDE

(SPECIFIC Helicopter MODEL)
for example
Farnsworth Z-100

(Type of Simulator)

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

(Simulator Level)

(Qualification Performance Standard Used)

(Simulator Location)

FAA Initial Evaluation

Date: _____

_____ Date: _____
(Sponsor)

_____ Date: _____
Manager, National
Simulator Program, FAA

ATTACHMENT 4 TO APPENDIX C TO PART 60—
Figure A4D – Sample Statement of Qualification - Certificate

INFORMATION

Federal Aviation Administration
National Simulator Program

Statement of Qualification

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

Go-Fast Airlines
Farnsworth Z-100 Full Flight Simulator
FAA Identification Number 0999

And found it to meet the standards set forth in
AC 120-63

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

Level D

Until March 30, 2009

Unless sooner rescinded or extended by the National Simulator Program Manager

February 15, 2008 — (date)

I. B. Checkin, Jr. — (for the NSPM)

ATTACHMENT 4 TO APPENDIX C TO PART 60—

Figure A4E – Sample Statement of Qualification; Configuration List

INFORMATION

STATEMENT of QUALIFICATION
CONFIGURATION LIST

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

ATTACHMENT 4 TO APPENDIX C TO PART 60—

Figure A4E – Sample Statement of Qualification; Configuration List

INFORMATION

Visual System Manufacturer and Type:	____	**Motion System Manufacturer and Type:**	____
Aircraft Make/Model/Series:	____	**FSTD Seats Available:**	____

Aircraft Equipment	**ENGINE TYPE(S):** ____	**Flight Instrumentation:** ☐ EFIS ☐ HUD ☐ HGS ☐ EFVS ☐ TCAS ☐ GPWS ☐ Plain View ☐ GPS ☐ FMS Type: ____ ☐ WX Radar ☐ Other: ____	Engine Instrumentation: ☐ EICAS ☐ FADEC ☐ Other: ____

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

Section 2. Supplementary Information

FAA Training Program Approval Authority:		☐ POI ☐ TCPM ☐ Other: ____	
Name:	____	**Office:**	____
Tel:	____	**Fax:**	____
Email:	____		

FSTD Scheduling Person:			
Name:	____		
Address 1:	____	**Address 2**	____
City:	____	**State:**	____
ZIP:	____	**Email:**	____
Tel:	____	**Fax:**	____

FSTD Technical Contact:			
Name:	____		
Address 1:	____	**Address 2**	____
City:	____	**State:**	____
ZIP:	____	**Email:**	____
Tel:	____	**Fax:**	____

Section 3. Training, Testing and Checking Considerations

Area/Function/Maneuver	Requested	Remarks
Private Pilot - Training / Checks: (142)	☐	____
Commercial Pilot - Training /Checks:(142)	☐	____
Multi-Engine Rating - Training / Checks (142)	☐	____
Instrument Rating -Training / Checks (142)	☐	____
Type Rating - Training / Checks (135/121/142)	☐	____
Proficiency Checks (135/121/142)	☐	____

ATTACHMENT 4 TO APPENDIX C TO PART 60—

Figure A4E – Sample Statement of Qualification; Configuration List

INFORMATION

CAT III * (lowest minimum) _____ RVR _____ ft. * *State CAT III (≤ 700 ft.), CAT IIIb (≤ 150 ft.), or CAT IIIc (0 ft.)*	☐	____
Circling Approach	☐	____
Windshear Training: (FSTD GB 03-05)	☐	____
Windshear Training IAW 121.409d (121 Turbojets Only) (FSTD GB 03-05)	☐	____
Generic Unusual Attitudes and Recoveries within the Normal Flight Envelope (FSTD GB 04-03)	☐	____
Specific Unusual Attitudes Recoveries (HBAT 95-10) (FSTD GB 04-03)	☐	____
Auto-coupled Approach/Auto Go Around	☐	____
Auto-land / Roll Out Guidance	☐	____
TCAS/ACAS I / II	☐	____
WX-Radar	☐	____
HUD (FSTD GB 03-02)	☐	____
HGS (FSTD GB 03-02)	☐	
EFVS (FSTD GB 03-03)	☐	
Future Air Navigation Systems (HBAT 98-16A)	☐	____
GPWS / EGPWS	☐	____
ETOPS Capability	☐	____
GPS	☐	____
SMGCS	☐	____
Helicopter Slope Landings	☐	____
Helicopter External Load Operations	☐	____
Helicopter Pinnacle Approach to Landings	☐	____
Helicopter Night Vision Maneuvers	☐	____
Helicopter Category A Takeoffs	☐	____

ATTACHMENT 4 TO APPENDIX C TO PART 60—

Figure A4F – Sample Statement of Qualification – List of Qualified Tasks

INFORMATION

STATEMENT of QUALIFICATION
List of Qualified Tasks
Go Fast Airline Training -- Farnsworth Z-100 -- Level D -- FAA ID# 0999

The FSTD is qualified to perform all of the Maneuvers, Procedures, Tasks, and Functions Listed in Appendix A, Attachment 1, Table A1B, Minimum FSTD Requirements In Effect on [mm/dd/yyyy] except for the following listed Tasks or Functions.

Qualified for all tasks in Table C1B for which the sponsor has requested qualification, except for the following: 6.e. Environmental system. 6.f. Fire detection and extinguisher system. 7.b. In-flight fire and smoke removal. 7.d. Ditching.
Additional tasks for which this FSTD is qualified (i.e., in addition to the list in Table C1B) Enhanced Visual System

Attachment 4 to Appendix C to Part 60—
Figure A4G – Sample Continuing Qualification Evaluation Requirements Page
INFORMATION

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

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

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

(Repeat as Necessary)

Index of Effective FSTD Directives Filed in this Section

Notification Number	Received From: (TPAA/NSPM)	Date of Notification	Date of Modification Completion

Continue as Necessary....

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, or Level 6. The Flight Standards Service, National Simulator Program Manager (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.

TABLE OF CONTENTS

1. Introduction.
2. Applicability (§ 60.1) and Applicability of sponsor rules to persons who are not sponsors and who are engaged in certain unauthorized activities (§ 60.2).
3. Definitions (60.3).
4. Qualification Performance Standards (§ 60.4).
5. Quality Management System (§ 60.5).
6. Sponsor Qualification Requirements (§ 60.7).
7. Additional Responsibilities of the Sponsor (§ 60.9).
8. FTD Use (§ 60.11).
9. FTD Objective Data Requirements (§ 60.13).
10. Special Equipment and Personnel Requirements for Qualification of the FTD (§ 60.14).
11. Initial (and Upgrade) Qualification Requirements (§ 60.15).
12. Additional Qualifications for Currently Qualified FTDs (§ 60.16).
13. Previously Qualified FTDs (§ 60.17).
14. Inspection, Continuing Qualification Evaluation, and Maintenance Requirements (§ 60.19).
15. Logging FTD Discrepancies (§ 60.20).
16. Interim Qualification of FTDs for New Helicopter Types or Models (§ 60.21).
17. Modifications to FTDs (§ 60.23).
18. Operations with Missing, Malfunctioning, or Inoperative Components (§ 60.25).
19. Automatic Loss of Qualification and Procedures for Restoration of Qualification (§ 60.27).
20. Other Losses of Qualification and Procedures for Restoration of Qualification (§ 60.29).
21. Record Keeping and Reporting (§ 60.31).
22. Applications, Logbooks, Reports, and Records: Fraud, Falsification, or Incorrect Statements (§ 60.33).
23. [Reserved]
24. Levels of FTD.
25. FSTD 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. 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) Advisory Circular (AC) 120–28C, Criteria for Approval of Category III Landing Weather Minima.

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

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

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

(14) AC 120–57A, Surface Movement Guidance and Control System (SMGS).

(15) AC 150/5300–13, Airport Design.

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

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

(18) AC 150/5390—2B, Heliport Design.

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

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

(21) AC 150/5345–28D, Precision Approach Path Indicator (PAPI) Systems.

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

(23) AC 29–2B, Flight Test Guide for Certification of Transport Category Rotorcraft.

(24) AC 27–1A, Flight Test Guide for Certification of Normal Category Rotorcraft.

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

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

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

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

END INFORMATION

2. APPLICABILITY (§§ 60.1 & 60.2)

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

3. DEFINITIONS (§ 60.3)

BEGIN INFORMATION

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

END INFORMATION

4. QUALIFICATION PERFORMANCE STANDARDS (§ 60.4)

There is no additional regulatory or informational material that applies to § 60.4, Qualification Performance Standards.

5. QUALITY MANAGEMENT SYSTEM (§ 60.5)

BEGIN INFORMATION

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

END INFORMATION

6. SPONSOR QUALIFICATION REQUIREMENTS (§ 60.7)

BEGIN INFORMATION

a. The intent of the language in §60.7(b) is to have a specific FTD, identified by the sponsor, used at least once in an FAA-approved flight training program for the 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 October 30, 2007 the 12-month period begins on the date of the first continuing qualification evaluation conducted in accordance with §60.19 after October 30, 2007 and continues for each subsequent 12-month period;

(ii) A device qualified on or after October 30, 2007 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)

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 FSTD.

END INFORMATION

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8. FTD USE (§ 60.11)

There is no additional regulatory or informational material that applies to § 60.11, FTD Use.

9. FTD OBJECTIVE DATA REQUIREMENTS (§ 60.13)

BEGIN QPS REQUIREMENTS

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

(1) A flight test plan consisting of:

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

(b) For each maneuver or procedure—

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

(ii) The atmospheric and environmental conditions.

(iii) The initial flight conditions.

(iv) The 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) An understanding of the accuracy of the data to be gathered using appropriate alternative data sources, procedures, and instrumentation that is traceable to a recognized standard as described in Attachment 2, Table D2F.

(4) Appropriate and sufficient data acquisition equipment or system(s), including appropriate data reduction and analysis methods and techniques, as would be 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.

(4) With any necessary guidance information provided; and

(5) Without alteration, adjustments, or bias; however the 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 are those data that are used to validate the performance, handling qualities, or other characteristics of the aircraft, including data related to any relevant changes occurring after the type certification is issued. This notification must be made within 10 working days.

END QPS REQUIREMENTS

BEGIN INFORMATION

e. 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.

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

g. 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, lacking adequate justification for selection. Other problems include inadequate information regarding initial conditions or test maneuvers. The NSPM has been forced to refuse these data submissions as validation data for an FTD evaluation. It is for this reason that the NSPM recommends that any data supplier not previously experienced in this area review the data necessary for programming and for validating the performance of the

FTD and discuss the flight test plan anticipated for acquiring such data with the NSPM well in advance of commencing the flight tests.

h. 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, Attachment 2 requires the sponsor or other data provider to ensure that a steady state condition exists at the instant of time captured by the ''snapshot.'' This is often verified by showing that a steady state condition existed from some period of time during which the snap shot is taken. The time period most frequently used is 5 seconds prior through 2 seconds following the instant of time captured by the snap shot. This paragraph is primarily addressing the source data and the method by which the data provider ensures that the steady state condition for the snap shot is representative.

i. The NSPM will consider, on a case-by-case basis, whether or not to approve supplemental validation data derived from flight data recording systems such as a Quick Access Recorder or Flight Data Recorder.

END INFORMATION

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

BEGIN INFORMATION

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

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

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

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

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 qualification test guide (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 applicable QPS.

(c) The result of FTD subjective tests prescribed in the applicable 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, 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, 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, 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 engine model(s) and its data revision number or reference.

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

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

(g) The FTD model and manufacturer.

(h) The date of FTD manufacture.

(i) The FTD computer identification.

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

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

(4) A Table of Contents.

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

(6) List of all relevant data references.

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

(8) Statements of compliance and capability (SOCs) with certain requirements. SOCs must provide references to the sources of information that show the capability of the FTD to comply with the requirement, a rationale explaining how the referenced material is used, mathematical equations and parameter values used, and the conclusions reached; *i.e.*, that the FTD complies with the requirement. Refer to the ''General FTD Requirements'' column, Table D1A, in Attachment 1, or in the ''Alternative Data Sources, Procedures, and Instrumentation'' column, Table D2F, in Attachment 2, to see when SOCs are required.

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

(10) The following information for each objective test designated in Attachment 2, 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 supplemented QTG for each 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 must 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 October 30, 2013 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 October 30, 2013. A copy of the eMQTG 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.

END QPS REQUIREMENTS

BEGIN INFORMATION

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

m. 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, the objective tests listed in Attachment 2, 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) Cockpit 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); and

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

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

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

(2) Subjective tests provide a basis for:

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

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

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

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

o. 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.

p. 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.

q. 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.

r. After an FTD is successfully evaluated, the NSPM issues a statement of qualification (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. However, it is the sponsor's responsibility to obtain TPAA approval prior to using the FTD in an FAA-approved flight training program.

s. Under normal circumstances, the NSPM establishes a date for the initial or upgrade evaluation within ten (10) working days after determining that a complete QTG is acceptable. Unusual circumstances may warrant establishing an evaluation date before this determination is made. A sponsor may schedule an evaluation date as early as 6 months in advance. However, there may be a delay of 45 days or more in rescheduling and completing the evaluation if the sponsor is unable to meet the scheduled date. See Attachment 4, Figure D4A, Sample Request for Initial, Upgrade, or Reinstatement Evaluation.

t. 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.

u. 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).

v. 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)

There is no additional regulatory or informational material that applies to §60.16, Additional Qualifications for a Currently Qualified FTD.

13. PREVIOUSLY QUALIFIED FTDS (§60.17)

BEGIN QPS REQUIREMENTS

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

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

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

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

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

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

b. FTDs qualified prior to October 30, 2007, 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.

c. [Reserved]

END QPS REQUIREMENTS

BEGIN INFORMATION

d. 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.

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

f. The intent of the requirement listed in §60.17(b), for each FTD to have a Statement of Qualification 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.

g. Downgrading of an FTD is a permanent change in qualification level and will necessitate the issuance of a revised Statement of Qualification 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 on-going 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.

h. 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.

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

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

END INFORMATION

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

BEGIN QPS REQUIREMENT

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

b. The description of the functional preflight inspection 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.

END QPS REQUIREMENTS

BEGIN INFORMATION

d. 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.

e. 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.

f. 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 (⅓) 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 (⅔) 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.

g. 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).

There is no additional regulatory or informational material that applies to §60.20. Logging FTD Discrepancies.

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

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

17. Modifications to FTDs (§60.23).

BEGIN QPS REQUIREMENTS

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

b. Prior to using the modified FTD:

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

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

END QPS REQUIREMENTS

BEGIN INFORMATION

c. FSTD Directives are considered modification of an FTD. See Attachment 4, Figure D4H for a sample index of effective FSTD Directives.

END INFORMATION

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

BEGIN INFORMATION

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

b. 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.

c. 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).

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).

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

21. RECORDKEEPING AND REPORTING (§ 60.31).

BEGIN QPS REQUIREMENTS

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

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

END QPS REQUIREMENTS

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

There are no additional QPS requirements or informational material that apply to § 60.33, Applications, Logbooks, Reports, and Records: Fraud, Falsification, or Incorrect Statements.

23. [RESERVED]

24. LEVELS OF FTD.

BEGIN INFORMATION

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

(1) *Level 4*. A device that may have an open helicopter-specific flight deck area, or an enclosed helicopter-specific cockpit and at least one operating system with air/ground logic (no aerodynamic programming required).

(2) *Level 5*. A device that may have an open helicopter-specific flight deck area, or an enclosed helicopter-specific cockpit and a generic aerodynamic program with at least one operating system and control loading that is representative of the simulated helicopter only at an approach speed and configuration.

(3) *Level 6*. A device that has an enclosed helicopter-specific cockpit 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.

END INFORMATION

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

BEGIN INFORMATION

There are no additional QPS requirements or informational material that apply to § 60.37, FSTD 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 a Statement of Compliance and Capability (SOC), which may include objective and subjective tests. The SOC will confirm that the requirement was satisfied, and describe how the requirement was met. The requirements for SOCs and tests 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 6 FTDs. The sponsor should also consult the objectives tests in Attachment 2 and the examination of functions and subjective tests listed in Attachment 3 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 Cockpit 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.

END INFORMATION

TABLE D1A—MINIMUM FTD REQUIREMENTS

<<<QPS requirements >>>					<<Information>> Notes
No.	General FTD requirements	FTD Level			
		4	5	6	
1. General Cockpit Configuration					

TABLE D1A—MINIMUM FTD REQUIREMENTS

<<<QPS requirements >>>					<<Information>> Notes
No.	General FTD requirements	FTD Level			
		4	5	6	
1.a	The FTD must have a cockpit that is a replica of the helicopter, or set purposes, the of helicopters simulated with controls, equipment, observable cockpit 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 helicopters or set of helicopters. Crewmember seats must afford the capability for the occupant to be able to achieve the design ''eye position'' for specific helicopters, or to approximate such a position for a generic set of helicopters.			X	For FTD purposes, the cockpit consists of all that space forward of a cross section of the fuselage at the most extreme aft setting of the pilots' seats including additional, required crewmember duty stations and those required bulkheads aft of the pilot seats.
2.b	The FTD must have equipment (i.e., instruments, panels, systems, and controls) simulated sufficiently for the authorized training/checking events to be accomplished. The installed equipment, must be locted in a spatially correct configuration, and may be in a cockpit or an open flight deck area. Actuation of this equipment must replicate the appropriate function in the helicopter.	X	X		
3.c	Circuit breakers must function accurately when they are involved in operating procedures or malfunctions requiring or involving flight crew response. Level 6 devices must have installed circuit breakers properly located in the FTD cockpit.		X	X	
4. Programming					

TABLE D1A—MINIMUM FTD REQUIREMENTS—Continued

<<<QPS requirements >>>					<<Information>> Notes
No.	General FTD requirements	FTD Level			
		4	5	6	
4.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. Level 6 additionally requires the effects of changes in gross weight and center of gravity. Level 5 requires only generic aerodynamic programming.		X	X	
4.b	The FTD must have computer (analog or digital) capability (i.e., capacity, accuracy, resolution, and dynamic response) needed to meet the qualification level sought.	X	X	X	
4.c	The FTD hardware and programming must be updated within 6 months of any helicopter modifications or data releases (or any such modification or data releases applicable to the set of helicopters) unless, with prior coordination, the NSPM authorizes otherwise.	X	X	X	
4.d	Related responses of the cockpit instruments (and the visual and motion systems, if installed and training, testing, or checking credits are being sought) must be coupled closely to provide integrated sensory cues. The instruments (and the visual and motion systems, if installed, and training, testing, or checking credits are being sought) must respond to abrupt input at the pilot's position within the allotted time, but not before the time, when the helicopter or set of helicopters would respond under the same conditions. (If a visual system is installed and training, testing, or checking credits are sought, the visual scene changes from steady state disturbance must occur within the appropriate system dynamic response limt but not before the instrument response (and not before the motion system onset if a motion system is installed)). A demonstration is required and must simultaneously record: The analog out put from the pilot's control column, wheel, and pedals; and the output signal to the pilot's attitude indicator. These recordings must be compared to helicopter response data in the following configurations: Takeoff, cruise, and approach or landing. The results must be recorded in the QTG. Additionally, if a visual system is installed and training, testing, or checking credit are sought, the output signal to the visual system display (including visual system analog delays must be recorded); and if a motion system is installed and training, testing, or checking credits are sought, the output from an accelerometer attached to the motion system platform located at an acceptable location near the pilots' seats is also required.	.....	X	X	
5. Equipment Operation					

TABLE D1A—MINIMUM FTD REQUIREMENTS—Continued

<<<QPS requirements >>>					<<Information>> Notes
No.	General FTD requirements	FTD Level			
		4	5	6	
5.a	All relevant instrument indications involved in the simulation of the helicopter (or set of helicopters) must automatically respond to control movement or external disturbances to the simulated helicopter or set of helicopters; e.g., turbulence or winds.		X	X	
5.b	Navigation equipment must be installed and operate within the tolerances applicable for the helicopter or set of helicopters. Level 5 only needs that navigation equipment necessary to fly an instrument approach. Level 6 must also include communication equipment (inter-phone and air/ground) like that in the helicopter, or set of helicopters, and, if appropriate to the operation being conducted, an oxygen mask microphone system.		X	X	
5.c	Installed systems must simulate the applicable helicopter (or set of helicopters) 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 sponor's training programs can be accomplished. Level 6 must simulate all applicable helicopter flight, navigation, and systems operation. Level 5 must have functional flight and navigational controls, displays, and instrumentation.	X	X	X	
5.d	The lighting environment for panels and instruments must be sufficient for the operation being conducted.	X	X	X	
5.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	
5.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		
6. Instructor or Evaluator Facilities					
6.a	In addition to the flight crewmember stations, suitable seating arrangements for an instructor/check airman and FAA Inspector must be available. These seats must provide adequate view of crewmember's panel(s).	X	X	X	These seats need not be a replica of an aircraft seat and may be as simple as an office chair placed in an appropriate position.
6.b	The FTD must have instructor controls that permit activation of normal, abnormal, and emergency conditions, as may be 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	

TABLE D1A—MINIMUM FTD REQUIREMENTS—Continued

<<<QPS requirements >>>					<<Information>> Notes
No.	General FTD requirements	FTD Level			
		4	5	6	
7. Motion System					
7.a	The FTD may have a motion system; if desired, although it is not required. If installed, the motion system operation may not be distracting. The motion system standards set out in QPS FAA–S–120–40C for at least Level A simulators is acceptable.	X	X	X	
8. Visual System					
8.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: (1) Single channel, uncollimated display is acceptable. (2) Minimum field of view: 18° vertical/24° horizontal for the pilot flying. (3) Maximum paralax error: 10° per pilot. (4) Scene content may not be distracting. (5) 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. (6) Minimum resolution of 5 arc-min. for both computed and displayed pixel size. (7) Maximum latency or through-put must not exceed 300 milliseconds. A statement of capability is required. A demonstration of latency or through-put is required. Visual system standards set out in QPS FAA–S–120–40C, for at least Level A simulators is acceptable. However, if additional authorizations (training, testing, or checking credits) are sought that require the use of a visual systems, the Level A simulator visual system standards apply.	X	X	X	
9. Sound System					
9.a	The FTD must simulate significant cockpit sounds resulting from pilot actions that correspond to those heard in the helicopter.			X	

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

BEGIN QPS REQUIREMENTS

1. TEST REQUIREMENTS

a. The ground and flight tests required for qualification are listed in Table D2A Objective Evaluation. 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. 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.

c. Certain tests included in this attachment must be supported with a Statement of Compliance and Capability (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. It is not acceptable to program the FTD so that the mathematical modeling is correct only at the validation test points. Unless noted otherwise, tests must represent 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; and

(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. 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.''

i. 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.

j. 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.

k. Some tests will not be required for helicopters using helicopter hardware in the FTD cockpit (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.

1. For objective test purposes, ''Near maximum'' gross weight is a weight chosen by the sponsor or data provider that is not less than the basic operating weight (BOW) of the helicopter being simulated plus 80% of the difference between the maximum certificated gross weight (either takeoff weight or landing weight, as appropriate for the test) and the BOW. ''Light'' gross weight is a weight chosen by the sponsor or data provider that is not more than 120% of the BOW of the helicopter being simulated or as limited by the minimum practical operating weight of the test helicopter. ''Medium'' gross weight is a weight chosen by the sponsor or data provider that is approximately ±10% of the average of the numerical values of the BOW and the maximum certificated gross weight. (NOTE: BOW is the empty weight of the aircraft plus the weight of the following: Normal oil quantity; lavatory servicing fluid; potable water; required crewmembers and their baggage; and emergency equipment. (References: Advisory Circular 120–27, ''Aircraft Weight and Balance;'' and FAA–H–8083–1, ''Aircraft Weight and Balance Handbook.'').

TABLE D2A—FLIGHT TRAINING DEVICE (FTD) OBJECTIVE TESTS

<<< QPS Requirements >>>		Tolerances	Flight conditions	Test details	FTD Level		<< Information >>
Test							Notes
No.	Title				5	6	
1. Performance							
1.a Engine Assessment							
1.a.1	Start Operations						
1.a.1.a	Engine start and acceleration (transient).	Light Off Time—±10% or ±1 sec.Torque—±5%Rotor Speed—±3% Fuel Flow—±10% Gas Generator Speed—±5% Power TurbineSpeed—±5% Gas TurbineTemp.—±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	
1.a.1.b	Steady State Idle and Operating RPM conditions.	Torque—±3% Rotor Speed—±1.5% Fuel Flow—±5% Gas Generator Speed—±2% Power Turbine Speed—±2% Turbine Gas Temp.—±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	±10% of total change of power turbine speed.	Ground	Record engine response to trim system actuation in both directions.		X	
1.a.3	Engine and Rotor Speed Governing.	Torque—±5% Rotor Speed—±1.5%	1) Climb ..... 2) Descent	Record results using a step input to the collective. May be conducted concurrently with climb and descent performance tests.		X	
1.b. In Flight							
	Performance and Trimmed Flight Control Positions.	Torque—±3% Pitch Attitude—±1.5° Sideslip Angle—±2° Longitudinal Control Position—±5% Lateral Control Position—±5% Directional Control Position—±5% Collective Control Position—±5%.	Cruise (Augmentation On and Off).	Record results for two gross weight CG combinations with varying trim speeds throughout the airspeed envelope. May be a series of snapshot tests.	X	X	
1.c. Climb							

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

<<< QPS Requirements >>>		Tolerances	Flight conditions	Test details	FTD Level		<< Information >>
Test							Notes
No.	Title				5	6	
	Performance and Trimmed Flight Control Positions.	Verticle Velocity—±100 fpm (61m/sec) or ±10% Pitch Attitude—±1.5° Sideslip Angle—±2° Longitudinal Control Position—±5% Lateral Control Position—±5% Directional Control Position—±5% Collective Control Position—±5%.	All engines operating. One engine inoperative. 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	
1.d Descent							
1.d.1	Descent Performance and Trimmed Flight Control Positions.	Torque—±3% Pitch Attitude—±1.5° Sideslip Angle—±2° Longitudinal Control Position—±5%. Lateral Control Position—±5% Directional Control Position—±5% Collective Control Position—±5%.	At or near 1,000 fpm rate of descent (RoD) at normal approach speed. Augmentati on System(s) On and Off.	Record results for two gross weight and CG combinations. May be a series of snapshot tests.	X	X	
1.d.2	Autorotation Performance and Trimmed Flight Control Positions.	Torque—±3% Pitch Attitude—±1.5° Sideslip Angle—±2° Longitudinal Control Position—±5% Lateral Control Position—±5% Directional Control Position—±5% Collective Control Position—±5%.	Steady descents. 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 approximately 50 kts. through at least maximum glide distance airspeed. May be a series of snapshot tests.	X	X	
1.e. Autorotation							

	Entry	Rotor Speed—±3% Pitch Attitude±2° Roll Attitude—±3° Yaw Attitude—±5° Airspeed—±5 kts. Vertical Velocity—±200 fpm (1.00 m/sec) or 10%.	1) Cruise; or 2) 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	
2. Handling Qualities.							
2.a.	Start [here] Contro 1 System Mechanical Characteristics.	Contact the NSPM for clarification of any issue regarding helicopters with reversible controls.					
2.a.1.	Cyclic	Breakout—±0.25lbs. (0.112 daN) or 25%. Force—±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	
2.a.2.	Collective and Pedals	Breakout—±0.5 lb. (0.224 daN) or 25%. Force —±1.0 lb. (0.224 daN) or 10%.	Ground; Static conditions. Trim On and Off. Friction Off Augmentation and On and Off.	Record results for an uninterrupted control sweep to the stops.	X	X	
2.a.3.	Brake Pedal Force vs. Position.	±5 lbs. (2.224 daN) or 10%	Ground; Static conditions.		X	X	
2.a.4.	Trim System Rate (all applicable systems).	Rate—±10%	Ground; Static conditions. Trim On Friction Off.	The tolerance applies to the recorded value of the trim rate.	X	X	
2.a.5.	Control Dynamics (all axes)	±10% of time for first zero crossing and ±10 (N+1)% of period thereafter. ±10% of amplitude of first overshoot. ±20% of amplitude of 2nd and subsequent overshoots greater than 5% of initial displacement ±1 overshoot.	Hover/Cruise Trim On Friction Off.	Results must be recorded for a normal control displacement in both directions in each axis (approximately 255 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	±0.10 in	Ground; Static conditions	Record and compare results for all controls.	X	X	
2.b. Longitudinal Handling Qualities.							

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

<<< QPS Requirements >>>		Tolerances	Flight conditions	Test details	FTD Level		<< Information >>
Test							Notes
No.	Title				5	6	
2.b.1	Control Response	Pitch Rate—±10% or ±2/sec. Pitch Attitude Change—±10% or ±1.5°.	Cruise Augmentation 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 unaugmented cases.	X	X	
2.b.2	Static Stability	Longitudinal Control Position: ±10% of change from trim or ±0.25 in. (6.3 mm) or Longitudinal Control Force: ±0.5 lb. (0.223 daN) or ±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	
2.b.3	Dynamic Stability						
2.b.3.a.	Long Term Response	±10% of calculated period. ±10% of time to ½ or double amplitude, or ±0.02 of damping ratio.	Cruise Augmentation On and Off.	Record results for three full cycles (6 overshoots after input completed) or that sufficient to determine time to ½ double or amplitude, whichever is less. For non-periodic responses, the time history must be matched.	X	X	
2.b.3.b	Short Term Response	±1.5° Pitch or ±2/sec. Pitch Rate. ±0.1 g Normal Acceleration.	Cruise or Climb. Augmentation On and Off.	Record results for at least two airspeeds.		X	
2.b.4	Maneuvering Stability	Longitudinal Control Position—±10% of change from trim or ±0.25 in. (6.3mm) or Longitudinal Control Forces—±0.5 lb. (0.223 daN) or ±10%.	Cruise or Climb. Augmentation On and Off.	Record results for at least two airspeeds. Record results for Approximately 30°–45° bank angle. The force may be shown as a cross plot for irreversible systems. May be a series of snapshot tests.		X	
2.b.5	Landing Gear Operating Times	±1 sec	Takeoff (Retraction) Approach (Extension).		X	X	

2.c. Lateral and Directional Handling Qualities.							
2.c.1	Control Response						
2.c.1.a	Lateral	Roll Rate—±10% or ±3°/sec. Roll Attitude Change—±10% or ±3°.	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	
2.c.1.b	(b) Directional	Yaw Rate—±10% or ±2°/sec. Yaw Attitude Change—±10% or ±2°.	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	
2.c.2.	Directional Static Stability	Lateral Control Position—±10% of change from trim or ±0.25 in. (6.3mm) or Lateral Control Force—±0.5 lb. (0.223 daN) or 10%. Roll Attitude—±1.5.. Directional Control Position—±10% of change from trim or ±0.25 in. (6.3mm) or Directional Control Force—±1 lb. (0.448 daN) or 10%.. Longitudinal Control Position—±10% of change from trim or ±0.25 in. (6.3mm). Vertical Velocity—±100 fpm (0.50m/sec) or 10%.	1) Cruise; ..... or 2) 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 test..	X	X	This is a steady heading sideslip test.
2.c.3.	Dynamic Lateral and Directional Stability.	.....	.....	.....			

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

<<< QPS Requirements >>>		Tolerances	Flight conditions	Test details	FTD Level		<< Information >>
Test							Notes
No.	Title				5	6	
2.c.3.a.	Lateral-Directional Oscillations ..	±0.5 sec. or ±10% of period. ±10% of time to ½ or double amplitude or ±0.02 of damping ratio. ±20% or ±1 sec of time difference between peaks of bank and sideslip.	Cruise or Climb. Augmentation On/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 ½ or double amplitude, whichever is less. For non-periodic response, the time history must be matched.	X	X	
2.c.3.b.	Spiral Stability	Correct Trend, ±2 bank or ±10% in 20 sec.	Cruise or Climb. Augmentation On and Off.	Record the results of a release from pedal only or cyclic only turns. Results must be recorded from turns in both directions.	X	X	
2.c.3.c.	Adverse/Proverse Yaw	Correct Trend, ±2 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	

3. CONTROL DYNAMICS

BEGIN INFORMATION

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 cockpit 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.

b. Recordings such as free response to an impulse or step function are classically used to estimate the dynamic properties of electromechanical systems. In any case, 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.

c. For initial and upgrade evaluations, it is required that control dynamic characteristics be measured at and recorded directly from the cockpit 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. Proper pitot-static inputs (if appropriate) must be provided to represent airspeeds typical of those encountered in flight.

d. 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 would then satisfy this test requirement.

e. 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.

f. 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.

g. Tolerances.

(1) Underdamped Response.

(a) 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 nonuniform 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 ±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.

(2) 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 ±10 percent. The simulator response must be critically damped also. Figure 2 of this attachment illustrates the procedure.

(3)(a) The following summarizes the tolerances, T, for an illustration of the referenced measurements. (See Figures 1 and 2, above)

$T(P_0)$ ±10% of P_0

$T(P_1)$ ±20% of P_1

T(A) ±10% of A_1, ±20% of Subsequent Peaks

$T(A_d)$ ±10% of A_d = Residual Band

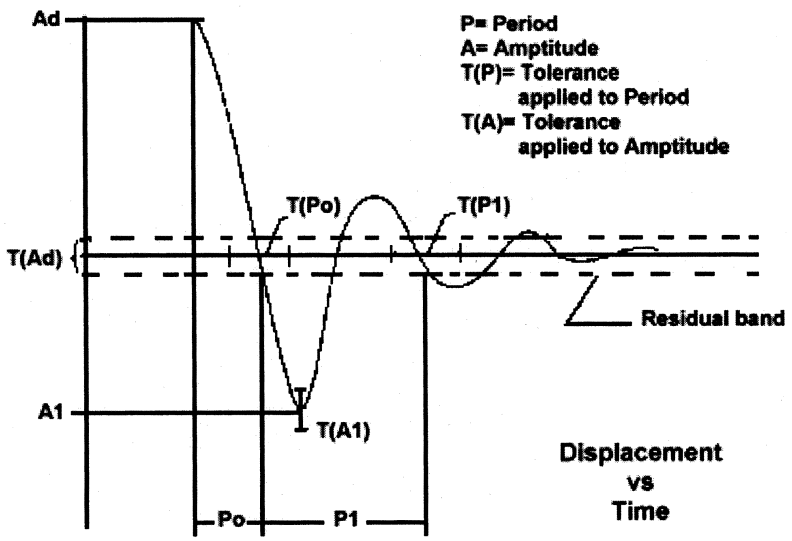
Overshoots ±1

(b) In the event the number of cycles completed outside of the residual band, and thereby significant, exceeds the number depicted in figure 1, the following tolerances (T) will apply:

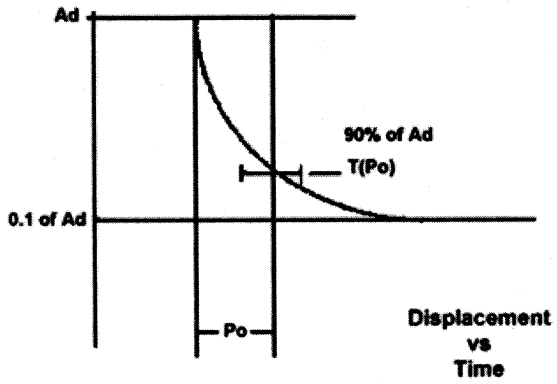
$T(P_n)$ ±10%(n+1)% of P_n, where ''n'' is the next in sequence.

END INFORMATION

Attachment 2 to Appendix D to Part 60—
Figure 1. Under-Damped Step Response



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



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

1. DISCUSSION

BEGIN INFORMATION

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 may be approved by the TPAA. All items in the following paragraphs are subject to an examination of function.

b. The List of Operations Tasks 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 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.

END INFORMATION

TABLE D3A—TABLE OF FUNCTIONS AND SUBJECTIVE TESTS LEVEL 6 FTD

<<< QPS Requirements >>>	
No.	Operations tasks
Tasks in this table are subject to evaluation if appropriate for the helicopter simulated as indicated in the SOQ Configuration List and/or for a Level 6 FTD. Items not installed or not functional on the FTD and, therefore, not appearing on the SOQ Configuration List, are not required to be listed as exceptions on the SOQ.	
1. Preflight Procedures	
1.a	Preflight Inspection (Cockpit 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.
2. Takeoff and Departure Phase	
2.a	instrument
2.b	Takeoff with engine failure after critical decision point (CDP).
3. Climb	
3.a	Normal.
3.b	One engine inoperative.
4. Inflight Maneuvers	
4.	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	Abnormal/emergency procedures.

TABLE D3A—TABLE OF FUNCTIONS AND SUBJECTIVE TESTS LEVEL 6 FTD—Continued

<<< QPS Requirements >>>	
No.	Operations tasks
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.
5. Instrument Procedures	
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.
6. Normal and Abnormal Procedures (any phase of flight)	
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.
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.
7. Postflight Procedures	
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.
8. Instructor Operating Station (IOS), as appropriate	

TABLE D3A—TABLE OF FUNCTIONS AND SUBJECTIVE TESTS LEVEL 6 FTD—Continued

<<< QPS Requirements >>>	
No.	Operations tasks
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 system 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.
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 D3B—TABLE OF FUNCTIONS AND SUBJECTIVE TESTS

Level 5 FTD

<<< QPS Requirements >>>	
Item No.	Operations tasks
Tasks in this table are subject to evaluation if appropriate for the helicopter simulated as indicated in the SOQ Configuration List and/or for a Level 5 FTD. Items not installed or not functional on the FTD and, therefore, not appearing on the SOQ Configuration List, are not required to be listed as exceptions on the SOQ.	
1. Preflight Procedures	
1.a. Preflight Inspection (Cockpit 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.
2. Climb	
2.a. Normal.	
3. Inflight Maneuvers	
3.a. Performance.	
3.b. Turns, Normal.	
4. Instrument Procedures	
4.a. Coupled instrument approach maneuvers (as applicable for the systems installed).	

TABLE D3B—TABLE OF FUNCTIONS AND SUBJECTIVE TESTS—Continued

Level 5 FTD

<<< QPS Requirements >>>	
Item No.	Operations tasks
5. Normal and Abnormal Procedures (any phase of flight)	
5.a. Normal system operation (Installed systems).	
5.b. Abnormal/Emergency system operation (installed systems).	
6. Postflight Procedures	
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.	
7. Instructor Operating Station (IOS), as appropriate	
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.	

TABLE D3B—TABLE OF FUNCTIONS AND SUBJECTIVE TESTS—Continued

Level 5 FTD

<<< QPS Requirements >>>	
Item No.	Operations tasks
7.e.	Observer Stations.
7.e1. ..... 7.e.2.	Position. Adjustments.

TABLE D3C—TABLE OF FUNCTIONS AND SUBJECTIVE TESTS

Level 4 FTD

<<< QPS Requirements >>>	
Item number	Operations tasks
Tasks in this table are subject to evaluation if appropriate for the helicopter simulated as indicated in the SOQ Configuration List and/or for a Level 4 FTD. Items not installed or not functional on the FTD and, therefore, not appearing on the SOQ Configuration List, are not required to be listed as exceptions on the SOQ.	
1. Preflight Procedures.	
1.a. Preflight Inspection (Cockpit Only) switches, indicators, systems, and equipment.	
1.b. APU/Engine start and run-up.	
1.b.1. ..... 1.b.2. ..... 1.b.3.	Normal start procedures. Alternate start procedures. Abnormal starts and shutdowns.
2. Normal and Abnormal Procedures (any phase of flight).	
2.a. Normal system operation (Installed systems).	
2.b. Abnormal/Emergency system operation (installed systems).	
3. Postflight Procedures.	

TABLE D3C—TABLE OF FUNCTIONS AND SUBJECTIVE TESTS—Continued

Level 4 FTD

<<< QPS Requirements >>>	
Item number	Operations tasks
3.a. Parking and Securing.	
3.b. Engine and systems operation.	
3.c. Parking brake operation.	
4. Instructor Operating Station (IOS), as appropriate.	
4.a. Power Switch(es).	
4.b. Preset positions (ground; air)	
4.c. Helicopter system malfunctions.	
4.c.1. ..... 4.c.2.	Insertion / deletion. 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 (FSTD Manufacturer), (Aircraft Type/Level) Flight Simulation Training Device (FSTD), (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 FSTD will be sponsored by (Name of Training Center/Air Carrier), FAA Designator (4 Letter Code). The FSTD will be sponsored under the following options: (Select One)

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

☐ The FSTD will be used for dry lease only in accordance with Paragraph 3b, FSTD Guidance Bulletin 03-08.

We agree to provide the formal request for the evaluation (*Ref: Appendix 4, AC 120-40B*) 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: FSTD 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: ____			
Section 1. FSTD Information and Characteristics			
Sponsor Name:	____	**FSTD Location:**	
Address:	____ ____	**Physical Address:**	____ ____
City:	____	**City:**	____
State:	____	**State:**	____
Country:	____	**Country:**	____
ZIP:	____	**ZIP:**	____
Manager	____		
Sponsor ID No: *(Four Letter FAA Designator)*	____	**Nearest Airport:** *(Airport Designator)*	____

Type of Evaluation Requested:			☐ **Initial** ☐ **Upgrade** ☐ **Recurrent** ☐ **Special** ☐ **Reinstatement**		
Qualification Basis: ____	☐ **A**	☐ **B**	☐ **Interim C**	☐ **C**	☐ **D**
	☐ **6**	☐ **7**	☐ **Provisional Status**		
Initial Qualification: (If Applicable)	**Date:** ____ **Level** ____		**Manufacturer's Identification/Serial No:**	____	
Upgrade Qualification: (If Applicable)	**Date:** ____ **Level** ____ MM/DD/YYYY		☐ **eQTG**		

Other Technical Information:			
FAA FSTD ID No: (If Applicable)	____	**FSTD Manufacturer:**	____
Convertible FSTD:	☐**Yes:**	**Date of Manufacture:**	____ MM/DD/YYYY
Related FAA ID No. (If Applicable)	____ ____ ____	**Sponsor FSTD ID No:** ____	
Aircraft model/series: ____		**Source of aerodynamic model:** ____	
Engine model(s) and data revision: ____		**Source of aerodynamic coefficient data:** ____	
FMS identification and revision level: ____		**Aerodynamic data revision number:** ____	
Visual system manufacturer/model: ____		**Visual system display:** ____	
Flight control data revision: ____		**FSTD computer(s) identification:** ____	
Motion system manufacturer/type: ____			

National Aviation Authority (NAA): (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 D4B – Sample Letter , Request for Initial, Upgrade, or Reinstatement Evaluation
Attachment: FSTD Information Form
INFORMATION

Visual System Manufacturer and Type:	____	**Motion System Manufacturer and Type:**	____
Aircraft Make/Model/Series:	____	**FSTD Seats Available:**	____

Aircraft Equipment	**ENGINE TYPE(S):** ____	**Flight Instrumentation:** ☐ **EFIS** ☐ **HUD** ☐ **HGS** ☐ **EFVS** ☐ **TCAS** ☐ **GPWS** ☐ **Plain View** ☐ **GPS** ☐ **FMS Type:** ____ ☐ **WX Radar** ☐ **Other:** ____	Engine Instrumentation: ☐ **EICAS** ☐ **FADEC** ☐ **Other:** ____

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

Section 2. Supplementary Information

FAA Training Program Approval Authority:		☐ **POI** ☐ **TCPM** ☐ **Other:** ____	
Name:	____	**Office:**	____
Tel:	____	**Fax:**	____
Email:	____		

FSTD Scheduling Person:			
Name:	____		
Address 1:	____	**Address 2**	____
City:	____	**State:**	____
ZIP:	____	**Email:**	____
Tel:	____	**Fax:**	____

FSTD Technical Contact:			
Name:	____		
Address 1:	____	**Address 2**	____
City:	____	**State:**	____
ZIP:	____	**Email:**	____
Tel:	____	**Fax:**	____

ATTACHMENT 4 TO APPENDIX D TO PART 60—
Figure D4B – Sample Letter , Request for Initial, Upgrade, or Reinstatement Evaluation
Attachment: FSTD Information Form
INFORMATION

Section 3. Training, Testing and Checking Considerations		
Area/Function/Maneuver	**Requested**	**Remarks**
Private Pilot - Training / Checks: (142)	☐	____
Commercial Pilot - Training /Checks:(142)	☐	____
Multi-Engine Rating - Training / Checks (142)	☐	____
Instrument Rating -Training / Checks (142)	☐	____
Type Rating - Training / Checks (135/121/142)	☐	____
Proficiency Checks (135/121/142)	☐	____
CAT I: (RVR 2400/1800 ft. DH200 ft)	☐	____
CAT II: (RVR 1200 ft. DH 100 ft)	☐	____
CAT III * (lowest minimum) ____ RVR ____ ft. * *State CAT III (≤ 700 ft.), CAT IIIb (≤ 150 ft.), or CAT IIIc (0 ft.)*	☐	____
Circling Approach	☐	____
Windshear Training: (FSTD GB 03-05)	☐	____
Windshear Training IAW 121.409d (121 Turbojets Only) (FSTD GB 03-05)	☐	____
Generic Unusual Attitudes and Recoveries within the Normal Flight Envelope (FSTD GB 04-03)	☐	____
Specific Unusual Attitudes Recoveries (HBAT 95-10) (FSTD GB 04-03)	☐	____
Auto-coupled Approach/Auto Go Around	☐	____
Auto-land / Roll Out Guidance	☐	____
TCAS/ACAS I / II	☐	____
WX-Radar	☐	____
HUD (FSTD GB 03-02)	☐	____
HGS (FSTD GB 03-02)	☐	
EFVS (FSTD GB 03-03)	☐	
Future Air Navigation Systems (HBAT 98-16A)	☐	____
GPWS / EGPWS	☐	____
ETOPS Capability	☐	____
GPS	☐	____
SMGCS	☐	____
Helicopter Slope Landings	☐	____
Helicopter External Load Operations	☐	____
Helicopter Pinnacle Approach to Landings	☐	____
Helicopter Night Vision Maneuvers	☐	____
Helicopter Category A Takeoffs	☐	____

Attachment 4 to Appendix D to Part 60—
Figure D4C – Sample Qualification Test Guide Cover Page

INFORMATION

SPONSOR NAME

SPONSOR ADDRESS

FAA QUALIFICATION TEST GUIDE

(SPECIFIC HELICOPTER MODEL)

(*for example*)

(Vertiflite AB-320)

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

(FTD Level)

(Qualification Performance Standard Used)

(FTD Location)

FAA Initial Evaluation

Date: _____

_____ Date: _____
(Sponsor)

_____ Date: _____
Manager, National Simulator Program, FAA

Attachment 4 to Appendix D to Part 60—
Figure D4D – Sample Statement of Qualification - Certificate

INFORMATION

Federal Aviation Administration
National Simulator Program

Statement of Qualification

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

Go-Fast Training Center
Vertiflite AB-320 Flight Training Device
FAA Identification Number 889

And found it to meet the standards set forth in
Part 60, Appendix D
Qualification Performance Standards

The Master Qualification Test Guide and the attached
Configuration List and List of Qualified Tasks
Provide the Qualification Basis for this device to operate at
Level 6
Until December 31, 2008

Unless sooner rescinded or extended by the National Simulator Program Manager

November 15, 2007 — (date)

I. B. Checkin, Jr. — (for the NSPM)

Attachment 4 to Appendix D to Part 60—
Figure D4E – Sample Statement of Qualification – Configuration List
INFORMATION

Date: ____			
Section 1. FSTD Information and Characteristics			
Sponsor Name:	____	**FSTD Location:**	
Address:	____ ____	**Physical Address:**	____ ____
City:	____	**City:**	____
State:	____	**State:**	____
Country:	____	**Country:**	____
ZIP:	____	**ZIP:**	____
Manager	____		
Sponsor ID No: *(Four Letter FAA Designator)*	____	**Nearest Airport:** *(Airport Designator)*	____

Type of Evaluation Requested:			☐ **Initial** ☐ **Upgrade** ☐ **Recurrent** ☐ **Special** ☐ **Reinstatement**		
Qualification Basis: ____	☐ **A**	☐ **B**	☐ **Interim C**	☐ **C**	☐ **D**
	☐ **6**	☐ **7**	☐ **Provisional Status**		
Initial Qualification: (If Applicable)	**Date:** ____ **Level** ____		**Manufacturer's Identification/Serial No:**	____	
Upgrade Qualification: (If Applicable)	**Date:** ____ **Level** ____ MM/DD/YYYY		☐ **eQTG**		

Other Technical Information:			
FAA FSTD ID No: (If Applicable)	____	**FSTD Manufacturer:**	____
Convertible FSTD:	☐ **Yes:**	**Date of Manufacture:**	____ MM/DD/YYYY
Related FAA ID No. (If Applicable)	____ ____ ____	**Sponsor FSTD ID No:** ____	
Aircraft model/series: ____		**Source of aerodynamic model:** ____	
Engine model(s) and data revision: ____		**Source of aerodynamic coefficient data:** ____	
FMS identification and revision level: ____		**Aerodynamic data revision number:** ____	
Visual system manufacturer/model: ____		**Visual system display:** ____	
Flight control data revision: ____		**FSTD computer(s) identification:** ____	
Motion system manufacturer/type: ____			

National Aviation Authority (NAA): (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 D4E – Sample Statement of Qualification – Configuration List
INFORMATION

Visual System Manufacturer and Type:	____	**Motion System Manufacturer and Type:**	____
Aircraft Make/Model/Series:	____	**FSTD Seats Available:**	____

Aircraft Equipment	**ENGINE TYPE(S):** ____	**Flight Instrumentation:** ☐ **EFIS** ☐ **HUD** ☐ **HGS** ☐ **EFVS** ☐ **TCAS** ☐ **GPWS** ☐ **Plain View** ☐ **GPS** ☐ **FMS Type:** ____ ☐ **WX Radar** ☐ **Other:** ____	Engine Instrumentation: ☐ **EICAS** ☐ **FADEC** ☐ **Other:** ____

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

Section 2. Supplementary Information

FAA Training Program Approval Authority:		☐ **POI** ☐ **TCPM** ☐ **Other:** ____	
Name:	____	**Office:**	____
Tel:	____	**Fax:**	____
Email:	____		

FSTD Scheduling Person:			
Name:	____		
Address 1:	____	**Address 2**	____
City:	____	**State:**	____
ZIP:	____	**Email:**	____
Tel:	____	**Fax:**	____

FSTD Technical Contact:			
Name:	____		
Address 1:	____	**Address 2**	____
City:	____	**State:**	____
ZIP:	____	**Email:**	____
Tel:	____	**Fax:**	____

Section 3. Training, Testing and Checking Considerations

Area/Function/Maneuver	Requested	Remarks
Private Pilot - Training / Checks: (142)	☐	____
Commercial Pilot - Training /Checks:(142)	☐	____
Multi-Engine Rating - Training / Checks (142)	☐	____
Instrument Rating -Training / Checks (142)	☐	____
Type Rating - Training / Checks (135/121/142)	☐	____
Proficiency Checks (135/121/142)	☐	____
CAT I: (RVR 2400/1800 ft. DH200 ft)	☐	____

Attachment 4 to Appendix D to Part 60—
Figure D4E – Sample Statement of Qualification – Configuration List
INFORMATION

CAT III * (lowest minimum) _____ RVR _____ ft. * *State CAT III (≤ 700 ft.), CAT IIIb (≤ 150 ft.), or CAT IIIc (0 ft.)*	☐	____
Circling Approach	☐	____
Windshear Training: (FSTD GB 03-05)	☐	____
Windshear Training IAW 121.409d (121 Turbojets Only) (FSTD GB 03-05)	☐	____
Generic Unusual Attitudes and Recoveries within the Normal Flight Envelope (FSTD GB 04-03)	☐	____
Specific Unusual Attitudes Recoveries (HBAT 95-10) (FSTD GB 04-03)	☐	____
Auto-coupled Approach/Auto Go Around	☐	____
Auto-land / Roll Out Guidance	☐	____
TCAS/ACAS I / II	☐	____
WX-Radar	☐	____
HUD (FSTD GB 03-02)	☐	____
HGS (FSTD GB 03-02)	☐	
EFVS (FSTD GB 03-03)	☐	
Future Air Navigation Systems (HBAT 98-16A)	☐	____
GPWS / EGPWS	☐	____
ETOPS Capability	☐	____
GPS	☐	____
SMGCS	☐	____
Helicopter Slope Landings	☐	____
Helicopter External Load Operations	☐	____
Helicopter Pinnacle Approach to Landings	☐	____
Helicopter Night Vision Maneuvers	☐	____
Helicopter Category A Takeoffs	☐	____

Attachment 4 to Appendix D to Part 60—
Figure D4F – 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)

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

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

(Repeat as Necessary)

Index of Effective FSD Directives
Filed in this Section

Notification Number	**Received From: (TPAA/NSPM)**	**Date of Notification**	**Date of Modification Completion**

Continue as Necessary....

APPENDIX E TO PART 60—QUALIFICATION PERFORMANCE STANDARDS FOR QUALITY MANAGEMENT SYSTEMS FOR FLIGHT SIMULATION TRAINING DEVICES

BEGIN QPS REQUIREMENTS

a. Not later than October 30, 2008 each current sponsor of an FSTD must submit to the NSPM a proposed Quality Management System (QMS) program as described in this QPS

appendix. The NSPM will review the program in order of receipt and notify the sponsor within 90 days of beginning the review regarding the acceptability of the program including any required adjustments. Within 6 months of the notification of acceptability, the sponsor must implement the program, conduct internal audit(s), make any required program adjustments as a result of any internal audit, and have the NSPM initial audit scheduled.

b. For first-time FSTD sponsors, not later than 120 days prior to the date scheduled for the initial FSTD evaluation, the sponsor must submit to the NSPM the proposed QMS program as described in this QPS appendix. The NSPM will review the program and notify the sponsor within 90 days of beginning the review regarding the acceptability of the program including any required adjustments. Within 6 months of the notification of acceptability, the sponsor must implement the program, conduct internal audit(s), make any required program adjustments as a result of any internal audit, and have the NSPM initial audit scheduled.

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 who has the responsibility and authority to establish and modify the sponsor's policies, practices, and procedures regarding the QMS program for the recurring qualification and the day-to-day use of each FSTD.

d. The minimum content required for an acceptable QMS is found in Table E1. The policies, processes, and/or procedures described in this table must be maintained in a Quality Manual and will serve as the basis for the following:

(1) The sponsor-conducted initial and ongoing periodic assessments;

(2) The NSPM-conducted initial and ongoing periodic assessments; and

(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.

END QPS REQUIREMENTS

BEGIN INFORMATION

e. When a person sponsors an FSTD maintained by a person other than a U.S. certificate holder, the sponsor remains responsible for the QMS program for that FSTD; however—

(1) If that FSTD is maintained under a qualification by a non-FAA regulatory authority and that authority and the NSPM have agreed to accept each other's simulator evaluations (*e.g.*, under a Bilateral Aviation Safety Agreement (BASA) and associated Simulator Implementation Procedures (SIP), such as the JAA of Europe), no additional requirements are necessary for QMS programs.

(2) If that FSTD is maintained under qualification of a regulatory authority where there is no BASA/SIP or that authority and the NSPM have not agreed to accept each other's qualification programs, the NSPM request additional information regarding those aspects of the sponsor's QMS program for maintaining the qualification standards for the FSTD.

END INFORMATION

BEGIN QPS REQUIREMENTS

TABLE E1—MINIMUM REQUIREMENTS FOR SATISFACTORY FSTD QUALITY MANAGEMENT SYSTEM

Number	QPS requirement	Information (Reference)
E1.1.	A QMS manual that sets out the policies, processes, and/or procedures outlined in this table..	§ 60.5(a).
E1.2.	A policy, process, and/or procedure specifying how the sponsor will identify deficiencies in the QMS.	§ 60.5(b).
E1.3.	A policy, process, and/or procedure specifying how the sponsor will document how the QMS program will be changed to address deficiencies when found.	§ 60.5(b).
E1.4.	A policy, process, and/or procedure specifying how the sponsor will address proposed program changes (for programs that do not meet the minimum requirements as notified by the NSPM) to the NSPM and receive approval prior to their implementation.	§ 60.5(c).
E1.5.	A policy, process, and/or procedure specifying how the sponsor will document that at least one FSTD is used within the sponsor's FAA-approved flight training program for the aircraft or set of aircraft at least once within the 12-month period following the initial/upgrade evaluation conducted by the NSP and at least once within each subsequent 12-month period thereafter.	§ 60.7(b)(5).
E1.6.	A policy, process, and/or procedure specifying how the sponsor will document that at least one FSTD is used within the sponsor's FAA-approved flight training program for the aircraft or set of aircraft at least once within the 12-month period following the first continuing qualification evaluation conducted by the NSP and at least once within each subsequent 12-month period thereafter.	§ 60.7(b)(6).

TABLE E1—MINIMUM REQUIREMENTS FOR SATISFACTORY FSTD QUALITY MANAGEMENT SYSTEM—Continued

Number	QPS requirement	Information (Reference)
E1.7.	A policy, process, and/or procedure specifying how the sponsor will obtain an annual written statement from a qualified pilot (after having flown the subject aircraft or set of aircraft during the preceding 12-month period) that the performance and handling qualities of the subject FSTD represents the subject aircraft or set of aircraft (within the normal operating envelope). Required only if the subject FSTD is not used in the sponsor's FAA-approved flight training program for the aircraft or set of aircraft at least once within the preceding 12-month period.	§ 60.5(b)(7) and § 60.7(d)(2).
E1.8.	A policy, process, and/or procedure specifying how independent feedback(from persons recently completing training, evaluation, or obtaining flight experience; instructors and check airmen using the FSTD for training, evaluation or flight experience sessions; and FSTD technicians and maintenance personnel) will be received and addressed by the sponsor regarding the FSTD and its operation.	§ 60.9(b)(1).
E1.9.	A policy, process, and/or procedure specifying how and where the FSTDStatement of Qualification will be posted, or accessed by an appropriate terminal or display, in or adjacent to the FSTD.	§ 60.9(b)(2).
E1.10.	A policy, process, and/or procedure specifying how the sponsor's management representative (MR) is selected and identified by name to the NSPM.	§ 60.9(c) and appendix E, paragraph(d).
E1.11.	A policy, process, and/or procedure specifying the MR authority and responsibility for the following:	
E1.11.a.	Monitoring the on-going qualification of assigned FSTDs to ensure all matters regarding FSTD qualification are being carried out as provided for in 14 CFR part 60.	
E1.11.b.	Ensuring that the QMS is properly established, implemented, and maintained by overseeing the QMS policies, practices, and/or procedures and by and modifying when and where necessary.	§ 60.9(c)(2), (3), and (4).
E1.11.c.	Regularly briefing sponsor's management on the status of the on-going FSTD qualification program and the effectiveness and efficiency of the QMS.	
E1.11.d.	Serving as the primary contact point for all matters between the sponsor and the NSPM regarding the qualification of assigned FSTDs.	
E1.11.e.	Delegating the MR assigned duties to an individual at each of the sponsor's locations, when/if/where appropriate.	
E1.12.	A policy, process, and/or procedure specifying how the sponsor will:.	
E1.12.a.	Ensure that the data made available to the NSPM (the validation data package) includes the aircraft manufacturer's flight test data (or other data approved by the NSPM) and all relevant data developed after the type certificate was issued (e.g., data developed in response to an airworthiness directive) if such data results from a change in performance, handling qualities, functions, or other characteristics of the aircraft that must be considered for flight crewmember training, evaluation, or for meeting experience requirements of this chapter;	§ 60.13; QPS appendices A, B, C, and D.
E1.12.b.	Notify the NSPM within 10 working days of becoming aware that an addition to or a revision of the flight related data or airplane systems related data is available if this data is used to program and/or operate a qualified FSTD; and	
E1.12.c.	Maintain a liaison with the manufacturer of the aircraft being simulated (or with the holder of the aircraft type certificate for the aircraft being simulated if the manufacturer is no longer in business), and if appropriate, with the person having supplied the aircraft data package for the FFS for the purposes of receiving notification of data package changes.	
E1.13.	A policy, process, and/or procedure specifying how the sponsor will make available all special equipment and qualified personnel needed to accomplish or assist in the accomplishment of tests during initial, continuing qualification, or special evaluations.	§ 60.14.
E1.14.	A policy, process, and/or procedure specifying how the sponsor will submit to the NSPM a request to evaluate the FSTD for initial qualification at a specific level and simultaneously request the TPAA forward a concurring letter to the NSPM; including how the MR will use qualified personnel to confirm the following:	
E1.14.a.	That the performance and handling qualities of the FSTD represents those of the aircraft or set of aircraft within the normal operating envelope;	§ 60.15(a)–(d); § 60.15(b); § 60.15(b)(i); § 60.15(b)(ii); § 60.15(b)(iii).
E1.14.b.	The FSTD systems and sub-systems(including the simulated aircraft systems) functionally represent those in the aircraft or set of aircraft; and	
E1.14.c.	The cockpit represents the configuration of the specific type or aircraft make, model, and series aircraft being simulated, as appropriate.	
E1.15.	A policy, process, and/or procedure specifying how, for an initial evaluation, all of the subjective tests and all of the objective tests are accomplished at the sponsor's training facility, except as provided for in the applicable QPS.	§ 60.15(e).

TABLE E1—MINIMUM REQUIREMENTS FOR SATISFACTORY FSTD QUALITY MANAGEMENT SYSTEM—Continued

Number	QPS requirement	Information (Reference)
E1.16.	A policy, process, and/or procedure specifying how, after the NSPM completes the evaluation for initial qualification, the sponsor will update the QTG with the results of the FAA-witnessed tests and demonstrations together with the results of all the objective tests and demonstrations described in the applicable QPS.	§ 60.15(h).
E1.17.	A policy, process, and/or procedure specifying how the sponsor will make the MQTG available to the NSPM upon request.	§ 60.15(i).
E1.18.	A policy, process, and/or procedure specifying how the sponsor will and apply to the NSPM for additional qualification(s) to the Statement of Qualification.	§ 60.16(a); § 60.16(a)(1)(i); § 60.16(a)(1)(ii).
E1.19.	A policy, process, and/or procedure specifying how the sponsor accomplishes all applicable QPS Attachment 2 objective tests each year in a minimum of four evenly spaced inspections as specified in the applicable QPS.	§ 60.19(a)(1) QPS appendices A, B, C, or D.
E1.20.	A policy, process, and/or procedure specifying how the sponsor completes and records a functional preflight check of the FSTD within the preceding 24 hours of FSTD use, including a description of the functional preflight.	§ 60.19(a)(2) QPS appendices A, B, C, or D.
E1.21.	A policy, process, and/or procedure specifying how the sponsor schedules with the NSPM continuing qualification evaluations not later than 60 days before the evaluation is due.	§ 60.19(b)(2).
E1.22.	A policy, process, and/or procedure specifying how the sponsor ensures that the FSTD has received a continuing qualification evaluation at the interval as described in the respective MQTG, allowing for the 1-month grace period before or after the calendar month required.	§ 60.19(b)(5)–(6).
E1.23.	A policy, process, and/or procedure describing that when a discrepancy is discovered the following is recorded in the FSTD discrepancy log:	
E1.23.a.	A description of each discrepancy is entered and remains in the log until the discrepancy is corrected; and	§ 60.19(c); § 60.19(c)(2)(i); § 60.19(c)(2)(ii).
E1.23.b.	A description of the corrective action taken for each discrepancy, the identity of the individual taking the action, and the date that action is taken.	§ 60.19(c)(2)(iii).
E1.24.	A policy, process, and/or procedure specifying how the discrepancy log is kept in a form and manner acceptable to the Administrator and is kept in or adjacent to the FSTD. (An electronic log that may be accessed by an appropriate terminal or display in or adjacent to the FSTD is satisfactory.)	
E1.25.	A policy, process, and/or procedure that requires each instructor, check airman, or representative of the Administrator conducting training, evaluation, or flight experience, and each person conducting the preflight inspection, who discovers a discrepancy, including any missing, malfunctioning, or inoperative components in the FSTD, to write or cause to be written a description of that discrepancy into the discrepancy log at the end of the FSTD preflight or FSTD use session.	§ 60.20.
E1.26.	A policy, process, and/or procedure specifying how the sponsor will (if operating an FSTD based on an interim qualification), within twelve months of the release of the final aircraft data package by the aircraft manufacturer (but no later than two years after the issuance of the interim qualification status the sponsor) apply for initial qualification based on the final aircraft data package approved by the aircraft manufacturer.	§ 60.21(c).
E1.27.	A policy, process, and/or procedure specifying how the sponsor determines whether an FSTD change qualifies as a modification as described in 14 CFR part 60.	§ 60.23(a)(1)–(2).
E1.28.	A policy, process, and/or procedure specifying how the sponsor will ensure the FSTD is modified in accordance with any FSTD Directive regardless of the original qualification basis.	§ 60.23(b).
E1.29.	A policy, process, and/or procedure specifying how, if an FSTD change is determined to be a modification as defined in 14 CFR part 60, the sponsor will notify the NSPM and TPAA of their intent to use the modified FSTD and to ensure that the modified FSTD will not be used prior to:	
E1.29.a.	Twenty-one days since the sponsor notified the NSPM and the TPAA of the proposed modification and the sponsor has not received any response from either the NSPM or the TPAA; or	§ 60.23(c)(1)(i),(ii), and (iv).
E1.29.b.	Twenty-one days since the sponsor notified the NSPM and the TPAA of the proposed modification and one has approved the proposed modification and the other has not responded; or	
E1.29.c.	The FSTD successfully completing any evaluation the NSPM may require in accordance with the standards for an evaluation for initial qualification or any part thereof before the modified FSTD is placed in service.	
E1.30	A policy, process, and/or procedure specifying how, after an FSTD modification is approved by the NSPM, the sponsor will:	
E1.30.a.	Post an addendum to the Statement of Qualification until such time as a permanent, updated statement is received from the NSPM and posted;	§ 60.23(d)–(e).

TABLE E1—MINIMUM REQUIREMENTS FOR SATISFACTORY FSTD QUALITY MANAGEMENT SYSTEM—Continued

Number	QPS requirement	Information (Reference)
E1.30.b.	Update the MQTG with current objective test results and appropriate objective data for each affected objective test or other MQTG section that is affected by the modification; and	
E1.30.c.	File in the MQTG the direction to make the modification and the record of the modification completion.	
E1.31.	A policy, process, and/or procedure specifying how the sponsor will track the length of time a component has been missing, malfunctioning, or inoperative (MMI), including:	
E1.31.a.	How the sponsor will post a list of MMI components in or adjacent to the FSTD; and	§ 60.25(b)–(c), and QPS appendices A, B, C, or D.
E1.31.b.	How the sponsor will notify the NSPM if the MMI has not been repaired or replaced within 30 days.*	
E1.32.	A policy, process, and/or procedure specifying how the sponsor will notify the NSPM and how the sponsor will seek requalification of the FSTD if the FSTD is moved and reinstalled in a different location.	§ 60.27(a)(3).
E1.33.	A policy, process, and/or procedure specifying how the sponsor will maintain control of the following: (The sponsor must specify how these records are maintained in plain language form or in coded form; but if the coded form is used, the sponsor must specify how the preservation and retrieval of information will be conducted.)	
E1.33.a.	The MQTG and each amendment thereto;	§ 60.31.
E1.33.b.	A record of all FSTD modifications required by this part since the issuance of the original Statement of Qualification;	
E1.33.c.	Results of the qualification evaluations (initial and each upgrade) since the issuance of the original Statement of Qualification;	
E1.33.d.	Results of the objective tests conducted in accordance with this part for a period of 2 years;	
E1.33.e.	Results of the previous three continuing qualification evaluations, or the continuing qualification evaluations from the previous 2 years, whichever covers a longer period;	
E1.33.f.	Comments obtained in accordance with Section 60.9(b);	
E1.33.g.	A record of all discrepancies entered in the discrepancy log over the previous 2 years, including the following:	
E1.33.g.1.	A list of the components or equipment that were or are missing, malfunctioning, or inoperative;	
E1.33.g.2.	The action taken to correct the discrepancy;	
E1.33.g.3.	The date the corrective action was taken; and	
E1.33.g.4.	The identity of the person determining that the discrepancy has been corrected.	

*Note 1. If the sponsor has an approved discrepancy prioritization system, this item is satisfied by describing how discrepancies are prioritized, what actions are taken, and how the sponsor will notify the NSPM if the MMI has not been repaired or replaced within the specified timeframe.

END QPS REQUIREMENTS

BEGIN INFORMATION

f. Table E2 contains a sample Assessment Tool that the NSPM will use when conducting the desk assessment of a sponsor's request for initial evaluation of the required elements of a QMS program.

g. Table E3 contains a sample Assessment Tool that the NSPM will use when conducting the on-site practical evaluation of a sponsor's request for initial and continuing evaluation of the required elements of a QMS program.

h. Table E4 contains a sample Assessment Tool that the NSPM will use when conducting the desk assessment of a sponsor's request for initial evaluation of the voluntary elements of a QMS program.

i. Table E5 contains a sample Assessment Tool that will be used by the NSPM when conducting the on-site practical evaluation of a sponsor's request for initial and continuing evaluation of the voluntary elements of a QMS program.

j. Additional Information.

(1) In addition to specifically designated QMS evaluations, the NSPM will evaluate the sponsor's QMS program as part of regularly scheduled FSTD continuing qualification evaluations and no-notice FSTD evaluations, focusing in part on the effectiveness and viability of the QMS program and its contribution to the overall capability of the FSTD to meet the requirements of this part.

(2) The sponsor, through the MR, may delegate duties associated with maintaining the qualification of the FSTD (*e.g.*, corrective and preventive maintenance, scheduling for

and the conducting of tests and/or inspections, functional preflight checks) but retains the responsibility and authority for the day-to-day qualification of the FSTD. One person may serve in this capacity for more than one FSTD, but one FSTD would not have more than one person serving in this capacity.

(3) The QMS requirements should not be interpreted to preclude a given QMS program from being applicable to more than one certificate holder (*e.g.*, part 119 and part 142 or two part 119 certificate holders) and should not be interpreted to preclude an individual from being a Management Representative (MR) for more than one certificate holder (*e.g.*, part 119 and part 142 or two part 119 certificate holders) as long as the other QMS program requirements and the other MR requirements are respectively met for each such certificate holder.

(4) Standard Measurements for Flight Simulator Quality: A quality system tied to measurement of FSTD performance will improve and maintain training quality. One acceptable means of measuring FSTD performance is ARINC report 433 (as amended), entitled ''Standard Measurements for Flight Simulator Quality. ARINC report 433 is a widely accepted industry standard.

(6) The NSPM will use the results of the assessment(s) of the voluntary portions of the QMS program (as described in Tables E4 and E5) to determine whether or not a sponsor or a FSTD may have the interval between NSPM-conducted evaluations extended and what the extension might be.

k. While the FAA does not mandate any specific QMS program format, the following subparagraphs outline those factors that would be typically found in an acceptable QMS program.

(1) Establishment of a Quality Policy. This is a formal written Quality Policy Statement that is a commitment by the sponsor outlining what the Quality System will achieve.

(2) The selected MR should be someone who has overall authority and responsibility for monitoring the on-going qualification of assigned FSTDs to ensure that all matters regarding FSTD qualification are being carried out as required by this part and ensuring that the QMS program is properly established, implemented, and maintained. The MR should regularly:

(i) Brief the sponsor's management regarding the status of on-going qualification processes; and

(ii) Serve as the primary contact point for all matters between the sponsor and the NSPM regarding the qualification of the assigned FSTDs.

(iii) Oversee the day-to-day quality control.

(3) The system and processes outlined in the QMS should enable the sponsor to monitor compliance with all applicable regulations and ensure correct maintenance and performance of the FSTD.

(4) A QMS program, together with a statement acknowledging completion of a periodic review by the MR, should include the following:

(i) A maintenance facility that provides suitable FSTD hardware and software tests and maintenance capability.

(ii) A recording system in the form of a technical log in which defects, deferred defects, and development projects are listed, assigned and reviewed within a specified time period.

(iii) Routine maintenance of the FSTD and performance of the QTG tests with adequate staffing to cover FSTD operating periods.

(iv) A planned internal assessment schedule and a periodic review should be used to verify that corrective action was complete and effective. The assessor should have adequate knowledge of FSTDs and should be acceptable to the NSPM.

(5) The MR should receive appropriate Quality System training and brief other personnel on the procedures.

TABLE E2—INFORMATION SIMULATION QUALITY MANAGEMENT SYSTEM (SQMS) ASSESSMENT TOOL—INITIAL (DESK)

Element No.	Basic (Part 60 required) elements	Rating see element assessment table			Comments
	Does the sponsor have . . .	N	P	Y	
E.2.1	A QMS program approved by the NSPM including a Quality Management System Manual that sets out the policies, processes, and/or procedures required by 14 CFR part 60 and part 60, appendix E.				
E.2.2	A policy, process, and/or procedure specifying how the sponsor will identify deficiencies in the QMS.				
E.2.3	A policy, process, and/or procedure specifying how the sponsor will document how the QMS program will be changed to address deficiencies when found.				
E.2.4	A policy, process, and/or procedure specifying how the sponsor will propose program changes to the NSPM and receive approval prior to their implementation.				

TABLE E2—INFORMATION SIMULATION QUALITY MANAGEMENT SYSTEM (SQMS) ASSESSMENT TOOL—INITIAL (DESK)—Continued

Element No.	Basic (Part 60 required) elements	Rating see element assessment table			Comments
	Does the sponsor have . . .	N	P	Y	
E.2.5	A policy, process, and/or procedure specifying how the sponsor will document that at least one FSTD is used within the sponsor's FAA-approved flight training program for the aircraft or set of aircraft at least once within the 12-month period following the initial/upgrade evaluation conducted by the NSP and at least once within each subsequent 12-month period thereafter.				
E.2.6	A policy, process, and/or procedure specifying how the sponsor will document that at least one FSTD is used within the sponsor's FAA-approved flight training program for the aircraft or set of aircraft at least once within the 12-month period following the first continuing qualification evaluation conducted by the NSP and at least once within each subsequent 12-month period thereafter.				
E.2.7	A policy, process, and/or procedure specifying how the sponsor will obtain an annual written statement from a qualified pilot (after having flown the subject aircraft or set of aircraft during the preceding 12-month period) that the performance and handling qualities of the subject FSTD represents the subject aircraft or set of aircraft (within the normal operating envelope). Required only if the subject FSTD is not used in the sponsor's FAA-approved flight training program for the aircraft or set of aircraft at least once within the preceding 12-month period.				
E.2.8	A policy, process, and/or procedure specifying how independent feedback (from persons recently completing training, evaluation, or obtaining flight experience; instructors and check airmen using the FSTD for training, evaluation or flight experience sessions; and FSTD technicians and maintenance personnel) will be received and addressed by the sponsor regarding the FSTD and its operation.				
E.2.9	A policy, process, and/or procedure specifying how and where the FSTD Statement of Qualification will be posted, or accessed by an appropriate terminal or display, in or adjacent to the FSTD.				
E.2.10	A policy, process, and/or procedure specifying how the sponsor's management representative (MR) is selected and identified by name to the NSPM.				
E.2.11	A policy, process, and/or procedure specifying the MR's authority and responsibility for the following:				
E.2.11.a	Monitoring the on-going qualification of assigned FSTDs to ensure all matters regarding FSTD qualification are being carried out as provided for in 14 CFR part 60.				
E.2.11.b	Ensuring that the QMS is properly established, implemented, and maintained by overseeing the QMS policies, practices, and/or procedures and by and modifying when and where necessary.				
E.2.11.c	Regularly briefing sponsor's management on the status of the on-going FSTD qualification program and the effectiveness and efficiency of the QMS. (designate maximum interval).				
E.2.11.d	Serving as the primary contact point for all matters between the sponsor and the NSPM regarding the qualification of assigned FSTDs.				
E.2.11.e	Delegating the MR assigned duties to an individual at each of the sponsor's locations, when/if/where appropriate.				
E.2.12	A policy, process, and/or procedure specifying how the sponsor will:				

TABLE E2—INFORMATION SIMULATION QUALITY MANAGEMENT SYSTEM (SQMS) ASSESSMENT TOOL—INITIAL (DESK)—Continued

Element No.	Basic (Part 60 required) elements	Rating see element assessment table			Comments
	Does the sponsor have . . .	N	P	Y	
E.2.12.a	Ensure that the data made available to the NSPM (the validation data package) includes the aircraft manufacturer's flight test data (or other data approved by the NSPM) and all relevant data developed after the type certificate was issued (e.g., data developed in response to an airworthiness directive) if such data results from a change in performance, handling qualities, functions, or other characteristics of the aircraft that must be considered for flight crew member training, evaluation, or for meeting experience requirements of this chapter.				
E.2.12.b	Immediately notify the NSPM when an addition to or a revision of the flight related data or airplane systems related data is available if this data is used to program and/or operate a qualified FFS, including technical information about this data to the NSPM relative to the data's significance for training, evaluation, or flight experience activities in the FFS.				
E.2.12.c	Maintain a liaison with the manufacturer of the aircraft being simulated (or with the holder of the aircraft type certificate for the aircraft being simulated if the manufacturer is no longer in business), and/or, if appropriate, with the person having supplied the aircraft data package for the FFS for the purposes of receiving notification of data package changes..				
E.2.13.	A policy, process, and/or procedure specifying how the sponsor will make available all special equipment and qualified personnel needed to accomplish or assist in the accomplishment of tests during initial, continuing qualification, or special evaluations.				
E.2.14	A policy, process, and/or procedure specifying how the sponsor will submit to the NSPM a request to evaluate the FSTD for initial qualification at a specific level and simultaneously request the TPAA forward a concurring letter to the NSPM; including how the MR will use qualified personnel to confirm the following:				
E.2.14.a	That the performance and handling qualities of the FSTD represents those of the aircraft or set of aircraft within the normal operating envelope.				
E.2.14.b	The FSTD systems and sub-systems (including the simulated aircraft systems) functionally represent those in the aircraft or set of aircraft.				
E.2.14.c	The cockpit represents the configuration of the specific type; or aircraft make, model, and series aircraft being simulated, as appropriate.				
E.2.15	A policy, process, and/or procedure specifying how, for an initial evaluation, all of the subjective tests and all of the objective tests are accomplished at the sponsor's training facility, except as provided for in the applicable QPS.				
E.2.16	A policy, process, and/or procedure specifying how, after the NSPM completes the evaluation for initial qualification, the sponsor will update the QTG with the results of the FAA-witnessed tests and demonstrations together with the results of all the objective tests and demonstrations described in the applicable QPS.				
E.2.17	A policy, process, and/or procedure specifying how the sponsor will make the MQTG available to the NSPM upon request.				
E.2.18	A policy, process, and/or procedure specifying how the sponsor will apply to the NSPM to add (an) additional qualification(s) to the Statement of Qualification.				
E.2.19	A policy, process, and/or procedure specifying how the sponsor accomplishes all applicable QPS Attachment 2 objective tests each year in a minimum of four evenly spaced inspections as specified in the applicable QPS.				
E.2.20	A policy, process, and/or procedure specifying how the sponsor completes a functional preflight check of the FSTD within the preceding 24 hours of FSTD use.				

TABLE E2—INFORMATION SIMULATION QUALITY MANAGEMENT SYSTEM (SQMS) ASSESSMENT TOOL—INITIAL (DESK)—Continued

Element No.	Basic (Part 60 required) elements	Rating see element assessment table			Comments
	Does the sponsor have . . .	N	P	Y	
E.2.21	A policy, process, and/or procedure specifying how the sponsor schedules with the NSPM continuing qualification evaluations not later than 60 days before the evaluation is due.				
E.2.22	A policy, process, and/or procedure specifying how the sponsor ensures that the FSTD has received a continuing qualification evaluation at the interval as described in the respective MQTG, allowing for the 1-month grace period before or after the calendar month required.				
E.2.23	A policy, process, and/or procedure describing that when a discrepancy is discovered the following is recorded in the FSTD discrepancy log:				
E.2.23.a	A description of each discrepancy is entered and remains in the log until the discrepancy is corrected.				
E.2.23.b	A description of the corrective action taken for each discrepancy, the identity of the individual taking the action, and the date that action is taken.				
E.2.24	A policy, process, and/or procedure specifying how the discrepancy log is kept in a form and manner acceptable to the Administrator and is kept in or adjacent to the FSTD. (An electronic log that may be accessed by an appropriate terminal or display in or adjacent to the FSTD is satisfactory.)				
E.2.25	A policy, process, and/or procedure that requires each instructor, check airman, or representative of the Administrator conducting training, evaluation, or flight experience for flight crew members, and each person conducting the preflight inspection, who discovers a discrepancy, including any missing, malfunctioning, or inoperative components in the FSTD, to write or cause to be written a description of that discrepancy into the discrepancy log at the end of the FSTD preflight or FSTD use session.				
E.2.26	A policy, process, and/or procedure specifying how the sponsor will (if operating an FSTD based on an interim qualification), within twelve months of the release of the final aircraft data package by the aircraft manufacturer (but no later than two years after the issuance of the interim qualification status the sponsor) apply for initial qualification based on the final aircraft data package approved by the aircraft manufacturer.				
E.2.27	A policy, process, and/or procedure specifying how the sponsor determines whether an FSTD change qualifies as a modification as described in 14 CFR part 60.				
E.2.28	A policy, process, and/or procedure specifying how the sponsor will ensure the FSTD is modified in accordance with any FSTD Directive regardless of the original qualification basis.				
E.2.29	A policy, process, and/or procedure specifying how, if an FSTD change is determined to be a modification as defined in 14 CFR part 60, the sponsor will notify the NSPM and TPAA of their intent to use the modified FSTD and to ensure that the modified FSTD will not be used prior to:				
E.2.29.a	Twenty-one days since the sponsor notified the NSPM and the TPAA of the proposed modification and the sponsor has not received any response from either the NSPM or the TPAA.				
E.2.29.b	Twenty-one days since the sponsor notified the NSPM and the TPAA of the proposed modification and one has approved the proposed modification and the other has not responded.				
E.2.29.c	The FSTD successfully completing any evaluation the NSPM may require in accordance with the standards for an evaluation for initial qualification or any part thereof before the modified FSTD is placed in service.				

TABLE E2—INFORMATION SIMULATION QUALITY MANAGEMENT SYSTEM (SQMS) ASSESSMENT TOOL—INITIAL (DESK)—Continued

Element No.	Basic (Part 60 required) elements	Rating see element assessment table			Comments
	Does the sponsor have . . .	N	P	Y	
E.2.30	A policy, process, and/or procedure specifying how, after a FSTD modification is approved by the NSPM, the sponsor will:				
E.2.30.a	Post an addendum to the Statement of Qualification until such time as a permanent, updated statement is received from the NSPM and posted.				
E.2.30.b	Update the MQTG with current objective test results and appropriate objective data for each affected objective test or other MQTG section that is affected by the modification.				
E.2.30.c	File in the MQTG the direction to make the modification and the record of the modification completion.				
E.2.31	A policy, process, and/or procedure specifying how the sponsor will track the length of time a component has been missing, malfunctioning, or inoperative (MMI), including:				
E.2.31.a	How the sponsor will post a list of MMI components in or adjacent to the FSTD.				
E.2.31.b	How the sponsor will notify the NSPM if the MMI has not been repaired or replaced within 30 days; or if the sponsor has a discrepancy prioritization system, describe how discrepancies are prioritized and how the sponsor will notify the NSPM if the MMI has not been repaired or replaced within the specified timeframe.				
E.2.32	A policy, process, and/or procedure specifying how the sponsor will notify the NSPM and how the sponsor will seek re-qualification of the FSTD if the FSTD is moved and reinstalled in a different location.				
E.2.33	A policy, process, and/or procedure specifying how the sponsor will maintain control of the following documents: [The sponsor must specify how these records are maintained in plain language form or in coded form; but if the coded form is used, the sponsor must specify how the preservation and retrieval of information will be conducted.]				
E.2.33.a	The MQTG and each amendment thereto.				
E.2.33.b	A record of all FSTD modifications required by this part since the issuance of the original Statement of Qualification.				
E.2.33.c	Results of the qualification evaluations (initial and each upgrade) since the issuance of the original Statement of Qualification..				
E.2.33.d.	Results of the objective tests conducted in accordance with this part for a period of 2 years.				
E.2.33.e	Results of the previous three continuing qualification evaluations, or the continuing qualification evaluations from the previous 2 years, whichever covers a longer period.				
E.2.33.f	Comments obtained in accordance with this part for a period of at least 90 days.				
E.2.33.g	A record of all discrepancies entered in the discrepancy log over the previous 2 years, including the following:				
E.2.33.g.1	A list of the components or equipment that were or are missing, malfunctioning, or inoperative.				
E.2.33.g.2	The action taken to correct the discrepancy.				
E.2.33.g.3	The date the corrective action was taken.				
E.2.33.g.4	The identity of the person determining that the discrepancy has been corrected.				

TABLE E.3—INFORMATION (SQMS) ASSESSMENT TOOL—ON-SITE

Element number	Basic (Part 60 Required) Elements	Rating See Element Assessment Table			Comments
		N	P	Y	
	There is evidence that the element is: (1) Being utilized/applied as is appropriate/necessary; (2) Being utilized/applied *as stated/specified/defined in the QMS;* (3) Achieving/producing effective results.				
E.3.1.	The Quality Management System Manual sets our current QMS policies, processes and/or procedures.				
E.3.2.	The policy, process, and/or procedure specifying how the sponsor will identify deficiencies in the QMS.				
E.3.3.	The policy, process, and/or procedure specifying how the sponsor will document how the QMS program will be changed to address deficiencies when found.				
E.3.4.	The policy, process, and/or procedure specifying how the sponsor will propose program changes to the NSPM and receive approval prior to their implementation.				
E.3.5.	The policy, process, and/or procedure specifying how the sponsor will document that at least one FSTD is used within the sponsor's FAA-approved flight training program for the aircraft or set of aircraft at least once within the 12-month period following the initial/upgrade evaluation conducted by the NSP and at least once within each subsequent 12-month period thereafter.				
E.3.6.	The policy, process, and/or procedure specifying how the sponsor will document that at least one FSTD is used within the sponsor's FAA-approved flight training program for the aircraft or set of aircraft at least once within the 12-month period following the first continuing qualification evaluation conducted by the NSP and at least once within each subsequent 12-month period thereafter.				
E.3.7.	The policy, process, and/or procedure specifying how the sponsor will obtain an annual written statement from a qualified pilot (after having flown the subject aircraft or set of aircraft during the preceding 12-month period) that the performance and handling qualities of the subject FSTD represents the subject aircraft or set of aircraft (within the normal operating envelope). Required only if the subject FSTD is not used in the sponsor's FAA-approved flight training program for the aircraft or set of aircraft at least once within the preceding 12-month period.				
E.3.8.	A policy, process, and/or procedure specifying how independent feedback (from persons recently completing training, evaluation, or obtaining flight experience; instructors and check airmen using the FSTD for training, evaluation or flight experience sessions; and FSTD technicians and maintenance personnel) will be received and addressed by the sponsor regarding the FSTD and its operation.				
E.3.9.	The policy, process, and/or procedure specifying how and where the FSTD Statement of Qualification will be posted, or accessed by an appropriate terminal or display, in or adjacent to the FSTD.				
E.3.10.	The policy, process, and/or procedure specifying how the sponsor's management representative (MR) is selected and identified by name to the NSPM.				
E.3.11.	The policy, process, and/or procedure specifying the MR's authority and responsibility for the following:				
E.3.11.a.	Monitoring the on-going qualification of assigned FSTDs to ensure all matters regarding FSTD qualification are being carried out as provided for in 14 CFR part 60.				
E.3.11.b.	Ensuring that the QMS is properly established, implemented, and maintained by overseeing the QMS policies, practices, and/or procedures and by and modifying when and where necessary.				
E.3.11.c.	Regularly briefing sponsor's management on the status of the on-going FSTD qualification program and the effectiveness and efficiency of the QMS. (designate maximum interval).				
E.3.11.d.	Serving as the primary contact point for all matters between the sponsor and the NSPM regarding the qualification of assigned FSTDs.				
E.3.11.e.	Delegating the MR assigned duties to an individual at each of the sponsor's locations, when/if/where appropriate.				
E.3.12.	A policy, process, and/or procedure specifying how the sponsor will:				

TABLE E.3—INFORMATION (SQMS) ASSESSMENT TOOL—ON-SITE—Continued

Element number	Basic (Part 60 Required) Elements	Rating See Element Assessment Table			Comments
		N	P	Y	
E.3.12.a.	Ensure that the data made available to the NSPM (the validation data package) includes the aircraft manufacturer's flight test data (or other data approved by the NSPM) and all relevant data developed after the type certificate was issued (e.g., data developed in response to an airworthiness directive) if such data results from a change in performance, handling qualities, functions, or other characteristics of the aircraft that must be considered for flight crew member training, evaluation, or for meeting experience requirements of this chapter.				
E.3.12.b.	Immediately notify the NSPM when an addition to or a revision of the flight related data or airplane systems related data is available if this data is used to program and/or operate a qualified FFS, including technical information about this data to the NSPM relative to the data's significance for training, evaluation, or flight experience activities in the FFS.				
E.3.12.c.	Maintain a liaison with the manufacturer of the aircraft being simulated (or with the holder of the aircraft type certificate for the aircraft being simulated if the manufacturer is no longer in business), and/or, if appropriate, with the person having supplied the aircraft data package for the FFS for the purposes of receiving notification of data package changes.				
E.3.13.	A policy, process, and/or procedure specifying how the sponsor will make available all special equipment and qualified personnel needed to accomplish or assist in the accomplishment of tests during initial, continuing qualification, or special evaluations.				
E.3.14.	A policy, process, and/or procedure specifying how the sponsor will submit to the NSPM a request to evaluate the FSTD for initial qualification at a specific level and simultaneously request the TPAA forward a concurring letter to the NSPM; including how the MR will use qualified personnel to confirm the following:				
E.3.14.a.	That the performance and handling qualities of the FSTD represent those of the aircraft or set of aircraft within the normal operating envelope.				
E.3.14.b.	The FSTD systems and sub-systems (including the simulated aircraft systems) functionally represent those in the aircraft or set of aircraft.				
E.3.14.c.	The cockpit represents the configuration of the specific type; or aircraft make, model, and series aircraft being simulated, as appropriate.				
E.3.15.	A policy, process, and/or procedure specifying how, for an initial evaluation, all of the subjective tests and all of the objective tests are accomplished at the sponsor's training facility, except as provided for in the applicable QPS.				
E.3.16.	A policy, process, and/or procedure specifying how, after the NSPM completes the evaluation for initial qualification, the sponsor will update the QTG with the results of the FAA-witnessed tests and demonstrations together with the results of all the objective tests and demonstrations described in the applicable QPS.				
E.3.17.	A policy, process, and/or procedure specifying how the sponsor will make the MQTG available to the NSPM upon request.				
E.3.18.	A policy, process, and/or procedure specifying how the sponsor will apply to the NSPM to add (an) additional qualification(s) to the Statement of Qualification.				
E.3.19.	A policy, process, and/or procedure specifying how the sponsor accomplishes all applicable QPS Attachment 2 objective tests each year in a minimum of four evenly spaced inspections as specified in the applicable QPS.				
E.3.20.	A policy, process, and/or procedure specifying how the sponsor completes a functional preflight check of the FSTD within the preceding 24 hours of FSTD use.				
E.3.21.	A policy, process, and/or procedure specifying how the sponsor schedules with the NSPM continuing qualification evaluations not later than 60 days before the evaluation is due.				
E.3.22.	A policy, process, and/or procedure specifying how the sponsor ensures that the FSTD has received a continuing qualification evaluation at the interval as described in the respective MQTG, allowing for the 1-month grace period before or after the calendar month required.				
E.3.23.	A policy, process, and/or procedure describing that when a discrepancy is discovered the following is recorded in the FSTD discrepancy log:				
E.3.23.a.	A description of each discrepancy is entered and remains in the log until the discrepancy is corrected.				
E.3.23.b.	A description of the corrective action taken for each discrepancy, the identity of the individual taking the action, and the date that action is taken.				

TABLE E.3—INFORMATION (SQMS) ASSESSMENT TOOL—ON-SITE—Continued

Element number	Basic (Part 60 Required) Elements	Rating See Element Assessment Table			Comments
		N	P	Y	
E.3.24	A policy, process, and/or procedure specifying how the discrepancy log is kept in a form and manner acceptable to the Administrator and is kept in or adjacent to the FSTD. (An electronic log that may be accessed by an appropriate terminal or display in or adjacent to the FSTD is satisfactory.).				
E.3.25.	A policy, process, and/or procedure that requires each instructor, check airman, or representative of the Administrator conducting training, evaluation, or flight experience for flight crew members, and each person conducting the preflight inspection, who discovers a discrepancy, including any missing, malfunctioning, or inoperative components in the FSTD, to write or cause to be written a description of that discrepancy into the discrepancy log at the end of the FSTD preflight or FSTD use session.				
E.3.26.	A policy, process, and/or procedure specifying how the sponsor will (if operating an FSTD based on an interim qualification), within twelve months of the release of the final aircraft data package by the aircraft manufacturer (but no later than two years after the issuance of the interim qualification status the sponsor) apply for initial qualification based on the final aircraft data package approved by the aircraft manufacturer.				
E.3.27.	A policy, process, and/or procedure specifying how the sponsor determines whether an FSTD change qualifies as a modification as described in 14 CFR part 60..				
E.3.28.	A policy, process, and/or procedure specifying how the sponsor will ensure the FSTD is modified in accordance with any FSTD Directive regardless of the original qualification basis.				
E.3.29.	A policy, process, and/or procedure specifying how, if an FSTD change is determined to be a modification as defined in 14 CFR part 60, the sponsor will notify the NSPM and TPAA of their intent to use the modified FSTD and to ensure that the modified FSTD will not be used prior to:				
E.3.29.a.	Twenty-one days since the sponsor notified the NSPM and the TPAA of the proposed modification and the sponsor has not received any response from either the NSPM or the TPAA.				
E.3.29.b.	Twenty-one days since the sponsor notified the NSPM and the TPAA of the proposed modification, and one has approved the proposed modification and the other has not responded.				
E.3.29.c.	The FSTD successfully completing any evaluation the NSPM may require in accordance with the standards for an evaluation for initial qualification or any part thereof before the modified FSTD is placed in service.				
E.3.30.	A policy, process, and/or procedure specifying how, after a FSTD modification is approved by the NSPM, the sponsor will:				
E.3.30.a.	Post an addendum to the Statement of Qualification until such time as a permanent, updated statement is received from the NSPM and posted.				
E.3.30.b.	Update the MQTG with current objective test results and appropriate objective data for each affected objective test or other MQTG section that is affected by the modification.				
E.3.30.c.	File in the MQTG the direction to make the modification and the record of the modification completion.				
E.3.31.	A policy, process, and/or procedure specifying how the sponsor will track the length of time a component has been missing, malfunctioning, or inoperative (MMI), including:				
E.3.31.a.	How the sponsor will post a list of MMI components in or adjacent to the FSTD.				
E.3.31.b.	How the sponsor will notify the NSPM if the MMI has not been repaired or replaced within 30 days; or if the sponsor has a discrepancy prioritization system, describe how discrepancies are prioritized and how the sponsor will notify the NSPM if the MMI has not been repaired or replaced within the specified timeframe.				
E.3.32.	A policy, process, and/or procedure specifying how the sponsor will notify the NSPM and how the sponsor will seek re-qualification of the FSTD if the FSTD is moved and reinstalled in a different location.				
E.3.33.	A policy, process, and/or procedure specifying how the sponsor will maintain control of the following documents: The sponsor must specify how these records are maintained in plain language form or in coded form; but if the coded form is used, the sponsor must specify how the preservation and retrieval of information will be conducted.].				
E.3.33.a.	The MQTG and each amendment thereto.				
E.3.33.b.	A record of all FSTD modifications required by this part since the issuance of the original Statement of Qualification.				

TABLE E.3—INFORMATION (SQMS) ASSESSMENT TOOL—ON-SITE—Continued

Element number	Basic (Part 60 Required) Elements	Rating See Element Assessment Table			Comments
		N	P	Y	
E.3.33.c.	Results of the qualification evaluations (initial and each upgrade) since the issuance of the original Statement of Qualification.				
E.3.33.d.	Results of the objective tests conducted in accordance with this part for a period of 2 years.				
E.3.33.e.	Results of the previous three continuing qualification evaluations, or the continuing qualification evaluations from the previous 2 years, whichever covers a longer period.				
E.3.33.f.	Comments obtained in accordance with this part for a period of at least 90 days.				
E.3.33.g.	A record of all discrepancies entered in the discrepancy log over the previous 2 years, including the following:				
E.3.33.g.1.	A list of the components or equipment that were or are missing, malfunctioning, or inoperative.				
E.3.33.g.2.	The action taken to correct the discrepancy.				
E.3.33.g.3.	The date the corrective action was taken.				
E.3.33.g.4.	The identity of the person determining that the discrepancy has been corrected.				

TABLE E.4—INFORMATION SQMS ASSESSMENT TOOL—INITIAL (DESK)

Element number	EXPANDED (voluntary) elements	Rating see element assessment table			Comments
	Does the sponsor have . . .	N	P	Y	
QUALITY MANAGEMENT SYSTEM MANUAL:					
V.4.1.	Quality Management System Manual documentation includes:				
V.4.1.a.	The scope of the SQMS, including:				
V.4.1.a.1.	Responsibilities Matrix, or the equivalent, designating responsibility, by position, name or title, for approval and control of SQMS functions/elements.				
V.4.1.a.2.	Documented SQMS policies, processes and procedures listed in V.4.10, or reference to them.				
V.4.1.a.3.	A description of the sequence and interaction of the documented SQMS processes.				
V.4.2.	Quality Management System Manual established as a controlled document that includes provision for identification of current revision status and the date of last revision imprinted on each page concerned.				
QUALITY POLICY AND QUALITY OBJECTIVES:					
V.4.3.	A quality policy that:				
V.4.3.a.	Is appropriate to the purpose of the organization.				
V.4.3.b.	Includes the concept of continual SQMS improvement.				
V.4.3.c.	Provides a framework for establishing and reviewing quality objectives.				
V.4.4.	Quality objectives that:				
V.4.4.a.	Have been established for relevant SQMS functions at relevant levels within the organization.				
V.4.4.b.	Include the ultimate objective of providing the continuous presentation of a qualified FSTD, or FSTDs, for credible flight training, evaluation and/or meeting experience requirements.				
V.4.4.c.	Are measurable and consistent with the Quality Policy.				
MANAGEMENT COMMITMENT:					
V.4.5.	A policy, process, and/or procedure that specifies how management will:				
V.4.5.a.	Ensure that the quality policy is communicated and understood at appropriate levels of the organization.				
V.4.5.b.	Ensure that employees are aware of the relevance and importance of their activities and how they contribute to the achievement of the quality objectives.				
V.4.5.c.	Ensure that the resources (human and financial) necessary to achieve the quality objectives are identified, planned and available.				
V.4.5.d.	Document management resource planning output.				
V.4.5.e.	Conduct and record periodic management reviews (stated minimum interval required) to:				
	(1) Evaluate planned resource allocation and				
	(2) Take action to ensure continuing suitability and effectiveness of the:.				

TABLE E.4—INFORMATION SQMS ASSESSMENT TOOL—INITIAL (DESK)—Continued

Element number	EXPANDED (voluntary) elements Does the sponsor have . . .	Rating see element assessment table			Comments
		N	P	Y	
V.4.5.e.1.	Quality policy.				
V.4.5.e.2.	Quality objectives.				
V.4.5.f.	Verify implementation of proper corrective action/managed change on assessment deficiencies.				
V.4.5.g.	Record the results of corrective action/managed change on assessment deficiencies and report the results to the NSPM.				
DOCUMENT/RECORD CONTROL					
V.4.6.	A Master List of internal and external documents that are *actively* utilized in the SQMS to ensure effective operation and control of the processes (identified, as applicable, by publisher/originator, title/description, volume no./form no., revision no./version, effective date).. Note: By implementing a policy, process or procedure that categorizes inactive/unused documents as ''archived,'' these documents: (1) May be left off of the Master List, (2) Must be controlled and (3) Must be added to the Master List if/when they are subsequently activated [re: V.4.7.h.]..				
V.4.7.	A policy, process, and/or procedure that specifies how the sponsor will provide for:				
V.4.7.a.	Approval of documents for adequacy prior to use.				
V.4.7.b.	Periodic review, updating, re-approval of documents (where necessary).				
V.4.7.c.	Identification of current document revision status including the date of last revision on each page concerned.				
V.4.7.d.	Ensuring that current relevant versions of applicable documents are available at point-of-use.				
V.4.7.e.	Suitable identification of obsolete documents if they are retained for any purpose.				
V.4.7.f.	Preventing the unintended use of obsolete documents.				
V.4.7.g.	Ensuring that external-origin documents are identified & their distribution/accessibility controlled.				
V.4.7.h.	Protection and storage/archiving of records/documents.				
V.4.8.	A policy, process, and/or procedure specifying how the sponsor will retain the following for a period of two years (The sponsor must specify whether these records are maintained in plain language form or in coded form. If the coded form is used, the sponsor must specify how the preservation retrieval of information will be conducted.):				
V.4.8.a.	A record of training time lost due to FSTD discrepancies.				
V.4.8.b.	A record of the two most recent NSPM assessments.				
V.4.8.c.	A record of the two most recent Sponsor assessments.				
V.4.8.d.	SQMS Corrective Action records and/or Managed Change documentation (Including change pertaining to assessment findings)				
ASSIGNMENT of PERSONNEL/TRAINING					
V.4.9.	A policy, process or procedure specifying how the sponsor will, for those performing inspection, testing, engineering and normal, preventative and corrective maintenance on FSTDs:				
V.4.9.a.	Identify the necessary skill requirements.				
V.4.9.b.	Assign personnel that satisfy the identified skill requirements based upon experience, skills, education or training				
V.4.9.c.	Maintain appropriate ongoing records of skill, experience, education and/or training qualifications for assigned personnel.				
V.4.9.d.	Evaluate the adequacy/appropriateness of the skill requirements and the effectiveness of sponsor-provided training, referencing, in part, the criteria for workmanship specified in V.4.11.d.				
POLICY, PROCESS and/or PROCEDURE CONTROL					
V.4.10.	Documented policies, processes and/or procedures for *essential QMS functions* that directly affect quality, including the relevant/essential sequence and interaction of these processes (Supported by diagrams/flow charts/maps at sponsor's discretion) to include:				
V.4.10.a.	Scheduling and tracking inspection, testing, engineering and normal and preventative maintenance on FSTDs to verify that the specified qualification requirements for the FSTD are met.				
V.4.10.b.	A policy, process, and/or procedure specifying how the sponsor will determine FSTD training, evaluation, and/or flight experience restrictions, including: (1) Implementation, status notification and coordination with the sponsor's training organization, other users and TPAA and (2) Removal of the restrictions.				

TABLE E.4—INFORMATION SQMS ASSESSMENT TOOL—INITIAL (DESK)—Continued

Element number	EXPANDED (voluntary) elements	Rating see element assessment table			Comments
	Does the sponsor have . . .	N	P	Y	
V.4.11.	A policy, process, and/or procedure specifying how the sponsor will implement controlled conditions to provide:				
V.4.11.a.	A suitable work environment.				
V.4.11.b.	Approval of equipment.				
V.4.11.c.	Availability of suitable equipment and suitable equipment maintenance.				
V.4.11.d.	Compliance with documented procedures and/or reference standards/codes set out in the Quality Management System Manual.				
V.4.11.e.	Criteria for workmanship (e.g., written standards, representative samples or illustrations).				
V.4.12.	A policy, process, and/or procedure specifying how the sponsor will ensure use of current, valid measuring and monitoring devices, including:				
V.4.12.a.	Recording the basis for their periodic, or prior to use, calibration.				
V.4.12.b.	Protecting them from damage and safeguarding them from adjustments that would invalidate their calibration.				
V.4.13.	A policy, process, and/or procedure that specifies how the sponsor will record NSPM assessments.				
INTERNAL ASSESSMENT					
V.4.14.	A policy, process, and/or procedure that specifies how the sponsor will conduct internal assessments to determine that the SQMS: (1) Has been effectively implemented and maintained, (2) Conforms to regulatory standards and (3) Conforms to SQMS requirements in accordance with documented procedures, as follows:				
V.4.14.a.	Responsibilities and requirements for conducting assessments.]				
V.4.14.b.	Assessment frequency (at least annually).				
V.4.14.c.	Assessment scope.				
V.4.14.d.	How assessments are conducted and recorded.				
V.4.14.e.	Personnel other than those who control/perform the activity, process, procedure or practice being assessed conduct the assessment (Authorization to deviate from this standard may be approved by the NSPM for those sponsors that have limited personnel resources).				
V.4.14.f.	When, how and by whom the results of such assessments and the associated corrective action/managed change are reported to Responsible Management and the NSPM.				
CORRECTIVE ACTION/MANAGED CHANGE (For Other Than FSTD Operational Discrepancies)					
V.4.15.	A policy, process, and/or procedure that specifies how a perceived need for change will:				
V.4.15.a.	Be validated (determined), and if valid, be activated as a Change Initiative.				
	If processed as a **Corrective Action:**				
V.4.15.b.	Determine the cause.				
V.4.15.c.	Determine and implement corrective action.				
V.4.15.d.	Record the action taken.				
V.4.15.e.	Evaluate the effectiveness of the action taken.				
V.4.15.f.	Record the results of this evaluation.				
V.4.15.g.	Evaluate the need for further action to prevent recurrence.				
	If processed as a **Managed Change:**				
V.4.15.h.	Analyze and determine action on the Change Initiative.				
V.4.15.i.	Establish the Scope of Change.				
V.4.15.j.	Develop a Change Plan.				
V.4.15.k.	Review the Change Plan.				
V.4.15.l.	Implement the Approved Change Plan.				
V.4.15.m.	Evaluate the implemented change.				
V.4.15.n.	Review the evaluation.				

TABLE E.5—INFORMATION—SQMS ASSESSMENT TOOL—ON-SITE

Element number	EXPANDED (Voluntary) Elements	Rating—See Element Assessment Table			Comments (Designate N/A Elements)
		N	P	Y	
	There is evidence that the element is:				
(4)	(1) Being utilized/applied as is appropriate/necessary;				

TABLE E.5—INFORMATION—SQMS ASSESSMENT TOOL—ON-SITE—Continued

Element number	EXPANDED (Voluntary) Elements	Rating—See Element Assessment Table			Comments (Designate N/A Elements)
		N	P	Y	
	(4) (2) Being utilized/applied *as stated/specified/defined in the QMS;* (4) (3) Achieving/producing effective results.				
QUALITY MANAGEMENT SYSTEM MANUAL:					
V.5.1.	Quality Management System Manual contains*current:*				
V.5.1.a.	Responsibilities Matrix, or the equivalent, designating responsibility by position, name or title for approval and/or control of essential QMS functions/elements.				
V.5.1.b.	Documented SQMS processes and procedures listed in V.5.10, or reference to them.				
V.5.1.c.	Descriptions of the sequence and interaction of the documented SQMS processes.				
V.5.2.	The Quality Management System Manual is being properly controlled and includes identification of current revision status and the date of last revision imprinted on each page concerned.				
QUALITY POLICY AND QUALITY OBJECTIVES:					
V.5.3.	Currently stated quality policy:				
V.5.3.a.	Is appropriate for the organization.				
V.5.3.b.	Includes the concept of continual SQMS improvement.				
V.5.4.	Current written quality objectives:				
V.5.4.a.	Exist for relevant QMS functions at relevant levels within the organization.				
V.5.4.b.	Include the *''ultimate objective''* of providing continuous presentation of a qualified FSTD, or FSTDs, for credible flight training, evaluation and/or meeting experience requirements.				
V.5.4.c.	Are measurable and consistent with the Quality Policy.				
MANAGEMENT COMMITMENT:					
V.5.5.	Management is using their stated SQMS method(s) to:				
V.5.5.a.	Communicate and ensure that the quality policy is understood at appropriate levels of the organization.				
V.5.5.b.	Ensure that employees are aware of the relevance and importance of their activities and how they contribute to the achievement of the quality objectives.				
V.5.5.c.	Allocate resources (human and financial), using documented resource planning output, and implement action necessary to achieve planned operational results/quality objectives.				
V.5.5.d.	Document resource planning output.				
V.5.5.e.	Conduct periodic recorded management reviews (in compliance with stated minimum interval) to evaluate and take action (corrective action/managed change) to ensure continuing suitability and effectiveness of the:				
v.5.5.e.1.	Quality policy.				
v.5.5.e.2.	Quality objectives.				
V.5.5.f.	Verify implementation of proper corrective action/managed change on assessment deficiencies.				
V.5.5.g.	Record the results of corrective action/managed change on assessment deficiencies and report the results to the NSPM.				
DOCUMENT/RECORD CONTROL					
V.5.6.	Internal and external documents:				
V.5.6.a.	That are *actively* utilized in the SQMS to ensure effective operation and control of the processes are:				
v.5.6.a.1.	On the Master List of Documents, including documents originally categorized as ''archived'' that have been activated.				
V.5.6.a.2.	Adequately identified by publisher/originator, title/description, volume no./form no., revision no./version, or effective date..				
V.5.6.b.	That are *inactive/unused* are being controlled according to the approved ''archiving'' policy [re: V.5.7.h.].				
V.5.7.	Stated SQMS method(s) for:				
V.5.7.a.	Approval of documents for adequacy prior to issue.				
V.5.7.b.	Periodically (where necessary) reviewing documents and records and updating/re-approving them.				

TABLE E.5—INFORMATION—SQMS ASSESSMENT TOOL—ON-SITE—Continued

Element number	EXPANDED (Voluntary) Elements	Rating—See Element Assessment Table			Comments (Designate N/A Elements)
		N	P	Y	
V.5.7.c.	Maintaining current revision(s) and entering revision status and the date of last revision on each page concerned.				
V.5.7.d.	Maintaining current relevant versions of applicable documents at point-of-use.				
V.5.7.e.	Suitably identifying and designating obsolete documents if they are retained for any purpose.				
V.5.7.f.	Preventing unintended use of obsolete documents.				
V.5.7.g.	Identifying and controlling distribution/accessibility of documents of external origin.				
V.5.7.h.	Adequately protecting and storing/archiving records/documents.				
V.5.8.	Documents/records have been retained for *two years*, in plain language form or in coded form, as follows:				
V.5.8.a.	Training time lost due to FSTD discrepancies.				
V.5.8.b.	Two most recent NSPM assessments.				
V.5.8.c.	Two most recent Sponsor assessments.				
V.5.8.d.	SQMS Corrective Action records and/or Managed Change documentation (Including change pertaining to assessment findings).				
V.5.8.e.	Documented Management Resource Planning output and review.				
ASSIGNMENT of PERSONNEL/TRAINING					
V.5.9.	Stated SQMS method(s) for:				
V.5.9.a.	Assignment of personnel to perform inspection, testing, engineering and normal, preventative and corrective maintenance on FSTDs based upon experience, skills, education or training that satisfies the identified skill requirements.				
V.5.9.b.	Maintaining appropriate records of experience, skills, education or training to indicate that the qualifications of the assigned personnel satisfy the stated skill requirements.				
V.5.9.c.	Evaluating the: (1) Adequacy/appropriateness of the identified skill requirements and (2) Effectiveness of sponsor-provided training, utilizing, in part, the criteria for workmanship specified in V.5.11.d.				
POLICY, PROCESS and/or PROCEDURE CONTROL					
V.5.10.	Documented policies, processes and/or procedures for essential SQMS functions, including the relevant/essential sequence and interaction of these processes (Supported by diagrams/flow charts/maps at sponsor's discretion) to include:				
V.5.10.a.	Scheduling and tracking inspection, testing, engineering and normal and preventative maintenance on FSTDs to verify that the specified qualification requirements for the FSTD are met.				
V.5.10.b.	Determination of *FSTD training, evaluation, and/or flight experience restrictions,* including their implementation, status notification and coordination with the sponsor's training organization, other users and TPAA and removal of the restrictions.				
V.5.11.	Implementation of controlled conditions that provide:				
V.5.11.a.	A suitable work environment.				
V.5.11.b.	Approval of equipment.				
V.5.11.c.	Availability of suitable equipment and suitable equipment maintenance.				
V.5.11.d.	Compliance with documented procedures and/or reference standards/codes as set out in the Quality Management System Manual.				
V.5.11.e.	Utilization of criteria for workmanship (*e.g.*, written standards, representative samples/illustrations).				
V.5.12.	Implementation of controlled conditions that provide availability of current, valid measuring/monitoring devices that are consistent with measurement requirements, including:				
V.5.12.a.	Recording the basis for the periodic, or prior to use, calibration of measurement devices.				

TABLE E.5—INFORMATION—SQMS ASSESSMENT TOOL—ON-SITE—Continued

Element number	EXPANDED (Voluntary) Elements	Rating—See Element Assessment Table			Comments (Designate N/A Elements)
		N	P	Y	
V.5.12.b.	Protection of measurement devices from damage and safeguarding them from adjustments that would invalidate their calibration.				
V.5.13.	The method used to record NSPM assessments, including all recommendations and corrective action/managed change taken.				
INTERNAL ASSESSMENT					
V.5.14.	Internal assessments have been conducted to determine that: (1) The SQMS has been effectively implemented and maintained, (2) Conforms to regulatory standards and (3) Conforms to SQMS requirements in accordance with documented procedures, including:.				
V.5.14.a.	Assignment of responsibilities and requirements for conducting assessments.				
V.514.b.	Assessment frequency.				
V.5.14.c.	Adequate assessment scope.				
V.5.14.d.	Assessment methodology and recording.				
V.5.14.e.	Personnel, other than those who control/perform the activity, process, procedure or practice being assessed, conducted the assessment (Note any NSPM approved authorization to deviate from this requirement for sponsors that have limited personnel resources).				
V.5.14.f.	Reporting assessment results to Responsible Management and the NSPM.				
CORRECTIVE ACTION/MANAGED CHANGE (For Other Than FSTD Operational Discrepancies)					
V.5.15.	The policy, process, and/or procedure that specifies how a perceived need for change will:				
V.5.15.a.	Be validated (determined), and if valid, be activated as a Change Initiative.				
	If processed as a Corrective Action:				
V.5.15.b.	Determine the cause.				
V.5.15.c.	Determine and implement corrective action.				
V.5.15.d.	Record the action taken.				
V.5.15.e.	Evaluate the effectiveness of the action taken.				
V.5.15.f.	Record the results of this evaluation.				
V.5.15.g.	Evaluate the need for further action to prevent recurrence.				
—.					
	If processed as a Managed Change:.				
V.5.15.h.	Analyze and determine action on the Change Initiative.				
V.5.15.i.	Establish the Scope of Change.				
V.5.15.j.	Develop a Change Plan.				
V.5.15.k.	Review the Change Plan.				
V.5.15.l.	Implement the Approved Change Plan.				
V.5.15.m.	Evaluate the implemented change.				
V.5.15.n.	Review the evaluation.				

Continuation Sheet

Sponsor _____ **Program** _____ **Date** _____ **Page No.** _____ **I or O** _____

FAA Element Number	Sponsor Item Number	Action*		Comments	Resolved#	
		Status/Category	Date		Status/Category	Date

(Continue as Necessary)

***ACTION**
Rating / Status Codes:
Rating = Yes (Y); Partial (P); None (N)
Status = Advisory (A); Question (Q); Request (R); Observation (O)

#RESOLVED
Rating / Status Codes:
Rating = Yes (Y)
Status = Corrected or Acceptable (OK)

ELEMENT ASSESSMENT TABLE		
Rating/Measurement Standard		
Criteria: Complete, adequate, appropriate, accurate, clearly defined – flow chart, diagram, description		
NONCOMPLIANCE/NONCONFORMITY (N)	PARTIAL COMPLIANCE/CONFORMITY (P)	ACCEBTABLE COMPLIANCE/CONFORMITY (Y)
Corrective Action Required	Corrective Action Required	No Corrective Action Required
There is no evidence of: A. Compliance/Conformity. B. A written description.	There is evidence of: A. A partial compliance/conformity. B. An incomplete written description.	There is evidence of: A. Adequate compliance/conformity. B. An adequate written description
C. Identification, definition, documentation (flow chart, diagram, description)	*C. The process or procedure is:* *(a) Identified/defined inadequately,* *or* *(b) Documented inadequately.*	*C. The process or procedure is:* *(a) Identified/defined adequately,* *or* *(b) Documented adequately*
D. Implementation of a process or procedure.	*D. The process or procedure is:* *(a) Implemented inadequately/inappropriately,* *or* *(b) Not current as defined/documented.*	*D. The process or procedure is:* *(a) Implemented adequately/appropriately,* *or* *(b) Current as defined/documented.*
E. Effectiveness of a process or procedure.	*E. Of inadequate or partial effectiveness of a process or procedure.*	*E. Of adequate effectiveness of a process or procedure.*

End Information

APPENDIX F TO PART 60—DEFINITIONS AND ABBREVIATIONS FOR FLIGHT SIMULATION TRAINING DEVICES

BEGIN INFORMATION

1. The definitions presented below in *Italic type face* are repeated from the regulatory definitions found in part 1 or part 60, as indicated. In the event that a discrepancy exists between a definition found here, and one found in part 1 or part 60, the part 1 or part 60 definition prevails.

END INFORMATION

BEGIN QPS REQUIREMENTS

2. DEFINITIONS.

1st Segment—is that portion of the takeoff profile from liftoff to gear retraction.

2nd Segment—is that portion of the takeoff profile from after gear retraction to initial flap/slat retraction.

3rd Segment—is that portion of the takeoff profile after flap/slat retraction is complete.

Aircraft data package—is a combination of the various types of data used to design, program, manufacture, modify, and test the FSTD.

Airspeed—is calibrated airspeed unless otherwise specified and is expressed in terms of nautical miles per hour (knots).

Altitude—is pressure altitude (meters or feet) unless specified otherwise.

Angle of attack—is the angle between the airplane longitudinal axis and the relative wind vector projected onto the airplane plane of symmetry.

Automatic Testing—is FSTD testing wherein all stimuli are under computer control.

Bank—is the airplane attitude with respect to or around the longitudinal axis, or roll angle (degrees).

Breakout—is the force required at the pilot's primary controls to achieve initial movement of the control position.

Certificate holder—A person issued a certificate under parts 119, 141, or 142 of this chapter or a person holding an approved course of training for flight engineers in accordance with part 63 of this chapter. (Part 60)

Closed Loop Testing—is a test method for which the input stimuli are generated by controllers, which drive the FSTD to follow a pre-defined target response.

Computer Controlled Airplane—is an airplane where all pilot inputs to the control surfaces are transferred and augmented by computers.

Control Sweep—is movement of the appropriate pilot controller from neutral to an extreme limit in one direction (Forward, Aft, Right, or Left), a continuous movement back through neutral to the opposite extreme position, and then a return to the neutral position.

Convertible FSTD—is an FSTD in which hardware and software can be changed so that the FSTD becomes a replica of a different model, usually of the same type aircraft. The same FSTD platform, cockpit shell, motion system, visual system, computers, and necessary peripheral equipment can thus be used in more than one simulation.

Critical Engine Parameter—is the parameter, which is the most accurate measure of propulsive force.

Deadband—is the amount of movement of the input for a system for which there is no reaction in the output or state of the system observed.

Distance—is the length of space between two points and is expressed in terms of nautical miles unless specified otherwise.

Discrepancy—as used in this part, means an aspect of the FSTD that is not correct with respect to the aircraft being simulated. This includes missing, malfunctioning, and/or inoperative components that are required to be present and operate correctly for training, evaluation, and experience functions to be creditable. It also includes errors in the documentation used to support the FSTD (*e.g.*, errors in, or information missing from, the MQTG, required statements from appropriately qualified personnel).

Downgrade—is a permanent change in the qualification level of an FSTD to a lower level.

Driven—is a test method where the input stimulus or variable is positioned by automatic means, generally a computer input.

Electronic Copy of the MQTG—an electronic copy of the MQTG provided by an electronic scan presented in a Portable Document File (PDF), or similar format, acceptable to the NSPM.

Electronic Master Qualification Test Guide—is an electronic version of the MQTG (eMQTG), where all objective data obtained from airplane testing, or another approved source, together with correlating objective test results obtained from the performance of the FSTD and a description of the equipment necessary to perform the evaluation for the initial and the continuing qualification evaluations is stored, archived, or presented in either reformatted or digitized electronic format.

Engine—as used in this part, means the appliance or structure that supplies propulsive force for movement of the aircraft: *i.e.*, the turbine engine for turbine powered aircraft; the turbine engine and propeller assembly for turbo-propeller powered aircraft; and the reciprocating engine and propeller assembly for reciprocating engine powered aircraft. For purposes of this part, engine failure is

the failure of either the engine, or propeller assembly, to provide thrust higher than idle power thrust due to a failure of either the engine or the propeller assembly.

Evaluation—With respect to an individual, the checking, testing, or review associated with flight crewmember qualification, training, and certification under parts 61, 63, 121, or 135 of this chapter. With respect to an FSTD, the qualification activities (*e.g.*, the objective and subjective tests, the inspections, or the continuing qualification evaluations) associated with the requirements of this part. (Part 60)

Fictional Airport—is a visual model of an airport that is a collection of non-''real world'' terrain, instrument approach procedures, navigation aids, maps, and visual modeling detail sufficient to enable completion of an Airline Transport Pilot Certificate or Type Rating.

Flight experience—Flight experience means recency of flight experience for landing credit purposes. (Part 60)

Flight simulation training device (FSTD) means a full flight simulator (FFS) or a flight training device (FTD). (Part 1)

Flight test data—(a subset of Objective data) Aircraft data collected by the aircraft manufacturer (or other supplier of data that are acceptable to the NSPM) during an aircraft flight test program. (Part 60)

Flight training device (FTD) means a replica of aircraft instruments, equipment, panels, and controls in an open flight deck area or an enclosed aircraft cockpit replica. It includes the equipment and computer programs necessary to represent aircraft (or set of aircraft) operations in ground and flight conditions having the full range of capabilities of the systems installed in the device as described in part 60 of this chapter and the qualification performance standard (QPS) for a specific FTD qualification level. (Part 1)

Free Response—is the response of the FSTD after completion of a control input or disturbance.

Frozen—is a test condition where one or more variables are held constant with time.

FSTD Approval—is the extent to which an FSTD may be used by a certificate holder as authorized by the FAA. It takes into account aircraft to FSTD differences and the training ability of the organization.

FSTD Directive—A document issued by the FAA to an FSTD sponsor, requiring a modification to the FSTD due to a recognized safety-of-flight issue and amending the qualification basis for the FSTD. (Part 60)

FSTD Latency—is the additional time beyond that of the response time of the aircraft due to the response of the FSTD.

FSTD Performance—The overall performance of the FSTD includes aircraft performance (*e.g.*, thrust/drag relationships, climb, range) as well as flight and ground handling. (Part 60)

Full flight simulator (FFS) means a replica of a specific type; or make, model, and series aircraft cockpit. It includes the assemblage of equipment and computer programs necessary to represent aircraft operations in ground and flight conditions, a visual system providing an out-of-the-cockpit view, a system that provides cues at least equivalent to those of a three-degree-of-freedom motion system, and has the full range of capabilities of the systems installed in the device as described in part 60 of this chapter and the qualification performance standards (QPS) for a specific FFS qualification level. (Part 1)

Generic Airport—is a Class III visual model that combines correct navigation aids for a real world airport with a visual model which does not correctly depict that same airport.

Grandfathering—as used in this part, means the practice of assigning a qualification basis for an FSTD, based on the period of time during which a published set of standards governed the requirements for the initial and continuing qualification of FSTDs. Each FSTD manufactured during this specified period of time is ''grandfathered,'' or is ''held to the standards'' that are, or were, in effect during that time period. The grandfathered standards remain applicable to each FSTD manufactured during the stated time period, regardless of any subsequent modification to those standards and regardless of the sponsor, as long as the FSTD remains continuously qualified or is maintained in a non-qualified status in accordance with the specific requirements and time periods set out in this part. Each FSTD manufactured prior to the beginning date (or manufactured after the ending date) of a designated grandfather time period would have as its qualification basis, the standards in effect during the time period prior to, or subsequent to, the designated period.

Gross Weight—For objective test purposes:

Basic Operating Weight—(BOW) is the empty weight of the aircraft plus the weight of the following: normal oil quantity; lavatory servicing fluid; potable water; required crewmembers and their baggage; and emergency equipment.

Near Maximum Gross Weight—is a weight chosen by the sponsor or data provider that is not less than the basic operating weight (BOW) of the airplane being simulated plus 80% of the difference between the maximum certificated gross weight (either takeoff weight or landing weight, as appropriate for the test) and the BOW.

Light Gross Weight—is a weight chosen by the sponsor or data provider that is not more than 120% of the BOW of the airplane being simulated or as limited by the minimum practical operating weight of the test airplane.

Medium Gross Weight—is a weight chosen by the sponsor or data provider that is approximately ±10% of the average of the numerical values of the BOW and the maximum certificated gross weight.

Ground Effect—is the change in aerodynamic characteristics due to modification of the airflow past the aircraft caused by the proximity of the Earth's surface to the airplane.

Hands Off—is a test maneuver conducted without pilot control inputs.

Hands On—is a test maneuver conducted with pilot control inputs as required.

Heave—is FSTD movement with respect to or along the vertical axis.

Height—is the height above ground level (or AGL) expressed in meters or feet.

''*In Use*'' *Runway*—as used in this part, means the runway that is ''active,'' (is currently ''selected'' and able to be used for takeoffs and landings) and has the surface lighting and markings required by this part.

Integrated Testing—is testing of the FSTD such that all aircraft system models are active and contribute appropriately to the results where none of the models used are substituted with models or other algorithms intended for testing only.

Irreversible Control System—is a control system in which movement of the control surface will not backdrive the pilot's control in the cockpit.

Locked—is a test condition where one or more variables are held constant with time.

Manual Testing—is FSTD testing conducted without computer inputs except for initial setup and all modules of the simulation are active.

Master Qualification Test Guide (MQTG)—The FAA-approved Qualification Test Guide with the addition of the FAA-witnessed test results, applicable to each individual FSTD. (Part 60)

Medium—is the normal operational weight for a given flight segment.

National Simulator Program Manager (NSPM)—The FAA manager responsible for the overall administration and direction of the National Simulator Program (NSP), or a person approved by that FAA manager. (Part 60)

Nominal—is the normal operating configuration, atmospheric conditions, and flight parameters for the flight segment specified.

Non-Normal Control—is a term used in reference to Computer Controlled Airplanes and is the state where one or more of the intended control, augmentation, or protection functions are not fully working. NOTE: Specific terms such as ALTERNATE, DIRECT, SECONDARY, or BACKUP may be used to define an actual level of degradation.

Normal Control—is a term used in reference to Computer Controlled Airplanes and is the state where the intended control, augmentation, and protection functions are fully working.

Objective data—Quantitative data, acceptable to the NSPM, used to evaluate the FSTD.

Objective test—A quantitative measurement and evaluation of FSTD performance. (Part 60)

Pitch—is the airplane attitude with respect to, or around, the lateral axis expressed in degrees.

Power Lever Angle (PLA)—is the angle of the pilot's primary engine control lever(s) in the cockpit. This may also be referred to as THROTTLE or POWER LEVER.

Predicted data—Estimations or extrapolations of either existing flight test data or data from other simulation models using engineering analyses, engineering simulations, design data, and/or wind tunnel data. (Part 60)

Protection Functions—are systems functions designed to protect an airplane from exceeding its flight maneuver limitations.

Pulse Input—is a step input to a control followed by an immediate return to the initial position.

Qualification level—The categorization of an FSTD established by the NSPM, based on the FSTDs demonstrated technical and operational capabilities as set out in this part. (Part 60)

Qualification Performance Standard (QPS)—The collection of procedures and criteria published by the FAA to be used when conducting objective tests and subjective tests, including general FSTD requirements, for establishing FSTD qualification levels. The QPS are published in the appendices to this part, as follows: Appendix A, for Airplane Simulators; Appendix B, for Airplane Flight Training Devices; Appendix C, for Helicopter Simulators; Appendix D, for Helicopter Flight Training Devices; Appendix E, for Quality Management Systems for Flight Simulation Training Devices; and Appendix F, for Definitions and Abbreviations for Flight Simulation Training Devices. (Part 60)

Qualification Test Guide (QTG)—The primary reference document used for evaluating an aircraft FSTD. It contains test results, statements of compliance and capability, the configuration of the aircraft simulated, and other information for the evaluator to assess the FSTD against the applicable regulatory criteria. (Part 60)

Quality Management System (QMS)—the aviation standard for flight simulation quality-systems that can be used for external quality-assurance purposes. It is a collection of generic and independent requirements unrelated to any specific industry or economic sector. It is not designed to enforce uniformity of quality systems, but to identify the processes needed, determine the sequence and interaction of these processes,

determine criteria and methods required to ensure the effective operation and control of these processes, ensure the availability of information necessary to support the operation and monitoring of these processes, measure, monitor and analyze these processes, and implement the actions necessary to achieve planned results. The design and implementation of a specific quality management system is influenced by the varying needs of the individual sponsor, their particular objectives, the flight simulation products and services supplied, and the processes and specific practices employed.

Real-World Airport—as used in this part in reference to airport visual models, means a computer generated visual depiction of an airport that exists in reality.

Representative—When used as an adjective in this part, means typical, demonstrative, or characteristic of, or with respect to, the feature being described. For example:

1. ''Representative sampling of tests'' means a sub-set of the complete set of all tests such that the sample includes one or more of the tests in each of the major categories, the results of which would provide the evaluator a typical, or overall, understanding of the performance and/or handling characteristics of the FSTD.

2. ''Representative airport model'' (or ''ground/airborne traffic,'' ''lights,'' ''runway/taxiway markings,'' ''terrain,'' ''weather phenomena'') means a computer generated visual depiction of a real-world or fictional airport (or traffic, lights, markings, terrain, weather phenomena.) that is typical or characteristic of an airport (or traffic, lights, markings, terrain, weather phenomena) regularly used or seen by the sponsor, or the sponsor's client using the FSTD, in normal operations.

Reversible Control System—is a control system in which movement of the control surface will backdrive the pilot's control in the cockpit.

Roll—is the airplane attitude with respect to, or around, the longitudinal axis expressed in degrees.

Set of aircraft—Aircraft that share similar handling and operating characteristics and similar operating envelopes and have the same number and type of engines or power plants. (Part 60)

Sideslip Angle—is the angle between the relative wind vector and the airplane plane of symmetry. (note: this definition replaces the current definition of ''sideslip.'')

Simulation Quality Management System (SQMS)—consists of the required and voluntary elements of a quality management system for FSTD continuing qualification.

Snapshot—is a presentation of one or more variables at a given instant of time.

Special Evaluation—is an evaluation of the FSTD for purposes other than initial, upgrade, or continuing qualification. Circumstances that might indicate the need for a special evaluation would include, but not necessarily be limited to, the following: after the FSTD is moved and reinstalled at another location; after an update to FSTD software or hardware that might affect performance or flying qualities; after a substantial update to FSTD avionics packages (e.g., autopilot, flight management systems); after substantial modifications to FSTD configuration; after a complaint is received from a credible source indicating that the FSTD does not perform or handle like the aircraft it simulates.

Sponsor—A certificate holder who seeks or maintains FSTD qualification and is responsible for the prescribed actions as set out in this part and the QPS for the appropriate FSTD and qualification level. (Part 60)

Statement of Compliance and Capability (SOC)—is a declaration that specific requirements have been met. It must declare that compliance with the requirement is achieved and explain how the requirement is met (e.g., gear modeling approach, coefficient of friction sources). It must also describe the capability of the FSTD to meet the requirement (e.g., computer speed, visual system refresh rate). In doing this, the statement must provide references to needed sources of information for showing compliance, rationale to explain how the referenced material is used, mathematical equations and parameter values used, and conclusions reached.

Step Input—is an abrupt control input held at a constant value.

Subjective test—A qualitative assessment of the performance and operation of the FSTD. (Part 60)

Surge—is FSTD movement with respect to or along the longitudinal axis.

Sway—is FSTD movement with respect to or along the lateral axis.

Time History—is a presentation of the change of a variable with respect to time.

Training Program Approval Authority (TPAA)—A person authorized by the Administrator to approve the aircraft flight training program in which the FSTD will be used. (Part 60)

Training Restriction—is a temporary condition where, due to a Missing, Malfunctioning, or Inoperative (MMI) Component condition, the FSTD may continue to be used at the qualification level indicated on its SOQ but restricted from accomplishing the task for which the correct function of the MMI component is required.

Transport Delay or ''Throughput''—is the total FSTD system processing time required for an input signal from a pilot primary flight control until motion system, visual system, or instrument response. It is the overall time delay incurred from signal input until output response. It does not include the characteristic delay of the airplane simulated.

Upgrade—The improvement or enhancement of an FSTD for the purpose of achieving a higher qualification level. (Part 60)

Validation Data—Objective data used to determine if the FSTD performance is within the tolerances prescribed in the QPS.

Validation Test—An objective test whereby FSTD parameters are compared to the relevant validation data to ensure that the FSTD performance is within the tolerances prescribed in the QPS.

Visual Data Base—is a display that may include one or more visual models.

Visual Model—is a collection of one or more visual scenes of an airport or portion(s) of an airport.

Visual System Response Time—is the interval from a control input to the completion of the visual display scan of the first video field containing the resulting different information.

Yaw—is airplane attitude with respect to, or around, the vertical axis expressed in degrees.

3. ABBREVIATIONS.

AFM Approved Flight Manual.
AlL Above Ground Level (meters or feet).
AOA Angle of Attack (degrees).
APD Aircrew Program Designee.
CCA Computer Controlled Airplane.
cd/m² candela/meter², 3.4263 candela/m² = 1 ft-Lambert.
CFR Code of Federal Regulations.
cm(s) centimeter, centimeters.
daN decaNewtons, one (1) decaNewton = 2.27 pounds.
deg(s) degree, degrees.
DOF Degrees-of-freedom.
eMQTG Electronic Master Qualification Test Guide.
EPR Engine Pressure Ratio.
FAA Federal Aviation Administration (U.S.).
fpm feet per minute.
ft foot/feet, 1 foot = 0.304801 meters.
ft-Lambert foot-Lambert, 1 ft-Lambert = 3.4263 candela/m².
g Acceleration due to Gravity (meters or feet/sec²); 1 g = 9.81 m/sec² or 32.2 feet/sec².
G/S Glideslope.
IATA International Airline Transport Association.
ICAO International Civil Aviation Organization.
IGE In ground effect.
ILS Instrument Landing System.
IQTG International Qualification Test Guide.
km Kilometers 1 km = 0.62137 Statute Miles.
kPa KiloPascal (Kilo Newton/Meters2). 1 psi = 6.89476 kPa.
kts Knots calibrated airspeed unless otherwise specified, 1 knot = 0.5148 m/sec or 1.689 ft/sec.
lb(s) pound(s), one (1) pound = 0.44 decaNewton.
LDP Landing decision point.
M,m Meters, 1 Meter = 3.28083 feet.
Min(s) Minute, minutes.
MLG Main Landing Gear.
Mpa MegaPascals (1 psi = 6894.76 pascals).
ms millisecond(s).
N NORMAL CONTROL Used in reference to Computer Controlled Airplanes.
nm Nautical Mile(s) 1 Nautical Mile = 6,080 feet.
NN NON-NORMAL CONTROL Used in reference to Computer Controlled Airplanes.
N1 Low Pressure Rotor revolutions per minute, expressed in percent of maximum.
N2 High Pressure Rotor revolutions per minute, expressed in percent of maximum.
N3 High Pressure Rotor revolutions per minute, expressed in percent of maximum.
NWA Nosewheel Angle (degrees).
OGE Out of ground effect.
PAPI Precision Approach Path Indicator System.
Pf Impact or Feel Pressure, often expressed as ''q.''
PLA Power Lever Angle.
PLF Power for Level Flight.
psi pounds per square inch.
QPS Qualification Performance Standard.
RAE Royal Aerospace Establishment.
R/C Rate of Climb (meters/sec or feet/min).
R/D Rate of Descent (meters/sec or feet/min).
REIL Runway End Identifier Lights.
RVR Runway Visual Range (meters or feet).
s second(s).
sec(s) second, seconds.
sm Statute Mile(s) 1 Statute Mile = 5,280 feet.
SOC Statement of Compliance and Capability.
Tf Total time of the flare maneuver duration.
Ti Total time from initial throttle movement until a 10% response of a critical engine parameter.
TIR Type Inspection Report.
T/O Takeoff.
Tt Total time from Ti to a 90% increase or decrease in the power level specified.
VASI Visual Approach Slope Indicator System.
VGS Visual Ground Segment.
V_1 Decision speed.
V_2 Takeoff safety speed.
Vmc Minimum Control Speed.
Vmca Minimum Control Speed in the air.
Vmcg Minimum Control Speed on the ground.
Vmcl Minimum Control Speed—Landing.
Vmu The speed at which the last main landing gear leaves the ground.
V_R Rotate Speed.
V_s Stall Speed or minimum speed in the stall.

WAT Weight, Altitude, Temperature.

END QPS REQUIREMENTS

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

SPECIAL FEDERAL AVIATION REGULATION NO. 73
SPECIAL FEDERAL AVIATION REGULATION NO. 93
SPECIAL FEDERAL AVIATION REGULATION NO. 100–1

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