Table 8.b --- Should not "normal engine and thrust reversal sounds, and other sounds of flaps, gear and spoiler extention and retraction" be read after "… other significant airplane noises"?

Table 8.c --- Additional details: 1). What is paragraph 4.w? 2). " … and airframe sounds" should read as " … and airframe sounds according to available data"

TABLE OF MINIMUM SIMULATOR REQUIREMENTS—Continued

General simulator requirements	QPS requirements: Simulator level A	B	C	D	Additional details	Information notes
(iii) Taxiway lights.						
g. 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:	X	X	X	X	A demonstration is required for initial and recurrent evaluations.	
(1) Runway definition, strobe lights, approach lights, runway edge white lights and Visual Approach Slope Indicator (VASI) or Precision Approach Path Indicator (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; as required by three (3) arc-minutes resolution on day scenes.. h. The simulator must provide visual system compatibility with aerodynamic programming.	X	X	X	X		
i. 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 feet (30 meters) above the touchdown zone. 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.	X	X	X	X	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 the airplane 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. (iii) glideslope angle. (iv) Airplane pitch angle on approach. (3) Airplane data for manual testing: (i) Gross weight. (ii) Airplane configuration. (iii) Approach airspeed.	
j. The simulator must provide visual cues necessary to assess sink rates (provide depth perception) during landings, to include: (1) Surface on runways, taxiways, and ramps. (2) Terrain features.		X	X	X	A demonstration is required for initial and recurrent evaluations.	

TABLE OF MINIMUM SIMULATOR REQUIREMENTS—Continued

General simulator requirements	QPS requirements: Simulator level A	B	C	D	Additional details	Information notes
k. The simulator must have night and dusk (or twilight) visual scene capability, including general terrain characteristics and significant landmarks, free from apparent quantization.			X	X	A demonstration is required for initial and recurrent evaluations. Dusk (or twilight) scene must enable identification of a visible horizon and general terrain characteristics.	Examples of general terrain characteristics are fields, roads, and bodies of water.
l. The simulator must provide for ..... (1) Accurate portrayal of the environment relating to the simulator attitude	X	X	X	X	A demonstration is required for initial evaluation. However, if there is any question regarding this function, the NSPM may require the demonstration be repeated during any inspection or subsequent recurrent evaluation.	
(2) Quick confirmation of visual system color, RVR, focus, and intensity.			X	X	An SOC is required. A demonstration is required for initial evaluation. However, if there is any question regarding this function, the NSPM may require the demonstration be repeated during any inspection or subsequent recurrent evaluation.	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 indictor.
m. 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.			X	X	A demonstration is required for initial and recurrent evaluations.	
n. The simulator must be capable of producing at least 10 levels of occulting.			X	X	A demonstration is required for initial evaluation. However, if there is any question regarding this function, the NSPM may require this demonstration to be accomplished during any inspection or subsequent recurrent evaluation.	
o. The 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 break out. (4) Patchy fog. (5) The effect of fog on airport lighting.			X	X	A demonstration is required for initial and recurrent evaluations. 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.	

TABLE OF MINIMUM SIMULATOR REQUIREMENTS—Continued

General simulator requirements	QPS requirements: Simulator level A	B	C	D	Additional details	Information notes
p. The surface resolution must be demonstrated by a test pattern of objects shown to occupy a visual angle of three (3) arc-minutes in the visual scene from the pilot's "eye point".			X	X	An SOC is required and must include the relevant calculations. A demonstration is required on initial evaluations. However, if there is any question regarding this function, the NSPM may require this demonstration to be accomplished during any inspection or subsequent recurrent evaluation.	
q. The lightpoint size must not be greater than six (6) arc-minutes.			X	X	An SOC is required and must include the relevant calculations. A demonstration is required on initial evaluations. However, if there is any question regarding this function, the NSPM may require this demonstration to be accomplished during any inspection or subsequent recurrent evaluation.	
r. The lightpoint contrast ratio must not be less than 25:1.			X	X	An SOC is required and must include the relevant calculations. A 1-degree spot photometer is used to measure a square of at least 1 degree, filled with lightpoints (where lightpoint modulation is just discernible) and compare the results to the measured adjacent background. A demonstration is required on initial evaluations. However, if there is any question regarding this function, the NSPM may require this demonstration to be accomplished during any inspection or subsequent recurrent evaluation.	
s. The simulator must have (1) daylight, (2) night, and (3) either 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. The simulator cockpit ambient lighting must be dynamically consistent with the visual scene displayed.				X	A demonstration is required for initial and recurrent evaluations. The daylight visual scene must be part of a total daylight cockpit environment which at least represents the amount of light in the cockpit on an overcast day. For daylight scenes, such ambient lighting must not "washout" the displayed visual scene nor fall below 5 foot-lamberts (17 cd/m²) of light as reflected from an instrument approach plate at knee height at both pilots' station. These requirement are applicable to any level of simulator equipped with a "daylight" visual system.	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/m²) 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.

TABLE OF MINIMUM SIMULATOR REQUIREMENTS—Continued

General simulator requirements	QPS requirements: Simulator level A	B	C	D	Additional details	Information notes
(1) The simulator visual system must provide a minimum contrast ratio of 5:1.					A raster-drawn pattern must be displayed that fills the entire visual scene (3 or more channels) consisting of a matrix of black and white squares no larger than 10° and no smaller than 5° per square, with a white square having a minimum threshold value of 2 foot-lamberts, or 7 cd/m² in the center of each channel. The contrast ratio is the numerical value of the brightness measured for the center (white) square divided by the brightness value for any adjacent (dark) square.	A 1° spot photometer is used to measure the brightness values.
(2) The simulator visual system must provide a highlight brightness of not less than six (6) foot-lamberts (20 cd/m²).					The test must use the full pattern described above, measuring the brightness of a white square, superimposed completely with a highlighted area covering the square. Use of calligraphic capabilities to enhance raster brightness is acceptable; however, individual light points or light point arrays are not acceptable.	A 1° spot photometer is used to measure the brightness values.
t. The simulator must provide operational visual scenes that portray physical relationships known to cause landing illusions to pilots.				X	A demonstration is required for initial and recurrent evaluations.	For example: short runways, landing approaches over water, uphill or downhill runways, rising terrain on the approach path, unique topographic features, *etc.*
u. The simulator must provide special weather representations of light, medium, and heavy precipitation near a thunderstorm on takeoff and during approach and landing.				X	A demonstration is required for initial and recurrent evaluations. 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.	
v. The simulator must present visual scenes of wet and snow-covered runways, including runway lighting reflections for wet conditions, partially obscured lights for snow conditions, or suitable alternative effects.				X	A demonstration is required for initial and recurrent evaluations.	
w. The simulator must present realistic color and directionality of all airport lighting.				X	A demonstration is required for initial and recurrent evaluations.	
8. Sound System						
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		

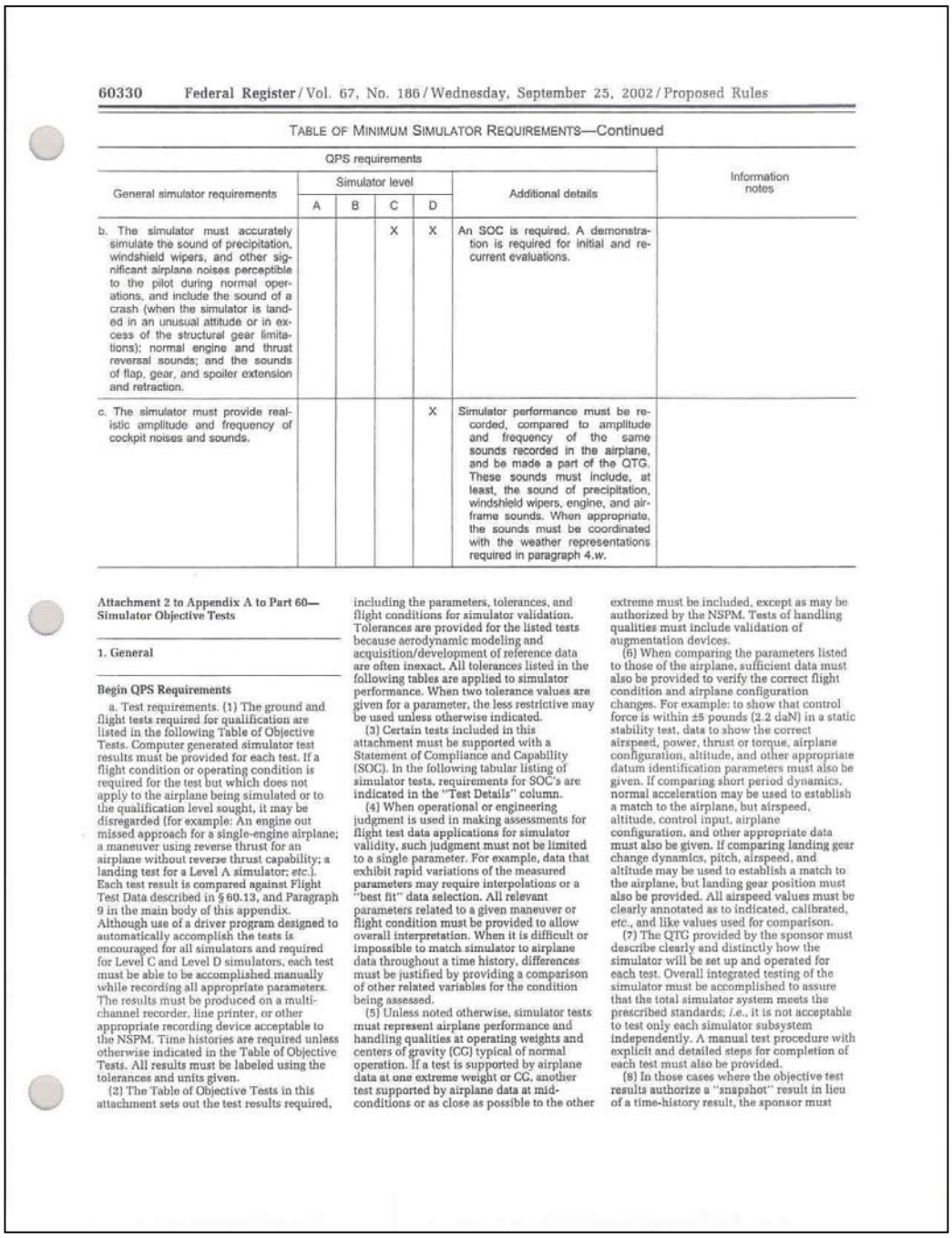

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TABLE OF MINIMUM SIMULATOR REQUIREMENTS—Continued

General simulator requirements	QPS requirements: Simulator level A	B	C	D	Additional details	Information notes
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.			X	X	An SOC is required. A demonstration is required for initial and recurrent evaluations.	
c. The simulator must provide realistic amplitude and frequency of cockpit noises and sounds.				X	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. These sounds must include, at least, the sound of precipitation, windshield wipers, engine, and airframe sounds. When appropriate, the sounds must be coordinated with the weather representations required in paragraph 4.w.	

Attachment 2 to Appendix A to Part 60—Simulator Objective Tests

1. General

Begin QPS Requirements

a. Test requirements. (1) The ground and flight tests required for qualification are listed in the following Table of Objective Tests. Computer generated simulator test results must be provided for each test. If a flight condition or operating condition is required for the test but which does not apply to the airplane being simulated or to the qualification level sought, it may be disregarded (for example: An engine out missed approach for a single-engine airplane; a maneuver using reverse thrust for an airplane without reverse thrust capability; a landing test for a Level A simulator; *etc.*). Each test result is compared against Flight Test Data described in § 60.13, and Paragraph 9 in the main body of 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 a multichannel recorder, line printer, or other appropriate recording device acceptable to the NSPM. Time histories are required unless otherwise indicated in the Table of Objective Tests. All results must be labeled using the **appropriate** tolerances and units.

(2) The Table of Objective Tests 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 aerodynamic 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.

(3) Certain tests included in this attachment must be supported with a Statement of Compliance and Capability (SOC). In the following tabular listing of simulator tests, requirements for SOC's are indicated in the ''Test Details'' column. **In view of objective tests in this Attachment, SOC is redundant.**

(4) 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.

(5) Unless noted otherwise, 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. Tests of handling qualities must include validation of augmentation devices.

(6) 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 ±5 pounds (2.2 daN) in 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 clearly annotated as to indicated, calibrated, *etc.,* and like values used for comparison.
(7) The QTG provided by the sponsor must describe clearly and distinctly how the simulator will be set up and operated for each test. Overall integrated testing of the simulator must be accomplished to assure that the total simulator system meets the prescribed standards; *i.e.*, it is not acceptable to test only each simulator subsystem independently. A manual test procedure with explicit and detailed steps for completion of each test must also be provided.
(8) In those cases where the objective test results authorize a ''snapshot'' result in lieu of a time-history result, the sponsor must

ensure that a steady state condition exists from 5 seconds prior to, through 2 seconds after, the instant of time captured by the ''snapshot.''
(9) For previously qualified simulators, the tests and tolerances of this attachment may be used in subsequent recurrent evaluations for any given test providing the sponsor has submitted a proposed MQTG revision to the NSPM and has received NSPM approval.
(10) Simulators are evaluated and qualified with an engine model simulating the airplane manufacturer's flight test engine. For qualification of alternate engine models (either variations of the flight test engines or other manufacturer's engines) additional simulator tests with the alternate engine models are required. Where thrust is different by more than 5% from the flight test engine, flight test data from an airplane equipped with the alternate engine is required. Where the airplane manufacturer certifies that the only impact on the simulator model is thrust, and that other variables related to the alternate engine (such as drag and thrust vector) are unchanged or are insignificantly changed, additional simulator tests may be run with the same initial conditions using the thrust from the flight test data as a driven **parameter for the alternate** engine model.**Please specify additional tests required for qualification of alternate engine when thrust difference from the flight test engine is a) less than 5% and b) more than 5%.**

(11) 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.
(12) For testing Computer Controlled Airplane (CCA) simulators, or other highly augmented airplane simulators, flight test data are required for both the Normal (N) and Non-normal (NN) control states, as indicated require data only in the Normal control state and are so noted. Where test results are independent of control state, Non-normal control data may be used. Tests for other levels of control state degradation may be required as detailed by the NSPM at the time of definition of a set of specific airplane tests for simulator data. 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. All tests in the Table of Objective Tests require test results in the Normal control state unless specifically noted otherwise in the additional requirements section following the CCA designation. Where applicable, flight test data must record Normal and Non-normal states for:
(a) Pilot controller deflections or electronically generated inputs, including location of input; and
(b) Flight control surface positions unless test results are not affected by, or are independent of, surface positions.
(13) For computer controlled airplanes using airplane hardware (*e.g.*, ''side stick controller'') in the simulator cockpit, some tests will not be required. Those tests are annotated in the ''Additional Requirements'' column with the Computer Controlled Airplane (CCA) note—''test not required if cockpit controller is installed in the simulator.'' However, in these cases the sponsor must supply a statement that the airplane hardware meets and will continue to meet the appropriate manufacturer's specifications and the sponsor must have supporting information to that fact available for NSPM review.
End QPS Requirements
b. Discussion
Begin Information
(1) If relevant winds are present in the 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.
(2) 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 paragraph 3, Motion System, in the following table).
SOC is redundant if safety checks have carried out as part of approved QA program.

(3) In the following Table of Objective Tests, the last column is titled ''Paragraph 8.'' A ''yes'' indication in that column directs the reader to paragraph 8 of this attachment for additional information relative to sources of data, procedures used to acquire the data, and instrumentation that may be used, as an alternative to those expected under normal flight test procedures that may be used for that particular test for Level A or Level B simulators. Paragraph 8 also contains notes, reminders, and information applicable to that particular test for those simulator levels. These data sources, procedures, and instrumentation, if used, would be submitted in accordance with the alternative data provisions of § 60.13 of Part 60 and Section 9 of this QPS attachment.
(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, in February 1995 and July 1996, respectively, and FAA Advisory Circulars (AC) 25–7, Flight Test Guide for Certification of Transport Category Airplanes, and (AC) 23–8A, Flight Test Guide for Certification of Part 23 Airplanes, for references and examples regarding flight testing requirements and techniques.
End Information

Common comments for Table of Objective Tests:
a) Test Numbering To standardize further, it is recommended that existing test numbering should be extended to include variations in flight conditions and weight etc. As an example, b.(1) Pitch Control will be expanded to b.(1)a1 Pitch Control for Takeoff with Forward displacement, b.(1)a2 Pitch Control for Takeoffwith Aft displacement, b.(1)b1 Pitch Control for Cruise with Forward displacemet, b.(1)b2 Pitch Control for Cruise with Aft displacement, b.(1)c1 Pitch Control for Landing with Forward displacement and b.(1)c2 Pitch Control for Landing with Aft displacement.

b) Tolerance type of information in "Test details" should be moved to "Tolerance". For example; Engine failure speed must be within +/- 1 knot in 2.b.(2) and ... a tolerance of +/- 0.8 in (2 cm)... in 3.a.(7), should be written under "Tolerance" column.

c) Multiple weights requirement for a test should be part of "Flight conditions". Example; In 3.e.(1) medium, light and near maximum landing weights should be part of "Flight conditions"

ensure that a steady state condition exists from 5 seconds prior to, through 2 seconds after, the instant of time captured by the "snapshot."

(9) For previously qualified simulators, the tests and tolerances of this attachment may be used in subsequent recurrent evaluations for any given test providing the sponsor has submitted a proposed MQTG revision to the NSPM and has received NSPM approval.

(10) Simulators are evaluated and qualified with an engine model simulating the airplane manufacturer's flight test engine. For qualification of alternate engine models (either variations of the flight test engines or other manufacturer's engines) additional simulator tests with the alternate engine models are required. Where thrust is different by more than 5% from the flight test engine, flight test data from an airplane equipped with the alternate engine is required. Where the airplane manufacturer certifies that the only impact on the simulator model is thrust, and that other variables related to the alternate engine (such as drag and thrust vector) are unchanged or are insignificantly changed, additional simulator tests may be run with the same initial conditions using the thrust from the flight test data as a driven parameter for the alternate engine model.

(11) 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.

(12) For testing Computer Controlled Airplane (CCA) simulators, or other highly augmented airplane simulators, flight test data are required for both the Normal (N) and Non-normal (NN) control states, as indicated in this attachment except that some tests require data only in the Normal control state and are so noted. Where test results are independent of control state, Non-normal control data may be used. Tests for other levels of control state degradation may be required as detailed by the NSPM at the time of definition of a set of specific airplane tests for simulator data. 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. All tests in the Table of Objective Tests require test results in the Normal control state unless specifically noted otherwise in the additional requirements section following the CCA designation. Where applicable, flight test data must record Normal and Non-normal states for:

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

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

(13) For computer controlled airplanes using airplane hardware (e.g., "side stick controller") in the simulator cockpit, some tests will not be required. Those tests are annotated in the "Additional Requirements" column with the Computer Controlled Airplane (CCA) note—"test not required if cockpit controller is installed in the simulator." However, in these cases the sponsor must supply a statement that the airplane hardware meets and will continue to meet the appropriate manufacturer's specifications and the sponsor must have supporting information to that fact available for NSPM review.

End QPS Requirements

b. Discussion

Begin Information

(1) 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.

(2) 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 paragraph 3, Motion System, in the following table).

(3) In the following Table of Objective Tests, the last column is titled "Paragraph 8." A "yes" indication in that column directs the reader to paragraph 8 of this attachment for additional information relative to sources of data, procedures used to acquire the data, and instrumentation that may be used, as an alternative to those expected under normal flight test procedures and that may be used for that particular test for Level A or Level B simulators. Paragraph 8 also contains notes, reminders, and information applicable to that particular test for those simulator levels. These data sources, procedures, and instrumentation, if used, would be submitted in accordance with the alternative data provisions of § 60.13 of Part 60 and Section 9 of this QPS attachment.

(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, in February 1995 and July 1996, respectively, and FAA Advisory Circulars (AC) 25–7, Flight Test Guide for Certification of Transport Category Airplanes, and (AC) 23–8A, Flight Test Guide for Certification of Part 23 Airplanes, for references and examples regarding flight testing requirements and techniques.

End Information

TABLE OF OBJECTIVE TESTS

QPS requirements								Information notes	Paragraph 8
Test	Tolerance	Flight conditions	Simulator level				Test details		
			A	B	C	D			
2. Performance									
a. Taxi									
(1) Minimum Radius Turn	±3 ft (0.9m) or 20% of Airplane Turn Radius.	Ground/Takeoff		X	X	X	Record both Main and Nosegear 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.	.....	Yes.

TABLE OF OBJECTIVE TESTS—Continued

QPS requirements									
Test	Tolerance	Flight conditions	Simulator level				Test details	Information notes	Paragraph 8
			A	B	C	D			
(2) Rate of Turn vs. Nosewheel Steering Angle.	±10% or ±2°/sec. Turn Rate ...	Ground/Takeoff		X	X	X	Record a minimum of two speeds, greater than minimum turning radius speed, with a spread of at least 5 knots.	.....	Yes.
b. Takeoff									
(1) Ground Acceleration Time and Distance.	±5% Time and Distance or ±5% Time and ±200 ft (61 m) of Distance.	Ground/Takeoff	X	X	X	X	Record acceleration time and distance for a minimum of 80% of the segment from brake release to V_R. Preliminary aircraft certification data may be used..	.....	Yes.
(2) Minimum Control Speed—Ground (V_{mcg}) using aerodynamic controls only (per applicable Airworthiness Standard) or Low Speed, Engine Inoperative 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).	Ground/Takeoff	X	X	X	X	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 simulator under test.	.....	Yes.
(3) Minimum Unstick Speed (V_{mu}) or equivalent as provided by the airplane manufacturer.	±3 Kts Airspeed ±1.5° Pitch	Ground/Takeoff	X	X	X	X	Record main landing gear strut compression or equivalent air/ground signal. Record from 10 Kts before start of rotation. Elevator input must precisely match airplane data. See 14CFR §25.107(d).	.....	Yes.
(4) Normal Takeoff	±3 Kts Airspeed ±1.5° Pitch ±1.5° Angle of Attack ±20 ft (6 m) Altitude. Additionally, for those simulators of airplanes with reversible flight control systems: Stick/Column Force; ± 10% or ± 5 lb (2.2 daN).	Ground/Takeoff and First Segment Climb.	X	X	X	X	Record takeoff profile from brake release to at least 200 ft (61 m) above ground level (AGL).	.....	Yes.
(5) Critical Engine Failure on Takeoff.	±3 Kts Airspeed ±1.5° Pitch, ±1.5° Angle of Attack, ±20 ft (6 m) Altitude, ±2° Bank and 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 ±1.3 daN (3 lb)); and Rudder Pedal Force; ±10% or ±5 lb (2.2 daN).	Ground/Takeoff and First Segment Climb.	X	X	X	X	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. **CCA:** Test in Normal AND Non-normal control state.	.....	Yes.