	Flight Operations Standards Department **Flight Crew Licensing and Training Section - Flight Synthetic Training Devices** **Full Flight Simulator (FFS) Qualification Checklist**

• **FFS Operator Name**				
• **FFS Qualification Level**	☐ **A**	☐ **B**	☐ **C**	☐ **D**
• **FFS Qualification Type**	☐ Initial Qualification	☐ Qualification renewal	☐ Variation	☐ Re-location
• **FFS Manufacturer Name**				
• **FFS Serial No**				
• **FFS Qualification Number**				
• **FFS Qualification Expiry Date**				

A. Full Flight Simulator (FFS) General Technical Requirements. The lowest level of flight simulator technical complexity

Qual. Level	General Technical Requirements	Result	
		YES	NO
A	An enclosed full-scale replica of the airplane cockpit/flight deck including simulation of all systems, instruments, navigational equipment, communications and caution and warning systems.		
	An instructor's station with seat shall be provided. Seats for the flight crewmembers and two seats for inspectors/observers shall also be provided.		
	Control forces and displacement characteristics shall correspond to that of the replicated airplane and they shall respond in the same manner as the airplane under the same flight conditions.		
	The use of class specific data tailored to the specific airplane type with fidelity sufficient to meet the objective tests, functions and subjective tests is allowed.		
	Generic ground effect and ground handling models are permitted.		
	Motion, visual and sound systems sufficient to support the training, testing and checking credits sought are required.		
	The visual system shall provide at least 45 degrees horizontal and 30 degrees vertical field of view per pilot.		
	The response to control inputs shall not be greater than 300 milliseconds more than that experienced on the aircraft		
B	Same as for Level A, and		
	Validation flight test data shall be used as the basis for flight and performance and systems characteristics.		
	Additionally ground handling and aerodynamics programming to include ground effect reaction and handling characteristics shall be derived from validation flight test data.		
C	Same as for Level B, and		
	A daylight/twilight/night visual system is required with a continuous, cross-cockpit, minimum collimated visual field of view providing each pilot with 180 degrees horizontal and 40 degrees vertical field of view.		
	A six degrees of freedom motion system shall be provided.		
	The sound simulation shall include the sounds of precipitation and other significant airplane noises perceptible to the pilot and shall be able to reproduce the sounds of a crash landing.		
	The response to control inputs shall not be greater than 150 milliseconds more than that experienced on the airplane.		
	Wind shear simulation shall be provided		

Qual. Level	General Technical Requirements	Result YES	Result NO
D	Same as for Level C, and		
	There shall be complete fidelity of sounds and motion buffets		

Remarks	

Inspector Name	Date	Signature

B. Full Flight Simulator (FFS) Qualification Requirements.

This checklist describes the minimum Full Flight Simulator (FFS) requirements for qualifying devices to the required Qualification Levels. Certain requirements included in this section shall be supported with a statement of compliance (SOC) and, in some designated cases, an objective test. The SOC will describe how the requirement was met. The test results shall show that the requirement has been attained. In the following tabular listing of JCAR FSTD standards, statements of compliance are indicated in the compliance column.

	Requirements	FFS Level				Statement of Compliance	YES	
		A	B	C	D		YES	NO
1	**General**							
a	A fully enclosed flight deck	X	X	X	X			
b	Flight deck, a full scale replica of the airplane simulated. Equipment for operation of the cockpit windows shall be included in the FSTD, but the actual windows need not be operable. The flight deck, for FSTD purposes, consists of all that space forward of a cross section of the fuselage at the most extreme aft setting of the pilots' seats. Additional required flight crewmember duty stations and those required bulkheads aft of the pilot seats are also considered part of the flight deck and shall replicate the airplane	X	X	X	X	Flight deck observer seats are not considered to be additional flight crewmember duty stations and may be omitted. Bulkheads containing items such as switches, circuit breakers, supplementary radio panels, etc. to which the flight crew may require access during any event after pre-flight cockpit preparation is complete are considered essential and may not be omitted. Bulkheads containing only items such as landing gear pin storage compartments, fire axes or extinguishers, spare light bulbs, aircraft document pouches etc. are not considered essential and may be omitted. Such items, or reasonable facsimile, shall still be available in the FSTD but may be relocated to a suitable location as near as practical to the original position. Fire axes and any similar purpose instruments need only be represented in silhouette		
c	Direction of movement of controls and switches identical to that in the airplane.	X	X	X	X			
d	Circuit breakers that affect procedures and/or result in observable cockpit indications properly located and functionally accurate	X	X	X	X			
e	Flight dynamics model that accounts for various combinations of drag and thrust normally encountered in flight corresponding to actual flight conditions, including the effect of change in airplane attitude, sideslip, thrust, drag, altitude, temperature, gross weight, moments of inertia, centre of gravity location, and configuration	X	X	X	X			

	Requirements	**FFS Level**				**Statement of Compliance**	**YES**	
		A	**B**	**C**	**D**		**YES**	**NO**
f	All relevant instrument indications involved in the simulation of the applicable airplane shall automatically respond to control movement by a flight crewmember or induced disturbance to the simulated airplane; e.g., turbulence or wind shear	**X**	**X**	**X**	**X**			
g	Communications, navigation, and caution and warning equipment corresponding to that installed in the applicant's airplane with operation within the tolerances prescribed for the applicable airborne equipment	**X**	**X**	**X**	**X**			
h	Navigational data with the corresponding approach facilities. Navigation aids should be usable within range without restriction	**X**	**X**	**X**	**X**	For all FFSs and FTDs 2 where used for area or airfield competence training or checking, navigation data should be updated within 28 days		
i	In addition to the flight crewmember duty stations, three suitable seats for the instructor, delegated examiner and CARC inspector. CARC will consider options to this standard based on unique cockpit configurations. These seats shall provide adequate vision to the pilot's panel and forward windows. Observer seats need not represent those found in the airplane but in the case of FSTDs fitted with a motion system, the seats shall be adequately secured to the floor of the FSTD, fitted with positive restraint devices and be of sufficient integrity to safely restrain the occupant during any known or predicted motion system excursion	**X**	**X**	**X**	**X**			
j	FSTD systems shall simulate applicable airplane system operation, both on the ground and in flight. Systems shall be operative to the extent that all normal, abnormal, and emergency operating procedures can be accomplished	**X**	**X**	**X**	**X**			
k	Instructor controls shall enable the operator to control all required system variables and insert abnormal or emergency conditions into the airplane systems	**X**	**X**	**X**	**X**	Where applicable and as required for training the following shall be available : - Position and flight freeze. - A facility to enable the dynamic plotting of the flight path on approaches, commencing at the final approach fix, including the vertical profile - Hard copy of map and approach plot		

	Requirements	FFS Level A	FFS Level B	FFS Level C	FFS Level D	Statement of Compliance	YES	NO
l	Control forces and control travel shall correspond to that of the replicated airplane. Control forces shall react in the same manner as in the airplane under the same flight conditions	X	X	X	X			
m	Ground handling and aerodynamic programming shall include: (1) Ground Effect. For example: round-out, flare, and touchdown. This requires data on lift, drag, pitching moment, trim, and power ground effect. (2) Ground reaction – reaction of the airplane upon contact with the runway during landing to include strut deflections, tire friction, side forces, and other appropriate data, such as weight and speed, necessary to identify the flight condition and configuration. (3) Ground handling characteristics – steering inputs to include crosswind, braking, thrust reversing, deceleration and turning radius	X	X	X	X	Statement of Compliance required. Tests required. For Level 'A' FFS, generic ground handling to the extent that allows turns within the confines of the runway, adequate control on flare, touchdown and roll-out (including from a cross -wind landing) only is acceptable		
n	Wind shear models shall provide training in the specific skills required for recognition of wind shear phenomena and execution of recovery maneuvers. Such models shall be representative of measured or accident derived winds, but may include simplifications which ensure repeatable encounters. For example, models may consist of independent variable winds in multiple simultaneous components.Wind models shall be available for the following critical phases of flight: (1) Prior to take-off rotation (2) At lift-off (3) During initial climb (4) Short final approach			X	X	Tests required. See AC No 1 to JCAR-FSTD A.030, Para 2.3, g.		
o	Instructor controls for environmental effects including wind speed and direction shall be provided	X	X	X	X			
p	Stopping and directional control forces shall be representative for at least the following runway conditions based on airplane related data: (1) Dry (2) Wet (3) Icy (4) Patchy wet (5) Patchy icy (6) Wet on rubber residue in touchdown zone.			X	X	Statement of Compliance required. Objective Tests required for (1), (2), (3), Subjective check for (4), (5), (6).		

	Requirements	FFS Level				Statement of Compliance	YES	
		A	B	C	D		YES	NO
q	Brake and tire failure dynamics (including anti skid) and decreased brake efficiency due to brake temperatures shall be representative and based on airplane related data			X	X	Statement of Compliance required. Subjective test is required for decreased braking efficiency due to brake temperature, if applicable.		
r	A means for quickly and effectively conducting daily testing of FSTD programming and hardware shall be available			X	X	Statement of Compliance required		
s	Computer capacity, accuracy, resolution, and dynamic response shall be sufficient to fully support the overall fidelity, including its evaluation and testing	X	X	X	X	Statement of Compliance required		
t	Control feel dynamics shall replicate the airplane simulated. Free response of the controls shall match that of the airplane within the tolerances specified. Initial and upgrade evaluations will include control free response (pitch, roll and yaw controller) measurements recorded at the controls. The measured responses shall correspond to those of the airplane in take-off, cruise, and landing configurations. (1) For airplanes with irreversible control systems, measurements may be obtained on the ground if proper pitot static inputs are provided to represent conditions typical of those encountered in flight. Engineering validation or airplane manufacturer rationale will be submitted as justification to ground test or omit a configuration. (2) For FSTDs requiring static and dynamic tests at the controls, special test fixtures will not be required during initial evaluation if the FSTD operator's MQTG shows both text fixture results and alternate test method results such as computer data plots, which were obtained concurrently. Repetition of the alternate method during initial evaluation may then satisfy this requirement.			X	X	Tests required		

u	One of the following two methods is acceptable as a means to prove compliance: (1) Transport Delay: A transport delay test may be used to demonstrate that the FSTD system response does not exceed 150 milliseconds. This test shall 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 motion system, to the visual system and instrument displays.	**X**	**X**	**X**	**X**	Tests required. For Level 'A' & 'B' FFSs, and applicable systems for FTDs, FNPTs and BITDs the maximum permissible delay is 300 milliseconds		
	(2) Latency: The visual system, flight deck instruments and initial motion system response shall respond to abrupt pitch, roll and yaw inputs from the pilot's position within 150 milliseconds of the time, but not before the time, when the airplane would respond under the same conditions							
v	Aerodynamic modeling shall be provided. This shall include, for airplanes issued an original type certificate after June 1980, low altitude level flight ground effect, Mach effect at high altitude, normal and reverse dynamic thrust effect on control surfaces, aero elastic representations, and representations of non-linearity's due to sideslip based on airplane flight test data provided by the manufacturer			**X**	**X**	Statement of Compliance required. Mach effect, aero elastic representations, and non-linearity's due to sideslip are normally included in the FSTD aerodynamic model. The Statement of Compliance shall address each of these items. Separate tests for thrust effects and a Statement of Compliance are required.		
w	Modeling that includes the effects of airframe and engine icing			**X**	**X**	Statement of Compliance required. SOC shall describe the effects that provide training in the specific skills required for recognition of icing phenomena and execution of recovery.		
x	Aerodynamic and ground reaction modeling for the effects of reverse thrust on directional control shall be provided		**X**	**X**	**X**	Statement of Compliance required		
y	Realistic airplane mass properties, including mass, centre of gravity and moments of inertia as a function of payload and fuel loading shall be implemented	**X**	**X**	**X**	**X**	Statement of Compliance required at initial evaluation. SOC shall include a range of tabulated target values to enable a demonstration of the mass properties model to be conducted from the instructor's station		

	Requirements	FFS Level A	FFS Level B	FFS Level C	FFS Level D	Statement of Compliance	YES	NO
z	Self-testing for FSTD hardware and programming to determine compliance with the FSTD performance tests shall be provided. Evidence of testing shall include FSTD number, date, time, conditions, tolerances, and the appropriate dependent variables portrayed in comparison with the airplane standard			X	X	Statement of Compliance required. Tests required		
aa	Timely and permanent update of hardware and programming subsequent to airplane modification sufficient for the Qualification Level sought	X	X	X	X			
bb	Daily pre-flight documentation either in the daily log or in a location easily accessible for review is required	X	X	X	X			
2	**Motion system**							
a	Motion cues as perceived by the pilot shall be representative of the airplane, e.g. touchdown cues shall be a function of the simulated rate of descent	X	X	X	X			
b	A motion system shall:					Statement of Compliance required. Tests required		
	(1) Provide sufficient cueing, which may be of a generic nature to accomplish the required tasks. Statement of Compliance required. Tests required	X						
	(2) Have a minimum of 3 degrees of freedom (pitch, roll & heave).		X					
	(3) Produce cues at least equivalent to those of a six-degrees-of-freedom synergistic platform motion system			X	X			
c	A means of recording the motion response time as required	X	X	X	X			
d	Motion effects programming shall include: (1) Effects of runway rumble oleo deflections, groundspeed, uneven runway, centerline lights and taxiway characteristics. (2) Buffets on the ground due to spoiler/ speed brake extension and thrust reversal. (3) Bumps associated with the landing gear. (4) Buffet during extension and retraction of landing gear. (5) Buffet in the air due to flap and spoiler/ speed brake extension. (6) Approach to stall buffet. (7) Touchdown cues for main and nose gear. (8) Nose wheel scuffing. (9) Thrust effect with brakes set (10) Mach and maneuver buffet. (11) Tire failure dynamics. (12) Engine malfunction and engine damage. (13) Tail and pod strike	X	X	X	X	For Level ‘A’FFS: Effects may be of a generic nature sufficient to accomplish the required tasks		

Requirements		FFS Level A	FFS Level B	FFS Level C	FFS Level D	Statement of Compliance	YES	NO
e	Motion vibrations: Tests with recorded results that allow the comparison of relative amplitudes versus frequency are required. Characteristic motion vibrations that result from operation of the airplane in so far as vibration marks an event or airplane state that can be sensed at the flight deck shall be present. The FSTD shall be programmed and instrumented in such a manner that the characteristic vibration modes can be measured and compared with airplane data				X	Statement of Compliance required. Tests required		
3	**Visual System**							
a	The visual system shall meet all the standards enumerated as applicable to the level of qualification requested by the applicant	X	X	X	X			
b	Continuous minimum collimated visual field-of-view of 45 degrees horizontal and 30 degrees vertical field of view simultaneously for each pilot	X	X			SOC is acceptable in place of this test		
c	Continuous, cross-cockpit, minimum collimated visual field of view providing each pilot with 180 degrees horizontal and 40 degrees vertical field of view. Application of tolerances require the field of view to be not less than a total of 176 measured degrees horizontal field of view (including not less than ±88 measured degrees either side of the centre of the design eye point) and not less than a total of 36 measured degrees vertical field of view from the pilot's and co-pilot's eye points			X	X	Consideration shall be given to optimizing the vertical field of view for the respective airplane cut-off angle. SOC is acceptable in place of this test.		
d	A means of recording the visual response time for visual systems	X	X	X	X			
e	System Geometry. The system fitted shall be free from optical discontinuities and artifacts that create non-realistic cues	X	X	X	X	Test required. A Statement of Compliance is acceptable in place of this test.		
f	Visual textural cues to assess sink rate and depth perception during take-off and landing shall be provided	X	X	X	X	For Level 'A' FFS visual cueing shall be sufficient to support changes in approach path by using runway perspective		
g	Horizon and attitude shall correlate to the simulated attitude indicator	X	X	X	X	Statement of Compliance required		
h	Occulting - A minimum of ten levels shall be available	X	X	X	X	Occulting shall be demonstrated. Statement of Compliance required		
i	Surface (Vernier) resolution shall occupy a visual angle of not greater than 2 arc minutes in the visual display used on a scene from the pilot's eye point.			X	X	Test and Statement of Compliance required containing calculations confirming resolution		

	Requirements	FFS Level A	FFS Level B	FFS Level C	FFS Level D	Statement of Compliance	YES	NO
j	Surface contrast ratio shall be demonstrated by a raster drawn test pattern showing a contrast ratio of not less than 5:1			X	X	Test and Statement of Compliance required		
k	Highlight brightness shall be demonstrated using a raster drawn test pattern. The high light brightness shall not be less than 20 cd/m2 (6ft-lamberts)			X	X	Test and Statement of Compliance required. Use of calligraphic lights to enhance raster brightness is acceptable.		
l	Light point size - not greater than 5 arc minutes			X	X	Test and Statement of Compliance required. This is equivalent to a light point resolution of 2.5 arc minutes.		
m	Light point contrast ratio – not less than 10:1	X	X			Test and Statement of compliance required		
n	Light point contrast ratio – not less than 25:1.			X	X	Test and Statement of compliance required		
o	Daylight, twilight and night visual capability as applicable for level of qualification sought	X	X	X	X	Statement of Compliance required for system capability. System objective and scene content tests are required		
p	The visual system shall be capable of meeting, as a minimum, the system brightness and contrast ratio criteria as applicable for level of qualification sought	X	X	X	X			
q	Total scene content shall be comparable in detail to that produced by 10000 visible textured surfaces and (in day) 6000 visible lights or (in twilight or night) 15000 visible lights, and sufficient system capacity to display 16 simultaneously moving objects			X	X			
r	The system, when used in training, shall provide in daylight, full color presentations and sufficient surfaces with appropriate textural cues to conduct a visual approach, landing and airport movement (taxi). Surface shading effects shall be consistent with simulated (static) sun position			X	X			

Requirements		FFS Level				Statement of Compliance	YES	
		A	B	C	D		YES	NO
s	The system, when used in training, shall provide at twilight, as a minimum, 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 shall include a definable horizon and typical terrain characteristics such as fields, roads and bodies of water and surfaces illuminated by representative own ship lighting (e.g. landing lights). If provided, directional horizon lighting shall have correct orientation and be consistent with surface shading effects			X	X			
t	The system, when used in training, shall provide at night, as a minimum, all features applicable to the twilight scene, as defined above, with the exception of the need to portray reduced ambient intensity that removes ground cues that are not self-illuminating or illuminated by own ship lights (e.g. landing lights).	X	X	X	X			
4	**Sound System**							
a	Significant flight deck sounds which result from pilot actions corresponding to those of the airplane or class of airplane	X	X	X	X			
	Sound of precipitation, rain removal equipment and other significant airplane noises perceptible to the pilot during normal and abnormal operations and the sound of a crash when the FSTD is landed in excess of limitations			X	X	Statement of Compliance required		
b	Comparable amplitude and frequency of flight deck noises, including engine and airframe sounds. The sounds shall be coordinated with the required weather.				X	Tests required		
c	The volume control shall have an indication of sound level setting which meets all qualification requirements.	X	X	X	X			

Remarks	

Inspector Name	Date	Signature

C. FFS Functions and Subjective Tests.

No.	Table of Functions and Subjective Tests	FFS				Result	
		A	B	C	D	YES	NO
a	**PREPARATION FOR FLIGHT**						
	(1) Preflight. Accomplish a functions check of all switches, indicators, systems, and equipment at all crewmembers' and instructors' stations and determine that;						
	(a) the flight deck design and functions are identical to that of the airplane or class of airplane simulated	✓	✓	✓	✓		
b	**SURFACE OPERATIONS (PRE-TAKE-OFF)**						
	(1) Engine Start						
	(a) Normal start	✓	✓	✓	✓		
	(b) Alternate start procedures	✓	✓	✓	✓		
	(c) Abnormal starts and shutdowns (hot start, hung start, tail pipe fire, etc.)	✓	✓	✓	✓		
	(2) Pushback/Power back	✓	✓	✓	✓		
	(3) Taxi						
	(a) Thrust response	✓	✓	✓	✓		
	(b) Power lever friction	✓	✓	✓	✓		
	(c) Ground handling	✓	✓	✓	✓		
	(d) Nose wheel scuffing	✓	✓	✓	✓		
	(e) Brake operation (normal and alternate/emergency)						
	A Brake fade (if applicable)	✓	✓	✓	✓		
	B. Other	✓	✓	✓	✓		
c	**TAKE-OFF**						
	(1) Normal						
	(a) Airplane/engine parameter relationships	✓	✓	✓	✓		
	(b) Acceleration characteristics (motion)	✓	✓	✓	✓		
	(c) Acceleration characteristics (not associated with motion)	✓	✓	✓	✓		
	(d) Nose wheel and rudder steering	✓	✓	✓	✓		
	(e) Crosswind (maximum demonstrated)	✓	✓	✓	✓		
	(f) Special performance (e.g. reduced V1, max de-rate, short field operations)	✓	✓	✓	✓		
	(g) Low visibility take-off	✓	✓	✓	✓		
	(h) Landing gear, wing flap leading edge device operation	✓	✓	✓	✓		
	(i) Contaminated runway operation	✓	✓	✓	✓		
	(j) Other	✓	✓	✓	✓		
	(2) Abnormal/emergency						
	(a) Rejected	✓	✓	✓	✓		
	(b) Rejected special performance (e.g. reduced V1, max de-rate, short field operations)	✓	✓	✓	✓		
	(c) With failure of most critical engine at most critical point, continued take-off	✓	✓	✓	✓		
	(d) With wind shear	✓	✓	✓	✓		
	(e) Flight control system failures, reconfiguration modes, manual reversion and associated handling	✓	✓	✓	✓		
	(f) Rejected, brake fade	✓	✓	✓	✓		
	(g) Rejected, contaminated runway	✓	✓	✓	✓		
	(h) Other	✓	✓	✓	✓		
d	**CLIMB**						
	(1) Normal	✓	✓	✓	✓		
	(2) One or more engines inoperative	✓	✓	✓	✓		
	(3) Other	✓	✓	✓	✓		

No.	Table of Functions and Subjective Tests	FFS				Result	
		A	B	C	D	YES	NO
e	**CRUISE**						
	(1) Performance characteristics (speed vs. power)	✓	✓	✓	✓		
	(2) High altitude handling	✓	✓	✓	✓		
	(3) High Mach number handling (Mach tuck, Mach buffet) and recovery (trim change)	✓	✓	✓	✓		
	(4) Over speed warning (in excess of Vmo or Mmo)	✓	✓	✓	✓		
	(5) High IAS handling	✓	✓	✓	✓		
f	**MANOEUVRES**						
	(1) High angle of attack, approach to stalls, stall warning, buffet, and g-break (take-off, cruise, approach, and landing configuration)	✓	✓	✓	✓		
	(2) Flight envelope protection (high angle of attack, bank limit, over speed, etc)	✓	✓	✓	✓		
	(3) Turns with/without speed brake/spoilers deployed	✓	✓	✓	✓		
	(4) Normal and standard rate turns	✓	✓	✓	✓		
	(5) Steep turns	✓	✓	✓	✓		
	(6) Performance turn	✓	✓	✓	✓		
	(7) In flight engine shutdown and restart (assisted and windmill)	✓	✓	✓	✓		
	(8) Maneuvering with one or more engines inoperative, as appropriate	✓	✓	✓	✓		
	(9) Specific flight characteristics (e.g. direct lift control)	✓	✓	✓	✓		
	(10) Flight control system failures, reconfiguration modes, manual reversion and associated handling	✓	✓	✓	✓		
	(11) Other	✓	✓	✓	✓		
g	**DESCENT**						
	(1) Normal	✓	✓	✓	✓		
	(2) Maximum rate (clean and with speed brake, etc)	✓	✓	✓	✓		
	(3) With autopilot	✓	✓	✓	✓		
	(4) Flight control system failures, reconfiguration modes, manual reversion and associated handling	✓	✓	✓	✓		
	(5) Other	✓	✓	✓	✓		
h	**INSTRUMENT APPROACHES AND LANDING**						
	Only those instrument approach and landing tests relevant to the simulated airplane type or class should be selected from the following list, where tests should be made with limiting wind Velocities, wind shear and with relevant system failures, including the use of Flight Director. (1) Precision						
	(a) PAR	✓	✓	✓	✓		
	(b) CAT I/GBAS (ILS/MLS) published approaches						
	A Manual approach with/without flight director including landing	✓	✓	✓	✓		
	B Autopilot/auto throttle coupled approach and manual landing	✓	✓	✓	✓		
	C Manual approach to DH and G/A all engines	✓	✓	✓	✓		
	D Manual one engine out approach to DH and G/A	✓	✓	✓	✓		
	E Manual approach controlled with and without flight director to 30 m (100 ft) below CAT I minima						
	(i) with cross-wind (maximum demonstrated)	✓	✓	✓	✓		
	(ii) with wind shear	✓	✓	✓	✓		
	F Autopilot/auto throttle coupled approach, one engine out to DH and G/A	✓	✓	✓	✓		
	G Approach and landing with minimum/standby electrical power	✓	✓	✓	✓		
	(c) CAT II/GBAS (ILS/MLS) published approaches						
	A Autopilot/auto throttle coupled approach to DH and landing	✓	✓	✓	✓		
	B Autopilot/auto throttle coupled approach to DH and G/A	✓	✓	✓	✓		
	C Auto coupled approach to DH and manual G/A	✓	✓	✓	✓		
	D Auto coupled/auto throttle Category II published approach	✓	✓	✓	✓		

No.	Table of Functions and Subjective Tests	FFS				Result	
		A	B	C	D	YES	NO
	(d) CAT III/GBAS (ILS/MLS) published approaches						
	A Autopilot/auto throttle coupled approach to land and rollout	✓	✓	✓	✓		
	B Autopilot/auto throttle coupled approach to DH/Alert Height and G/A	✓	✓	✓	✓		
	C Autopilot/auto throttle coupled approach to land and rollout with one engine out	✓	✓	✓	✓		
	D Autopilot/auto throttle coupled approach to DH/Alert Height and G/A with one engine out	✓	✓	✓	✓		
	E Autopilot/auto throttle coupled approach (to land or to go around)						
	(i) with generator failure	✓	✓	✓	✓		
	(ii) with 10 knot tail wind	✓	✓	✓	✓		
	(iii) with 10 knot crosswind	✓	✓	✓	✓		
	(2) Non-precision						
	(a) NDB	✓	✓	✓	✓		
	(b) VOR, VOR/DME, VOR/TAC	✓	✓	✓	✓		
	(c) RNAV (GNSS)	✓	✓	✓	✓		
	(d) ILS LLZ (LOC), LLZ(LOC)/BC	✓	✓	✓	✓		
	(e) ILS offset localizer	✓	✓	✓	✓		
	(f) direction finding facility	✓	✓	✓	✓		
	(g) surveillance radar	✓	✓	✓	✓		
	NOTE: If Standard Operating Procedures are to use autopilot for non-precision approaches then these should be evaluated						
i	**VISUAL APPROACHES (SEGMENT) AND LANDINGS**						
	(1) Maneuvering, normal approach and landing all engines operating with and without visual approach aid guidance	✓	✓	✓	✓		
	(2) Approach and landing with one or more engines inoperative	✓	✓	✓	✓		
	(3) Operation of landing gear, flap/slats and speed brakes (normal and abnormal)	✓	✓	✓	✓		
	(4) Approach and landing with crosswind (max. demonstrated for Flight simulator)	✓	✓	✓	✓		
	(5) Approach to land with wind shear on approach	✓	✓	✓	✓		
	(6) Approach and landing with flight control system failures,(for Flight simulator - reconfiguration modes, manual reversion and associated handling (most significant degradation which is probable)	✓	✓	✓	✓		
	(7) Approach and landing with trim malfunctions						
	(a) longitudinal trim malfunction	✓	✓	✓	✓		
	(b) lateral-directional trim malfunction	✓	✓	✓	✓		
	(8) Approach and landing with standby (minimum) electrical/hydraulic power	✓	✓	✓	✓		
	(9) Approach and landing from circling conditions (circling approach)	✓	✓	✓	✓		
	(10) Approach and landing from visual traffic pattern	✓	✓	✓	✓		
	(11) Approach and landing from non-precision approach	✓	✓	✓	✓		
	(12) Approach and landing from precision approach	✓	✓	✓	✓		
	(13) Approach procedures with vertical guidance (APV), e.g., SBAS	✓	✓	✓	✓		
	(14) Other	✓	✓	✓	✓		
	NOTE: FSTD with visual systems, which permit completing a special approach procedure in accordance with applicable regulations, may be approved for that particular approach procedure.						
j	**MISSED APPROACH**						
	(1) All engines	✓	✓	✓	✓		
	(2) One or more engine(s) out	✓	✓	✓	✓		
	(3) With flight control system failures, reconfiguration modes, manual reversion and for flight simulator - associated handling	✓	✓	✓	✓		

No.	Table of Functions and Subjective Tests	FFS A	FFS B	FFS C	FFS D	Result YES	Result NO
k	**SURFACE OPERATIONS (POST LANDING)**						
	(1) Landing roll and taxi						
	(a) Spoiler operation	✓	✓	✓	✓		
	(b) Reverse thrust operation	✓	✓	✓	✓		
	(c) Directional control and ground handling, both with and without reverse thrust	✓	✓	✓	✓		
	(d) Reduction of rudder effectiveness with increased reverse thrust (rear pod-mounted engines)	✓	✓	✓	✓		
	(e) Brake and anti-skid operation with dry, wet, and icy condition	✓	✓	✓	✓		
	(f) Brake operation, to include auto-braking system where applicable	✓	✓	✓	✓		
	(g) Other	✓	✓	✓	✓		
l	**ANY FLIGHT PHASE**						
	(1) Airplane and power plant systems operation						
	(a) Air conditioning and pressurization (ECS)	✓	✓	✓	✓		
	(b) De-icing/anti-icing	✓	✓	✓	✓		
	(c) Auxiliary power plant/auxiliary power unit (APU)	✓	✓	✓	✓		
	(d) Communications	✓	✓	✓	✓		
	(e) Electrical	✓	✓	✓	✓		
	(f) Fire and smoke detection and suppression	✓	✓	✓	✓		
	(g) Flight controls (primary and secondary)	✓	✓	✓	✓		
	(h) Fuel and oil, hydraulic and pneumatic	✓	✓	✓	✓		
	(i) Landing gear	✓	✓	✓	✓		
	(j) Oxygen	✓	✓	✓	✓		
	(k) Power plant	✓	✓	✓	✓		
	(l) Airborne radar	✓	✓	✓	✓		
	(m) Autopilot and Flight Director	✓	✓	✓	✓		
	(n) Collision avoidance systems. (e.g. GPWS,TCAS)	✓	✓	✓	✓		
	(o) Flight control computers including stability and control augmentation	✓	✓	✓	✓		
	(p) Flight display systems	✓	✓	✓	✓		
	(q) Flight management computers	✓	✓	✓	✓		
	(r) Head-up guidance, head-up displays	✓	✓	✓	✓		
	(s) Navigation systems	✓	✓	✓	✓		
	(t) Stall warning/avoidance	✓	✓	✓	✓		
	(u) Wind shear avoidance equipment	✓	✓	✓	✓		
	(v) Automatic landing aids	✓	✓	✓	✓		
	(2) Airborne procedures						
	(a) Holding	✓	✓	✓	✓		
	(b) Air hazard avoidance. (traffic, weather)			✓	✓		
	(c) Wind shear			✓	✓		
	(3) Engine shutdown and parking						
	(a) Engine and systems operation	✓	✓	✓	✓		
	(b) Parking brake operation	✓	✓	✓	✓		
	(4) Other as appropriate including effects of wind	✓	✓	✓	✓		
m	**VISUAL SYSTEM**						
	(1) Functional test content requirements (Levels C and D). Note—The following is the minimum airport model content requirement to satisfy visual capability tests, and provides suitable visual cues to allow completion of all functions and subjective tests described in this appendix. FSTD operators are encouraged to use the model content described below for the functions and subjective tests. If all of the elements cannot be found at a single real world airport, then additional real world airports may be used. The intent of this visual scene content requirement description is to identify that content required to aid the pilot in making appropriate, timely decisions.						

No.	Table of Functions and Subjective Tests	FFS				Result	
		A	B	C	D	YES	NO
	(a) two parallel runways and one crossing runway displayed simultaneously; at least two runways should be lit simultaneously			✓	✓		
	(b) runway threshold elevations and locations shall be modeled to provide sufficient correlation with airplane systems (e.g., HGS, GPS, altimeter); slopes in runways, taxiways, and ramp areas should not cause distracting or unrealistic effects, including pilot eye-point height variation			✓	✓		
	(c) representative airport buildings, structures and lighting			✓	✓		
	(d) one useable gate, set at the appropriate height, for those airplanes that typically operate from terminal gates			✓	✓		
	(e) representative moving and static gate clutter (e.g., other airplanes, power carts, tugs, fuel trucks, additional gates)			✓	✓		
	(f) representative gate/apron markings (e.g., hazard markings, lead-in lines, gate numbering) and lighting			✓	✓		
	(g) representative runway markings, lighting, and signage, including a wind sock that gives appropriate wind cues			✓	✓		
	(h) representative taxiway markings, lighting, and signage necessary for position identification, and to taxi from parking to a designated runway and return to parking; representative, visible taxi route signage shall be provided; a low visibility taxi route (e.g. Surface Movement Guidance Control System, follow-me truck, daylight taxi lights) should also be demonstrated			✓	✓		
	(i) representative moving and static ground traffic (e.g., vehicular and airplane)			✓	✓		
	(j) representative depiction of terrain and obstacles within 25 NM of the reference airport			✓	✓		
	(k) representative depiction of significant and identifiable natural and cultural features within 25 NM of the reference airport **Note**—This refers to natural and cultural features that are typically used for pilot orientation in flight. Outlying airports not intended for landing need only provide a reasonable facsimile of runway orientation			✓	✓		
	(l) representative moving airborne traffic			✓	✓		
	(m) appropriate approach lighting systems and airfield lighting for a VFR circuit and landing, non-precision approaches and landings, and Category I, II and III precision approaches and landings			✓	✓		
	(n) representative gate docking aids or a marshaller			✓	✓		
	(2) Functional test content requirements (Levels A and B) **Note**—The following is the minimum airport model content requirement to satisfy visual capability tests, and provides suitable visual cues to allow completion of all functions and subjective tests described in this appendix. FSTD operators are encouraged to use the model content described below for the functions and subjective tests.						
	(a) representative airport runways and taxiways	✓	✓				
	(b) runway definition	✓	✓				
	(c) runway surface and markings	✓	✓				
	(d) lighting for the runway in use including runway edge and centerline lighting, visual approach aids and approach lighting of appropriate colors	✓	✓				
	(e) representative taxiway lights	✓	✓				
	(3) Visual scene management						
	(a) Runway and approach lighting intensity for any approach should be set at an intensity representative of that used in training for the visibility set; all visual scene light points should fade into view appropriately	✓	✓	✓	✓		
	(b) The directionality of strobe lights, approach lights, runway edge lights, visual landing aids, runway centre line lights, threshold lights, and touchdown zone lights on the runway of intended landing should be realistically replicated	✓	✓	✓	✓		

No.	Table of Functions and Subjective Tests	FFS A	FFS B	FFS C	FFS D	Result YES	Result NO
	(4) Visual feature recognition **Note**—Tests 4(a) through 4(g) below contain the minimum distances at which runway features should be visible. Distances are measured from runway threshold to an airplane aligned with the runway on an extended 3-degree glide slope in suitable simulated meteorological conditions. For circling approaches, all tests below apply both to the runway used for the initial approach and to the runway of intended landing						
	(a) Runway definition, strobe lights, approach lights, and runway edge white lights from 8 km (5 sm) of the runway threshold	✓	✓	✓	✓		
	(b) Visual Approach Aids lights from 8 km (5 sm) of the runway threshold			✓	✓		
	(c) Visual Approach Aids lights from 5 km (3 sm) of the runway threshold	✓	✓				
	(d) Runway centerline lights and taxiway definition from 5 km (3 sm)	✓	✓	✓	✓		
	(e) Threshold lights and touchdown zone lights from 3 km (2 sm)	✓	✓	✓	✓		
	(f) Runway markings within range of landing lights for night scenes as required by the surface resolution test on day scenes	✓	✓	✓	✓		
	(g) For circling approaches, the runway of intended landing and associated lighting should fade into view in a non-distracting manner	✓	✓	✓	✓		
	(5) Airport model content. Minimum of three specific airport scenes as defined below						
	(a) terminal approach area						
	A accurate portrayal of airport features is to be consistent with published data used for airplane operations			✓	✓		
	B all depicted lights should be checked for appropriate colors, directionality, behavior and spacing (e.g., obstruction lights, edge lights, centre line, touchdown zone, VASI, PAPI, REIL and strobes)			✓	✓		
	C depicted airport lighting should be selectable via controls at the instructor station as required for airplane operation			✓	✓		
	D selectable airport visual scene capability at each model demonstrated for: (i) night (ii) twilight (iii) day			✓	✓		
	E (i) ramps and terminal buildings which correspond to an operator's LOFT and LOS scenarios			✓	✓		
	(ii) terrain- appropriate terrain, geographic and cultural features			✓	✓		
	(iii) dynamic effects - the capability to present multiple ground and air hazards such as another airplane crossing the active runway or converging airborne traffic; hazards should be selectable via controls at the instructor station			✓	✓		
	(iv) illusions - operational visual scenes which portray representative physical relationships known to cause landing illusions, for example short runways, landing approaches over water, uphill or downhill runways, rising terrain on the approach path and unique topographic features **Note** - Illusions may be demonstrated at a generic airport or specific aerodrome			✓	✓		
	(6) Correlation with airplane and associated equipment						
	(a) visual system compatibility with aerodynamic programming	✓	✓	✓	✓		
	(b) Visual cues to assess sink rate and depth perception during landings. Visual cueing sufficient to support changes in approach path by using runway perspective. Changes in visual cues during take-off and approach should not distract the pilot		✓	✓	✓		
	(c) accurate portrayal of environment relating to flight simulator attitudes	✓	✓	✓	✓		
	(d) the visual scene should correlate with integrated airplane systems, where fitted (e.g. terrain, traffic and weather avoidance systems and Head-up Guidance System (HGS))			✓	✓		
	(e) representative visual effects for each visible, own ship, airplane external light		✓	✓	✓		
	(f) the effect of rain removal devices should be provided			✓	✓		

No.	Table of Functions and Subjective Tests	FFS				Result	
		A	B	C	D	YES	NO
	(7) Scene quality						
	(a) surfaces and textural cues should be free from apparent quantization (aliasing)			✓	✓		
	(b) system capable of portraying full color realistic textural cues			✓	✓		
	(c) the system light points should be free from distracting jitter, smearing or streaking	✓	✓	✓	✓		
	(d) demonstration of occulting through each channel of the system in an operational Scene	✓	✓				
	(e) demonstration of a minimum of ten levels of occulting through each channel of the system in an operational scene			✓	✓		
	(f) system capable of providing focus effects that simulate rain and light point perspective growth			✓	✓		
	(g) system capable of six discrete light step controls (0-5)	✓	✓	✓	✓		
	(8) Environmental effects						
	(a) the displayed scene should correspond to the appropriate surface contaminants and include runway lighting reflections for wet, partially obscured lights for snow, or suitable alternative effects			✓	✓		
	(b) Special weather representations which include the sound, motion and visual effects of light, medium and heavy precipitation near a thunderstorm on take-off, approach and landings at and below an altitude of 600 m (2 000 ft) above the aerodrome surface and within a radius of 16 km (10 sm) from the aerodrome			✓	✓		
	(c) in - cloud effects such as variable cloud density, speed cues and ambient changes should be provided			✓	✓		
	(d) the effect of multiple cloud layers representing few, scattered, broken and overcast conditions giving partial or complete obstruction of the ground scene			✓	✓		
	(e) gradual break-out to ambient visibility/RVR, defined as up to 10% of the respective cloud base or top, 20 ft ≤ transition layer ≤200 ft; cloud effects should be checked at and below a height of 600 m (2 000 ft) above the aerodrome and within a radius of 16 km (10 sm) from the airport			✓	✓		
	(f) Visibility and RVR measured in terms of distance. Visibility/RVR should be checked at and below a height of 600 m (2 000 ft) above the aerodrome and within a radius of 16 km (10 sm.) from the airport	✓	✓	✓	✓		
	(g) Patchy fog giving the effect of variable RVR Note – Patchy fog is sometimes referred to as patchy RVR.			✓	✓		
	(h) effects of fog on aerodrome lighting such as halos and defocus			✓	✓		
	(i) effect of own ship lighting in reduced visibility, such as reflected glare, to include landing lights, strobes, and beacons			✓	✓		
	(j) wind cues to provide the effect of blowing snow or sand across a dry runway or taxiway should be selectable from the instructor station			✓	✓		
	(9) Instructor controls of:						
	(a) Environmental effects, e.g. cloud base, cloud effects, cloud density, visibility in kilometers/statute miles and RVR in meters/feet	✓	✓	✓	✓		
	(b) Airport/aerodrome selection	✓	✓	✓	✓		
	(c) Airport/aerodrome lighting including variable intensity where appropriate	✓	✓	✓	✓		
	(d) Dynamic effects including ground and flight traffic	✓	✓	✓	✓		
	(10) Night visual scene capability	✓	✓	✓	✓		
	(11) Twilight visual scene capability			✓	✓		
	(12) Daylight visual scene capability			✓	✓		

No.	Table of Functions and Subjective Tests	FFS				Result	
		A	B	C	D	YES	NO
n	**MOTION EFFECTS**						
	The following specific motion effects are required to indicate the threshold at which a flight crewmember should recognize an event or situation. Where applicable below, flight simulator pitch, side loading and directional control characteristics should be representative of the airplane as a function of airplane type:						
	(1) Effects of runway rumble, oleo deflections, ground speed, uneven runway, runway centerline lights and taxiway characteristics (a) After the airplane has been pre-set to the takeoff position and then released, taxi at various speeds, first with a smooth runway, and note the general characteristics of the simulated runway rumble effects of oleo deflections. Next repeat the maneuver with a runway roughness of 50%, then finally with maximum roughness. The associated motion vibrations should be affected by ground speed and runway roughness. If time permits, different gross weights can also be selected as this may also affect the associated vibrations depending on airplane type. The associated motion effects for the above tests should also include an assessment of the effects of centerline lights, surface discontinuities of uneven runways, and various taxiway characteristics	*	✓	✓	✓		
	(2) Buffets on the ground due to spoiler/speed brake extension and thrust (a) Perform a normal landing and use ground spoilers and reverse thrust – either individually or in combination with each other – to decelerate the simulated airplane. Do not use wheel braking so that only the buffet due to the ground spoilers and thrust reversers is felt.	*	✓	✓	✓		
	(3) Bumps associated with the landing gear (a) Perform a normal take-off paying special attention to the bumps that could be perceptible due to maximum oleo extension after lift-off. When the landing gear is extended or retracted, motion bumps could be felt when the gear locks into position	*	✓	✓	✓		
	(4) Buffet during extension and retraction of landing gear (a) Operate the landing gear. Check that the motion cues of the buffet experienced are reasonably representative of the actual airplane	*	✓	✓	✓		
	(5) Buffet in the air due to flap and spoiler/speed brake extension and approach to stall buffet (a) First perform an approach and extend the flaps and slats, especially with airspeeds deliberately in excess of the normal approach speeds. In cruise configuration verify the buffets associated with the spoiler/speed brake extension. The above effects could also be verified with different combinations of speed brake/flap/gear settings to assess the interaction effects	*	✓	✓	✓		
	(6) Approach to stall buffet (a) Conduct an approach-to-stall with engines at idle and a deceleration of 1 knot/second. Check that the motion cues of the buffet, including the level of buffet increase with decreasing speed, are reasonably representative of the actual airplane	*	✓	✓	✓		
	(7) Touchdown cues for main and nose gear (a) Fly several normal approaches with various rates of descent. Check that the motion cues of the touchdown bump for each descent rate are reasonably representative of the actual airplane	*	✓	✓	✓		
	(8) Nose wheel scuffing (a) Taxi the simulated airplane at various ground speeds and manipulate the nose wheel steering to cause yaw rates to develop which cause the nose wheel to vibrate against the ground (“scuffing”). Evaluate the speed/nose wheel combination needed to produce scuffing and check that the resultant vibrations are reasonably representative of the actual airplane	*	✓	✓	✓		
	(9) Thrust effect with brakes set (a) With the simulated airplane set with the brakes on at the take-off point, increase the engine power until buffet is experienced and evaluates its characteristics. This effect is most discernible with wing mounted engines. Confirm that the buffet increases appropriately with increasing engine thrust	*	✓	✓	✓		

No.	Table of Functions and Subjective Tests	FFS A	FFS B	FFS C	FFS D	Result YES	Result NO
	(10) Mach and maneuver buffet (a) With the simulated airplane trimmed in 1 g flight while at high altitude, increase the engine power such that the Mach number exceeds the documented value at which Mach buffet is experienced. Check that the buffet begins at the same Mach number as it does in the airplane (for the same configuration) and that buffet levels are a reasonable representation of the actual airplane. In the case of some airplanes, maneuver buffet could also be verified for the same effects. Maneuver buffet can occur during turning flight at conditions greater than 1 g, particularly at higher altitudes	*	✓	✓	✓		
	(11) Tire failure dynamics (a) Dependent on airplane type, a single tire failure may not necessarily be noticed by the pilot and therefore there should not be any special motion effect. There may possibly be some sound and/or vibration associated with the actual tire losing pressure. With a multiple tire failure selected on the same side the pilot may notice some yawing which should require the use of the rudder to maintain control of the airplane			✓	✓		
	(12) Engine malfunction and engine damage (a) The characteristics of an engine malfunction as stipulated in the malfunction definition document for the particular FSTD should describe the special motion effects felt by the pilot. The associated engine instruments should also vary according to the nature of the malfunction	*	✓	✓	✓		
	(13) Tail strikes and pod strikes (a) Tail-strikes can be checked by over-rotation of the airplane at a speed below Vr whilst performing a takeoff. The effects can also be verified during a landing. The motion effect should be felt as a noticeable bump. If the tail strike affects the airplane's angular rates, the cueing provided by the motion system should have an associated effect.	*	✓	✓	✓		
	(b) Excessive banking of the airplane during its take-off/landing roll can cause a pod strike. The motion effect should be felt as a noticeable bump. If the pod strike affects the airplane's angular rates, the cueing provided by the motion system should have an associated effect	*	✓	✓	✓		
o	**SOUND SYSTEM**						
	(1) The following checks should be performed during a normal flight profile with motion						
	(a) precipitation			✓	✓		
	(b) rain removal equipment			✓	✓		
	(c) significant airplane noises perceptible to the pilot during normal operations, such as engine, flaps, gear, spoiler extension/retraction, thrust reverser to a comparable level of that found in the airplane	✓	✓	✓	✓		
	(d) abnormal operations for which there are associated sound cues including, but not limited to, engine malfunctions, landing gear/tire malfunctions, tail and engine pod strike and pressurization malfunction			✓	✓		
	(e) sound of a crash when the flight simulator is landed in excess of limitations			✓	✓		
p	**SPECIAL EFFECTS**						
	(1) Braking Dynamics (a) Representative brake failure dynamics (including antiskid) and decreased brake efficiency due to high brake temperatures based on airplane related data. These representations should be realistic enough to cause pilot identification of the problem and implementation of appropriate procedures. FSTD pitch, side-loading and directional control characteristics should be representative of the airplane			✓	✓		
	(2) Effects of Airframe and Engine Icing (a) See Appendix 1 to JCAR FSTD A.030 par 2.1(t).			✓	✓		

NOTE 1: For Level 'A', an asterisk (*****) denotes that the appropriate effect is required to be present.
NOTE 2: Motion and buffet cues will only be applicable to FSTD equipped with an appropriate motion system:
(1) Takeoff characteristics sufficient to commence the airborne exercises
(2) For FNPT 1
(3) Only trim change required
(4) For FNPT, variable intensity airport lighting not required

Remarks	

Inspector Name	**Date**	**Signature**

D. Full Flight Simulator (FFS) Validation Test.

1. PERFORMANCE										
No	**Tests**	**Tolerance**	**Flight Conditions**	**FFS**				**COMMENTS**	**Result**	
				A	**B**	**C**	**D**		**YES**	**NO**
a	**TAXI**									
	(1) Minimum Radius Turn.	± 0.9 m (3 ft) or ± 20% of airplane turn radius.	Ground	C T & M	✓	✓	✓	Plot both main and nose gear turning loci. Data for no brakes and the minimum thrust required maintaining a steady turn except for airplanes requiring asymmetric thrust or braking to turn.		
	(2) Rate of Turn vs. Nose wheel Steering Angle (NWA).	± 10% or ± 2º/s turn rate.	Ground	C T & M	✓	✓	✓	Tests for a minimum of two speeds, greater than minimum turning radius speed, with a spread of at least 5 kts groundspeed		
b	**TAKE-OFF**									
								Note-All commonly used take-off flap settings should be demonstrated at least once either in minimum un-stick speed (1b3), normal take-off (1b4), and critical engine failure on take-off (1b5) or cross wind take-off (1b6).		
	(1) Ground Acceleration Time and Distance.	± 5% or ±1.5 s time and ± 5% or ± 61 m (200 ft) distance	Take-off	C T & M	✓	✓	✓	Acceleration time and distance should be recorded for a minimum of 80% of the total time from brake release to VR. May be combined with normal takeoff (1b4) or rejected takeoff (1b7). Plotted data should be shown using appropriate scales for each portion of the maneuver.		
	(2) Minimum Control Speed, ground (VMCG) aerodynamic controls only per applicable airworthiness requirement or alternative engine inoperative test to demonstrate ground control characteristics.	± 25% of maximum airplane lateral deviation or ± 1.5 m (5 ft) For airplanes with reversible flight control systems: ± 10% or ± 2·2 daN (5 lb) rudder pedal force	Take-off	C T & M	✓	✓	✓	Engine failure speed should be within ± 1 kt of airplane engine failure speed. Engine thrust decay should be that resulting from the mathematical model for the engine variant applicable to the flight simulator under test. If the modeled engine variant is not the same as the airplane manufacturers' flight test engine, then a further test may be run with the same initial conditions using the thrust from the flight test data as the driving parameter. If a VMCG test is not available an acceptable alternative is a flight test snap engine deceleration to idle at a speed between V1 and V1-10 kts, followed by control of heading using aerodynamic control only and recovery should be achieved with the main gear on the ground. To ensure only aerodynamic control, nose wheel steering should be disabled (i.e., catered) or the nose wheel held slightly off the ground		

1. PERFORMANCE

No	Tests	Tolerance	Flight Conditions	FFS A	FFS B	FFS C	FFS D	COMMENTS	Result YES	Result NO
	(3) Minimum Un-stick Speed (VMU) or equivalent test to demonstrate early rotation take off characteristics.	± 3 kts airspeed ± 1.5º pitch angle	Take-off	C T & M	✓	✓	✓	VMU 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 VMU test is not available, alternative acceptable flight tests are a constant high attitude take-off run through main gear liftoff, or an early rotation take-off. Record time history data from 10 kts before start of rotation until at least 5 seconds after the occurrence of main gear lift-off.		
	(4) Normal Take-off.	± 3 kts airspeed ± 1.5º pitch angle ± 1.5º AOA ± 6 m (20 ft) height For airplanes with reversible flight control systems: ± 10% or ± 2·2 daN (5 lb) column force	Take-off	C T & M	✓	✓	✓	Data required for near maximum certificated take-off weight at mid centre of gravity and light take-off weight at an AFT centre of gravity. If the airplane has more than one certificated take-off configuration, a different configuration should be used for each weight. Record take-off profile from brake release to at least 61 m (200 ft) AGL. May be used for ground acceleration time and distance (1b1). Plotted data should be shown using appropriate scales for each portion of the maneuver.		
	(5) Critical Engine Failure on Takeoff	± 3 kts airspeed ± 1.5º pitch angle ± 1.5º AOA ± 6 m (20 ft) height ± 2º bank and side slip angle ± 3° heading angle For airplanes with reversible flight control systems: ± 10% or ± 2·2 daN (5 lb) column force ± 10% or ± 1·3 daN (3 lb) wheel force ± 10% or ± 2·2 daN (5 lb) rudder pedal force	Take-off	C T & M	✓	✓	✓	Record take-off profile to at least 61 m (200 ft) AGL. Engine failure speed should be within ± 3 kts of airplane data. Test at near maximum take-off weight.		

1. PERFORMANCE

No	Tests	Tolerance	Flight Conditions	FFS A	FFS B	FFS C	FFS D	COMMENTS	Result YES	Result NO
	(6) Crosswind Takeoff	± 3 kts airspeed ± 1.5º pitch angle ± 1.5º AOA ± 6 m (20 ft) height ± 2º bank and side slip angle ± 3° heading Correct trends at airspeeds below 40 kts for rudder/pedal and heading. For airplanes with reversible flight control systems: ± 10% or ± 2·2 daN (5 lb) column force ± 10% or ± 1·3 daN (3 lb) wheel force ± 10% or ± 2·2 daN (5 lb) rudder pedal force	Take-off	C T & M	✓	✓	✓	Record take-off profile from brake release to at least 61 m (200 ft) AGL. Requires test data, including wind profile, for a crosswind component of at least 60% of the AFM value measured at 10m (33 ft) above the runway.		
	(7) Rejected Takeoff	± 5% time or ± 1.5 s ± 7.5% distance or ± 76 m (250 ft)	Take-off	C T & M	✓	✓	✓	Record near maximum take-off weight. Speed for reject should be at least 80% of V_1. Auto brakes will be used where applicable. Maximum braking effort, auto or manual. Time and distance should be recorded from brake release to a full stop.		
	(8) Dynamic Engine Failure after Take-off.	± 20% or ± 2º/s body angular rates	Take-off	C T & M	✓	✓	✓	Engine failure speed should be within ± 3 kts of airplane data. Engine failure may be a snap deceleration to idle. Record hands off from 5 sec before engine failure to + 5 sec or 30 deg banks, whichever occurs first. Note: for safety considerations, airplane flight test may be performed out of ground effect at a safe altitude, but with correct airplane configuration and airspeed. CCA: Test in normal AND Non-normal Control state.		

No	Tests	Tolerance	Flight Conditions	FFS A	FFS B	FFS C	FFS D	COMMENTS	Result YES	Result NO
1. PERFORMANCE										
c	**CLIMB**									
	(1) Normal Climb All engines operating	± 3 kts airspeed ± 5% or ± 0·5 m/s (100 ft/min) R/C	Clean or specified climb configuration	✓	✓	✓	✓	Flight test data or airplane performance manual data may be used. Record at nominal climb speed and mid initial climb altitude. FSTD performance to be recorded over an interval of at least 300 m (1 000 ft).		
	(2) One Engine Inoperative Second Segment Climb	± 3 kts airspeed ± 5% or ± 0.5 m/s (100 ft/min) R/C but not less than AFM values.	2nd Segment Climb for FNPTs and BITDs Gear up and Take-off Flaps		✓	✓	✓	Flight test data or airplane performance manual data may be used. Record at nominal climb speed. Flight simulator performance to be recorded over an interval of at least 300m (1 000 ft). Test at WAT (Weight, Altitude, or Temperature) limiting condition.		
	(3) One Engine Inoperative En route Climb.	± 10% time ± 10% distance ± 10% fuel used	Clean	✓	✓	✓	✓	Flight test data or airplane performance manual data may be used. Test for at least a 1 550 m (5 000 ft) segment.		
	(4) One Engine Inoperative Approach Climb for airplanes with icing accountability if required by the flight manual for this phase of flight.	± 3 kts airspeed ± 5% or ± 0.5 m/s (100 ft/min) R/C but not less than AFM values	Approach			✓	✓	Flight test data or airplane performance manual data may be used. FSTD performance to be recorded over an interval of at least 300 m (1 000 ft). Test near maximum certificated landing weight as may be applicable to an approach in icing conditions. Airplane should be configured with all anti ice and de-ice systems operating normally, gear up and go-around flap. All icing accountability considerations, in accordance with the flight manual for an approach in icing conditions, should be applied		

1. PERFORMANCE										
No	**Tests**	**Tolerance**	**Flight Conditions**	**FFS**				**COMMENTS**	**Result**	
				A	**B**	**C**	**D**		**YES**	**NO**
d	**CRUISE/DESCENT**									
	(1) Level Flight Acceleration	± 5% time	Cruise	CT&M	✓	✓	✓	Minimum of 50 kts. Increase using maximum continuous thrust rating or equivalent. For very small airplanes, speed change may be reduced to 80% of operational speed range		
	(2) Level Flight Deceleration	± 5% time	Cruise	CT&M	✓	✓	✓	Minimum of 50 kts. decrease using idle power. For very small airplanes, speed change may be reduced to 80% of operational speed range		
	(3) Cruise Performance	± 0.05 EPR or ± 5% N1 or ± 5% torque ± 5% fuel flow	Cruise	✓	✓	✓	✓	May be a single snapshot showing instantaneous fuel flow or a minimum of two consecutive snapshots with a spread of at least 3 minutes in steady flight.		
	(4) Idle Descent	± 3 kts airspeed ± 5% or ± 1·0 m/s (200 ft/min) R/D	Clean	✓	✓	✓	✓	Idle power stabilized descent at normal descent speed at mid altitude. Flight simulator performance to be recorded over an interval of at least 300 m (1 000 ft).		
	(5) Emergency Descent	± 5 kts airspeed ± 5% or ± 1·5 m/s (300 ft/min) R/D	As per AFM	✓	✓	✓	✓	Stabilized descent to be conducted with speed brakes extended if applicable, at mid altitude and near VMO or according to emergency descent procedure. Flight simulator performance to be recorded over an interval of at least 900 m (3 000 ft).		
e	**STOPPING**									
	(1) Deceleration Time and Distance, Manual Wheel Brakes, Dry Runway, No Reverse Thrust.	± 5% or ±1.5 s time. For distances up to 1 220 m (4 000 ft) ± 61 m (200 ft) or ± 10%, whichever is the smaller. For distances greater than 1 220 m (4000 ft) ± 5% distance.	Landing	CT&M	✓	✓	✓	Time and Distance should be recorded for at least 80% of the total time from touchdown to a full stop. Data required for medium and near maximum certificated landing weight. Engineering data may be used for the medium weight condition. Brake system pressure should be recorded.		
	(2) Deceleration Time and Distance, Reverse Thrust No Wheel Brakes, Dry Runway.	± 5% or ±1.5 s time and the smaller of ± 10% or ± 61 m (200 ft) of distance.	Landing	CT&M	✓	✓	✓	Time and distance should be recorded for at least 80% of the total time from initiation of reverse thrust to full thrust reverser minimum operating speed. Data required for medium and near maximum certificated landing weights. Engineering data may be used for the medium weight condition.		

1. PERFORMANCE										
No	**Tests**	**Tolerance**	**Flight Conditions**	**FFS A**	**FFS B**	**FFS C**	**FFS D**	**COMMENTS**	**Result YES**	**Result NO**
	(3) Stopping Distance, Wheel Brakes, Wet Runway.	± 10% or ± 61 m (200 ft) distance	Landing			✓	✓	Either flight test or manufacturers performance manual data should be used where available. Engineering data, based on dry runway flight test stopping distance and the effects of contaminated runway braking coefficients are an acceptable alternative.		
	(4) Stopping Distance, Wheel Brakes, icy Runway.	± 10% or ± 61 m (200 ft) distance	Landing			✓	✓	Either flight test or manufacturer's performance manual data should be used where available. Engineering data, based on dry runway flight test stopping distance and the effects of contaminated runway braking coefficients, are an acceptable alternative.		
f	**ENGINES**									
	(1) Acceleration	± 10% Ti or ± 0·25s ± 10% Tt	Approach or Landing	C T & M	✓	✓	✓	Ti = Total time from initial throttle movement until a 10% response of a critical engine parameter. Tt = Total time from initial throttle movement to 90% of go around power. Critical engine parameter should be a measure of power (N1, N2, EPR, etc). Plot from flight idle to go around power for a rapid throttle movement.		
	(2) Deceleration	± 10% TI or ± 0·25s ± 10% Tt	Ground	C T & M	✓	✓	✓	Ti = Total time from initial throttle movement Ti = Total time from initial throttle movement until a 10% response of a critical engine parameter. Tt = Total time from initial throttle movement to 90% decay of maximum take-off power. Plot from maximum take-off power to idle for a rapid throttle movement.		

No	Tests	Tolerance	Flight Conditions	FFS A	FFS B	FFS C	FFS D	COMMENTS	Result YES	Result NO
2. HANDLING QUALITIES										
a	**STATIC CONTROL CHECKS**									
								NOTE: Pitch, roll and yaw controller position vs. force or time shall be measured at the control. An alternative method would be to instrument the FSTD in an equivalent manner to the flight test airplane. The force and position data from this instrumentation can be directly recorded and matched to the airplane data. Such a permanent installation could be used without any time for installation of external devices. CCA: Testing of position versus force is not applicable if forces are generated solely by use of airplane hardware in the FSTD.		
	(1) Pitch Controller Position vs. Force and Surface Position Calibration.	± 0.9 daN (2 lbs) breakout. ± 2.2 daN (5 lbs) or ± 10% force. ± 2º elevator angle	Ground	✓	✓	✓	✓	Uninterrupted control sweep to stops. Should be validated (where possible) with in-flight data from tests such as longitudinal static stability, stalls, etc. Static and dynamic flight control tests should be accomplished at the same feel or impact pressures.		
	(2) Roll Controller Position vs. Force and Surface Position Calibration.	± 0.9 daN (2 lbs) breakout ± 1.3 daN (3 lbs) or ± 10% force ± 2º aileron angle ± 3º spoiler angle	Ground	✓	✓	✓	✓	Uninterrupted control sweep to stops. Should be validated with in-flight data from tests such as engine out trims, steady state sideslips, etc. Static and dynamic flight control tests should be accomplished at the same feel or impact pressures.		
	(3) Rudder Pedal Position vs. Force and Surface Position Calibration.	± 2.2 daN (5 lbs) breakout ± 2.2 daN (5 lbs) or ± 10% force ± 2º rudder angle	Ground	✓	✓	✓	✓	Uninterrupted control sweep to stops. Should be validated with in flight data from tests such as engine out trims, steady state sideslips, etc. Static and dynamic flight control tests should be accomplished at the same feel or impact pressures		
	(4) Nose wheel Steering Controller Force and Position Calibration.	± 0.9 daN (2 lbs) breakout ± 1.3 daN (3 lbs) or ± 10% force ± 2º NWA	Ground	CT&M	✓	✓	✓	Uninterrupted control sweep to stops		
	(5) Rudder Pedal Steering Calibration.	± 2º NWA	Ground	CT&M	✓	✓	✓	Uninterrupted control sweep to stops		
	(6) Pitch Trim Indicator vs. Surface Position Calibration	± 0.5º trim angle.	Ground	✓	✓	✓	✓	Purpose of test is to compare flight simulator against design data or equivalent		

2. HANDLING QUALITIES

No	Tests	Tolerance	Flight Conditions	FFS A	FFS B	FFS C	FFS D	COMMENTS	Result YES	Result NO
	(7) Pitch Trim Rate	± 10% or ± 0.5 deg/s trim rate (°/s)	Ground and approach	✓	✓	✓	✓	Trim rate to be checked at pilot primary induced trim rate (ground) and autopilot or pilot primary trim rate in flight at go-around flight conditions.		
	(8) Alignment of Cockpit Throttle Lever vs. Selected Engine Parameter.	± 5º of TLA or ± 3% N1 or ± 0·03 EPR or ± 3% torque For propeller-driven airplanes, where the propeller levers do not have angular travel, a tolerance of ± 2 cm (± 0.8 in) applies.	Ground	✓	✓	✓	✓	Simultaneous recording for all engines. The tolerances apply against airplane data and between engines. For airplanes with throttle detents, all detents to be presented. In the case of propeller-driven airplanes, if an additional lever, usually referred to as the propeller lever, is present, it should also be checked. Where these levers do not have angular travel a tolerance of ± 2 cm (± 0.8 inches) applies. May be a series of Snapshot tests		
	(9) Brake Pedal Position vs. Force and Brake System Pressure Calibration.	± 2.2 daN (5 lbs) or ± 10% force. ± 1.0 MPa (150 psi) or ± 10% brake system pressure.	Ground	C T & M	✓	✓	✓	Flight simulator computer output results may be used to show compliance. Relate the hydraulic system pressure to pedal position in a ground static test.		

No	Tests	Tolerance	Flight Conditions	FFS A	FFS B	FFS C	FFS D	COMMENTS	Result YES	Result NO
2. HANDLING QUALITIES										
b	**DYNAMIC CONTROL CHECKS**									
								Tests 2b1, 2b2, and 2b3 are not applicable if dynamic response is generated solely by use of airplane hardware in the flight simulator. Power setting may be that required for level flight unless otherwise specified		
	(1) Pitch Control.	<u>For under damped systems</u>: ± 10% of time from 90% of initial displacement (Ad) 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 (A_d). ± 1 overshoot (first significant overshoot should be matched) <u>For over damped systems:</u> ± 10% of time from 90% of initial displacement (A_d) to 10 % of initial displacement (0·1 A_d)	Take-off, Cruise, and Landing			✓	✓	Data should be for normal control displacements in both directions (approximately 25% to 50% full throw or approximately 25% to 50% of maximum allowable pitch controller deflection for flight conditions limited by the maneuvering load envelope). Tolerances apply against the absolute values of each period (considered independently). n = The sequential period of a full oscillation. Refer to paragraph 2.4.1		

2. HANDLING QUALITIES

No	Tests	Tolerance	Flight Conditions	FFS A	FFS B	FFS C	FFS D	COMMENTS	Result YES	Result NO
	(2) Roll Control.	For under damped systems: ± 10% of time from 90% of initial displacement (Ad) 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 (Ad). ± 1 overshoot (first significant overshoot should be matched) For over damped systems: ± 10% of time from 90% of initial displacement (Ad) to 10 % of initial displacement (0·1 Ad).	Take-off, Cruise, and Landing			✓	✓	Data should be for normal control displacement (approximately 25% to 50% of full throw or approximately 25% to 50% of maximum allowable roll controller deflection for flight conditions limited by the maneuvering load envelope). Refer to paragraph 2.4.1		
	(3) Yaw Control.	For under damped systems: ± 10% of time from 90% of initial displacement (Ad) 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 (Ad). ± 1 overshoot (first significant overshoot should be matched) For over damped systems: ± 10% of time from 90% of initial displacement (Ad) to 10 % of initial displacement (0·1 Ad).	Take-off, Cruise, and Landing			✓	✓	Data should be for normal displacement (Approximately 25% to 50% of full throw). Refer to paragraph 2.4.1		

2. HANDLING QUALITIES										
No	Tests	Tolerance	Flight Conditions	FFS				COMMENTS	Result	
				A	B	C	D		YES	NO
	(4) Small Control Inputs - pitch.	± 0·15 °/s body pitch rate or ± 20% of peak body pitch rate applied throughout the time history.	Approach or Landing			✓	✓	Control inputs should be typical of minor corrections made while established on an ILS approach (approximately 0·5 to 2 °/s pitch rate). Test in both directions. Show time history data from 5 seconds before until at least 5 seconds after initiation of control input. CCA: Test in normal AND non-normal control state.		
	(5) Small Control Inputs - roll	± 0·15 °/s body roll rate or ± 20% of peak body roll rate applied throughout the time history	Approach or Landing			✓	✓	Control inputs should be typical of minor corrections made while established on an ILS approach (approximately 0·5 to 2 °/s roll rate). Test in one direction. For airplanes that exhibit non symmetrical behavior, test in both directions. Show time history data from 5 seconds before until at least 5 seconds after initiation of control input. CCA: Test in normal AND non-normal control state		
	(6) Small Control Inputs – yaw	± 0·15 °/s body yaw rate or ± 20% of peak body yaw rate applied throughout the time history	Approach or Landing			✓	✓	Control inputs should be typical of minor corrections made while established on an ILS approach (approximately 0·5 to 2 °/s yaw rate). Test in one direction. For airplanes that exhibit non-symmetrical behavior, test in both directions. Show 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 state.		

2. HANDLING QUALITIES

No	Tests	Tolerance	Flight Conditions	FFS A	FFS B	FFS C	FFS D	COMMENTS	Result YES	Result NO
c	**LONGITUDINAL**							Power setting may be that required for level flight unless otherwise specified.		
	(1) Power Change Dynamics.	± 3 kts airspeed ± 30 m (100 ft) altitudes. ± 1.5º or ± 20% pitch angle	Approach	✓	✓	✓	✓	Power change from thrust for approach or level flight to maximum continuous or go-around power. Time history of uncontrolled free response for a time increment equal to at least 5 sec before initiation of the power change to completion of the power change + 15 sec. CCA: Test in Normal AND Non-normal Control state.		
	(2) Flap Change Dynamics.	± 3 kts airspeed ± 30 m (100 ft) altitudes. ± 1.5º or ± 20% pitch angle	Take-off Through initial flap retraction and approach to landing	✓	✓	✓	✓	Time history of uncontrolled free response for a time increment equal to at least 5 sec before initiation of the reconfiguration change to completion of the reconfiguration change + 15 sec. CCA: Test in Normal and Non-normal Control state.		
	(3) Spoiler / Speed brake Change Dynamics.	± 3 kts airspeed ± 30 m (100 ft) altitude. ± 1.5 º or ± 20% pitch angle	Cruise	✓	✓	✓	✓	Time history of uncontrolled free response for a time increment equal to at least 5 sec before initiation of the reconfiguration change to completion of the reconfiguration change + 15 sec. Results required for both extension and retraction. CCA: Test in Normal AND Non-normal Control state.		
	(4) Gear Change Dynamics.	± 3 kts airspeed ± 30 m (100 ft) altitude. ± 1.5º or ± 20% pitch angle For FNPTs and BITDs, ± 2º or ± 20% pitch angle	Takeoff (retraction) and Approach (extension)	✓	✓	✓	✓	Time history of uncontrolled free response for a time increment equal to at least 5 sec before initiation of the configuration change to completion of the reconfiguration change + 15 sec. CCA: Test in Normal AND Non-normal Control state.		
	(5) Longitudinal Trim	± 1º elevator ± 0·5º stabilizer ± 1º pitch angle ± 5% net thrust or equivalent	Cruise, Approach and Landing	✓	✓	✓	✓	Steady-state wings level trim with thrust for level flight. May be a series of snapshot tests. CCA: Test in Normal OR Non-normal Control state.		

2. HANDLING QUALITIES										
No	Tests	Tolerance	Flight Conditions	FFS A	FFS B	FFS C	FFS D	COMMENTS	Result YES	Result NO
	(6) Longitudinal Maneuvering Stability (Stick Force /g).	± 2.2 daN (5 lbs) or ± 10% pitch controller Force Alternative method: ± 1º or ± 10% change of elevator	Cruise, Approach and Landing	✓	✓	✓	✓	Continuous time history data or a series of snapshot tests may be used. Test up to approximately 30º of bank for approach and landing configurations. Test up to approximately 45º of bank for the cruise configuration. Force tolerance not applicable if forces are generated solely by the use of airplane hardware in the FSTD. Alternative method applies to airplanes which do not exhibit stick-force-per-g characteristics. CCA: Test in Normal AND Non-normal Control state as applicable.		
	(7) Longitudinal Static Stability.	± 2.2 daN (5 lbs) or ± 10% pitch controller force. Alternative method: ± 1° or ± 10% change of elevator	Approach	✓	✓	✓	✓	Data for at least two speeds above and two speeds below trim speed. May be a series of snapshot tests. Force tolerance not applicable if forces are generated solely by the use of airplane hardware in the FSTD. Alternative method applies to airplanes which do not exhibit speed stability characteristics. CCA: Test in Normal OR Non-normal Control state as applicable		
	(8) Stall Characteristics.	± 3 kts airspeed for initial buffet, stall warning, and stall speeds. For airplanes with reversible flight control systems (for FS only): ± 10% or ± 2·2 daN (5 lb) column force (prior to g-break only)	2nd Segment Climb and Approach or Landing	✓	✓	✓	✓	Wings-level (1 g) stall entry with thrust at or near idle power. Time history data should be shown to include full stall and initiation of recovery. Stall warning signal should be recorded and should occur in the proper relation to stall. FSTDs for airplanes exhibiting a sudden pitch attitude change or 'g break' should demonstrate this characteristic. CCA: Test in Normal and Non-normal Control state.		
	(9) Phugoid Dynamics.	± 10% period. ± 10% time to ½ or double amplitude or ± 0.02 of damping ratio.	Cruise	✓	✓	✓	✓	Test should include 3 full cycles or that necessary to determine time to ½ or double amplitude, whichever is less. CCA: Test in Non-normal Control state.		
		± 10% Period with representative damping	Cruise					Test should include at least 3 full cycles. Time history recommended.		

2. HANDLING QUALITIES

No	Tests	Tolerance	Flight Conditions	FFS A	FFS B	FFS C	FFS D	COMMENTS	Result YES	Result NO
	(10) Short Period Dynamics.	± 1.5º pitch angle or ± 2º/s pitch rate. ± 0.1 g normal acceleration.	Cruise	✓	✓	✓	✓	CCA: Test in Normal AND Non-normal Control state.		
d	**LATERAL DIRECTIONAL**							Power setting may be that required for level flight unless otherwise specified.		
	(1) Minimum Control Speed, Air (VMCA or VMCL), per Applicable Airworthiness Standard or Low Speed Engine Inoperative Handling Characteristics in the Air.	± 3 kts airspeed	Take-off or Landing (whichever is most critical in The airplane)	C T & M	✓	✓	✓	Minimum speed may be defined by a performance or control limit which prevents demonstration of VMC or VMCL in the conventional manner. Take-off thrust should be set on the operating engine(s). Time history or snapshot data may be used CCA: Test in Normal OR Non-normal Control state.		
	(2) Roll Response (Rate).	± 10% or ± 2º/sec roll rate FS only: For airplanes with reversible flight control systems: ± 10% or ± 1·3 daN (3 lb) roll controller force.	Cruise and Approach or Landing	✓	✓	✓	✓	Test with normal roll control displacement (about 30% of maximum control wheel). May be combined with step input of flight deck roll controller test (2d3).		
	(3) Step Input of Cockpit Roll Controller (or Roll Overshoot).	± 10% or ± 2º bank angle	Approach or Landing	✓	✓	✓	✓	With wings level, apply a step roll control input using approximately one-third of roll controller travel. At approximately 20° to 30° bank, abruptly return the roll controller to neutral and allow at least 10 seconds of airplane free response. May be combined with roll response (rate) test (2d2). CCA: Test in Normal AND Non-normal Control state.		
	(4) Spiral Stability.	Correct trend and ± 2º or ± 10% bank angle in 20 seconds If alternate test is used: correct trend and ± 2° aileron.	Cruise and Approach or Landing	✓	✓	✓	✓	Airplane data averaged from multiple tests may be used. Test for both directions. As an alternative test, show lateral control required to maintain a steady turn with a bank angle of approximately 30°. CCA: Test in Non-normal Control state.		
	(5) Engine Inoperative Trim.	± 1º rudder angle or ± 1º tab angle or equivalent pedal. ± 2º sideslip angle.	2nd Segment Climb and Approach or Landing	✓	✓	✓	✓	Test should be performed in a manner similar to that for which a pilot is trained to trim an engine failure condition. 2nd segment climb test should be at take-off thrust. Approach or landing test should be at thrust for level flight. May be snapshot tests.		

2. HANDLING QUALITIES

No	Tests	Tolerance	Flight Conditions	FFS A	FFS B	FFS C	FFS D	COMMENTS	Result YES	Result NO
	(6) Rudder Response.	± 2º/s or ± 10% yaw rate	Approach or Landing	✓	✓	✓	✓	Test with stability augmentation ON and OFF.		
		± 2 deg/sec or ± 10% yaw rate or heading change						Test with a step input at approximately 25% of full rudder pedal throw. CCA: Test in Normal AND Non-normal Control state.		
	(7) Dutch Roll (Yaw Damper OFF).	± 0.5 s or ± 10% of period. ± 10% of time to ½ or double amplitude or ± 0.02 of damping ratio. ± 20% or ± 1 s of time difference between peaks of bank and sideslip	Cruise and Approach or Landing	✓	✓	✓	✓	Test for at least 6 cycles with stability augmentation OFF. CCA: Test in Non-normal Control state		
	(8) Steady State Side slip.	For a given rudder position: ± 2º bank angle ± 1º sideslip angle ± 10% or ± 2º aileron ± 10% or ± 5º spoiler or equivalent roll controller position or force For FFSs representing aircraft with reversible flight control systems: ±10% or ±1·3 daN (3 lb) wheel force ±10% or ±2·2 daN (5 lb) rudder pedal force.	Approach or Landing	✓	✓	✓	✓	May be a series of snapshot tests using at least two rudder positions (in each direction for propeller driven airplanes) one of which should be near maximum allowable rudder.		

2. HANDLING QUALITIES										
No	Tests	Tolerance	Flight Conditions	FFS				COMMENTS	Result	
				A	B	C	D		YES	NO
e	**LANDINGS**									
	(1) Normal Landing	± 3 kts airspeed ± 1.5º pitch angle ± 1.5º AOA ± 3 m (10 ft) or ± 10% of height For airplanes with reversible flight control systems: ± 10% or ± 2·2 daN (5 lb) column force	Landing	C T & M	✓	✓	✓	Test from a minimum of 61 m (200 ft) AGL to nose wheel touch- down. Two tests should be shown, including two normal landing flaps (if applicable) one of which should be near maximum certificated landing weight, the other at light or medium weight CCA: Test in Normal AND Non-normal Control state if applicable.		
	(2) Minimum Flap Landing.	± 3 kts airspeed ± 1.5º pitch angle ± 1.5º AOA ± 3 m (10 ft) or ± 10% of height For airplanes with reversible flight control systems: ± 10% or ± 2·2 daN (5 lb) column force	Minimum Certified Landing Flap Configuration		✓	✓	✓	Test from a minimum of 61 m (200 ft) AGL to nose wheel touchdown. Test at near maximum landing weight.		
	(3) Crosswind Landing.	± 3 kts airspeed ± 1.5º pitch angle ± 1.5º AOA ± 3 m (10 ft) or ± 10% height ± 2º bank angle ± 2º sideslip angle ± 3° heading angle For airplanes with reversible flight control systems: ± 10% or ± 2·2 daN (5 lb) column force ± 10% or ± 1·3 daN (3 lb) wheel force ± 10% or ± 2·2 daN (5 lb) rudder pedal force.	Landing		✓	✓	✓	Test from a minimum of 61 m (200 ft) AGL to a 50% decrease in main landing gear touchdown speed. Requires test data, including wind profile, for a crosswind component of at least 60% of AFM value measured at 10m (33 ft) above the runway.		
	(4) One Engine Inoperative Landing.	± 3 kts airspeed ± 1.5º pitch angle ± 1.5º AOA ± 3 m (10 ft) or ± 10% height ± 2º bank angle ± 2º sideslip angle ± 3° heading angle	Landing		✓	✓	✓	Test from a minimum of 61 m (200 ft) AGL to a 50% decrease in main landing gear touchdown speed.		

No	Tests	Tolerance	Flight Conditions	FFS A	FFS B	FFS C	FFS D	COMMENTS	Result YES	Result NO
2. HANDLING QUALITIES										
	(5) Autopilot Landing (if applicable).	± 1.5 m (5 ft) flare height. ± 0.5 s or ± 10%Tf. ± 0.7 m/s (140ft/min) R/D at touchdown. ± 3 m (10 ft) 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. Time of autopilot flare mode engage and main gear touchdown should be noted. This test is not a substitute for the ground effects test requirement. Tf = Duration of Flare.		
	(6) All engine autopilot Go Around.	± 3 kts airspeed ± 1.5° pitch angle ± 1.5° AOA	As per AFM		✓	✓	✓	Normal all engine autopilot go around should be demonstrated (if applicable) at medium weight. CCA: Test in Normal AND Non-normal		
	(7) One-Engine inoperative Go around	± 3 kts airspeed ±1·5° pitch angle ±1·5° AOA ± 2° bank angle ± 2° sideslip angle	As per AFM		✓	✓	✓	Engine inoperative go-around required near maximum certificated landing weight with critical engine(s) inoperative. Provide one test with autopilot (if applicable) and one without autopilot. CCA: Non-autopilot test to be conducted in Non-normal mode.		
	(8) Directional Control (Rudder Effectiveness) with Reverse Thrust symmetric).	± 5 kts airspeed ± 2°/s yaw rate	Landing		✓	✓	✓	Apply rudder pedal input in both directions using full reverse thrust until reaching full thrust reverser minimum operating speed.		
	(9) Directional Control (Rudder Effectiveness) with Reverser Thrust asymmetric)	± 5 kts airspeed ± 3° heading angle	Landing		✓	✓	✓	With full reverse thrust on the operating engine(s), maintain heading with rudder pedal input until maximum rudder pedal input or thrust reverser minimum operating speed is reached.		
f	**GROUND EFFECT**									
	(1) A Test to demonstrate Ground Effect.	± 1º elevator ± 0·5º stabilizer angle. ± 5% net thrust or equivalent. ± 1º AOA ± 1.5 m (5 ft) or ± 10% height ± 3 kts airspeed ± 1º pitch angle	Landing		✓	✓	✓	See Paragraph 2.4.2. A rationale should be provided with justification of results. CCA: Test in Normal or Non-normal control state.		

2. HANDLING QUALITIES

No	Tests	Tolerance	Flight Conditions	FFS A	FFS B	FFS C	FFS D	COMMENTS	Result YES	Result NO
g	**WIND SHEAR**									
	(1) Four Tests, two take-off and two landing with one of each conducted in still air and the other with Wind Shear active to demonstrate Wind Shear models.	None	Take-off and Landing			✓	✓	Wind shear models are required which provide training in the specific skills required for recognition of wind shear phenomena and execution of recovery maneuvers Wind shear models should be representative of measured or accident derived winds, but may be simplifications which ensure repeatable encounters. For example, models may consist of independent variable winds in multiple simultaneous components. Wind models should be available for the following critical phases of flight: (1) Prior to take-off rotation (2) At lift-off (3) During initial climb (4) Short final approach The United States Federal Aviation Administration (FAA) Wind shear Training Aid, wind models from the Royal Aerospace Establishment (RAE), the United States Joint Aerodrome Weather studies (JAWS) Project or other recognized sources may be implemented and should be supported and properly referenced in the QTG. Wind models from alternate sources may also be used if supported by airplane related data and such data are properly supported and referenced in the QTG. Use of alternate data should be coordinated with the CARC prior to submittal of the QTG for approval		

2. HANDLING QUALITIES

No	Tests	Tolerance	Flight Conditions	FFS A	FFS B	FFS C	FFS D	COMMENTS	Result YES	Result NO
h	**FLIGHT AND MANOEUVRE ENVELOPE PROTECTION FUNCTIONS**									
								This paragraph is only applicable to Computer-controlled airplanes. Time history results of response to control inputs during entry into each envelope protection function (i.e., with normal and degraded control states if function is different) are required. Set thrust as required to reach the envelope protection function		
	(1) Over speed	± 5 kts airspeed	Cruise	✓	✓	✓	✓			
	(2) Minimum Speed.	± 3 kts airspeed	Take-off, Cruise and Approach or Landing							
	(3) Load Factor	± 0.1 g	Take-off, Cruise	✓	✓	✓	✓			
	(4) Pitch Angle	± 1.5º pitch angle	Cruise, Approach	✓	✓	✓	✓			
	(5) Bank Angle	± 2º or ± 10% bank angle	Approach	✓	✓	✓	✓			
	(6) Angle of Attack	± 1.5º AOA	Second Segment Climb and Approach or Landing	✓	✓	✓	✓			

3. MOTION SYSTEM										
No	Tests	Tolerance	Flight Conditions	FFS				COMMENTS	Result	
				A	B	C	D		YES	NO
a	Frequency response	As specified by the applicant for flight simulator qualification	Not Applicable	✓	✓	✓	✓	Appropriate test to demonstrate frequency response required. See also AC No. 1 to JCAR-FSTD A.030 Para 2.4.3.2		
b	Leg Balance	As specified by the applicant for flight simulator qualification	Not Applicable	✓	✓	✓	✓	Appropriate test to demonstrate leg balance required See also AC No. 1 to JCAR-FSTD A.030 Para 2.4.3.2		
c	Turn-around check	As specified by the applicant for flight simulator qualification	Not Applicable	✓	✓	✓	✓	Appropriate test to demonstrate turn-around required. See also AC No. 1 to JCAR-FSTD A.030 Para 2.4.3.2		
d	Motion effects							Refer to AC No 1 to JCAR-FSTD A.030 3.3(n) subjective testing		
e	Motion System repeatability	± 0·05g actual platform linear accelerations	None			✓	✓	Ensure that motion system hardware and software (in normal flight simulator operating mode) continue to perform as originally qualified. Performance changes from the original baseline can be readily identified with this information. See AC No. 1 to JCAR-FSTD A.030 Para 2.4.3.4		
f	Motion cueing Performance signature	None	Ground and flight	✓	✓	✓	✓	For a given set of flight simulation critical maneuvers record the relevant motion variables. These tests should be run with the motion buffet module disabled. See AC No. 1 to JCAR-FSTD A.030 Para 2.4.3.3		
g	Characteristic motion vibrations	None	Ground and flight					The recorded test results for characteristic buffets should allow the comparison of relative amplitude versus frequency. For atmospheric disturbance testing, general purpose disturbance models that approximate demonstrable flight test data are acceptable. Principally, the flight simulator results should exhibit the overall appearance and trends of the airplane plots, with at least some of the frequency “spikes” being present within 1 or 2 Hz of the airplane data. See AC No. 1 to JCAR-FSTD A.030 para2.4.3.5		

No	Tests	Tolerance	Flight Conditions	FFS A	FFS B	FFS C	FFS D	COMMENTS	Result YES	Result NO
3. MOTION SYSTEM										
	The following tests with recorded results and an SOC are required for characteristic motion vibrations, which can be sensed at the flight deck where applicable by airplane type:									
	(1) Thrust effects with brakes set	N/A	Ground				✓	Test should be conducted at maximum possible thrust with brakes set.		
	(2) Landing gear extended buffet	N/A	Flight				✓	Test condition should be for a normal operational speed and not at the gear limiting speed.		
	(3) Flaps extended buffet	N/A	Flight				✓	Test condition should be for a normal operational speed and not at the flap limiting speed		
	(4) Speed brake deployed buffet	N/A	Flight				✓			
	(5) Approach-to-stall buffet	N/A	Flight				✓	Test condition should be approach-to-stall. Post-stall characteristics are not required.		
	(6) High speed or Mach buffet	N/A	Flight				✓	Test condition should be for high speed maneuver buffet/wind-up-turn or alternatively Mach buffet		
	(7) In flight vibrations	N/A	Flight (clean configuration)				✓	Test should be conducted to be representative of in-flight vibrations for propeller driven airplanes		

No	Tests	Tolerance	Flight Conditions	FFS A	FFS B	FFS C	FFS D	COMMENTS	Result YES	Result NO
4. VISUAL SYSTEM										
a	**SYSTEM RESPONSE TIME**									
	(1) Transport Delay	150 milliseconds or less after controller movement. 300 milliseconds or less after controller movement.	Pitch, roll and yaw	 ✓	 ✓	✓	✓	One separate test is required in each axis. See Appendix 5 to AC FSTD A.030		
	or									
	(2) Latency	- 150 milliseconds or less after controller movement. - 300 milliseconds or less after controller movement	Take-off, Cruise, and Approach or Landing	 ✓	 ✓	✓	✓	One test is required in each axis (pitch, roll, yaw) for each of the 3 conditions compared with airplane data for a similar input. The visual scene or test pattern used during the response testing shall be representative of the required system capacities to meet the daylight, twilight (dusk/dawn) and night visual capability as applicable. FS only: Response tests should be confirmed in daylight, twilight and night settings as applicable.		
b	**DISPLAY SYSTEM TESTS**									
	(1) (a) Continuous collimated cross cockpit visual field of view	Continuous, cross cockpit, minimum collimated visual field of view providing each pilot with 180 degrees horizontal and 40 degrees vertical field of view. Horizontal FOV: Not less than a total of 176 measured degrees (including not less than ±88 measured degrees either side of the centre of the design eye point). Vertical FOV: Not less than a total of 36 measured degrees from the pilot's and co-pilot's eye point	Not Applicable			✓	✓	Field of view should be measured using a visual test pattern filling the entire visual scene (all channels) consisting of a matrix of black and white 5° squares. Installed alignment should be confirmed in a Statement of Compliance.		
	(b) Continuous collimated visual field of view	Continuous, minimum collimated visual field of view providing each pilot with 45 degrees horizontal and 30 degrees vertical field of view	Not Applicable	✓	✓			30 degrees vertical field of view may be insufficient to meet the requirements of AC No. 1 to JCAR-FSTD A.030 Table 2.3 paragraph 4.c (visual ground segment)		

4. VISUAL SYSTEM

No	Tests	Tolerance	Flight Conditions	FFS A	FFS B	FFS C	FFS D	COMMENTS	Result YES	Result NO
	(2) System geometry	5° even angular spacing within ± 1° as measured from either pilot eye-point, and within 1·5° for adjacent squares.	Not Applicable	✓	✓	✓	✓	System geometry should be measured using a visual test pattern filling the entire visual scene (all channels) consisting of a matrix of black and white 5° squares with light points at the intersections. The operator should demonstrate that the angular spacing of any chosen 5° square and the relative spacing of adjacent squares are within the stated tolerances. The intent of this test is to demonstrate local linearity of the displayed image at either pilot eye-point		
	(3) Surface Contrast Ratio	Not less than 5:1	Not Applicable			✓	✓	Surface contrast ratio should be measured using a raster drawn test pattern filling the entire visual scene (all channels). The test pattern should consist of black and white squares, 5 per square with a white square in the centre of each channel. Measurement should be made on the centre bright square for each channel using a 1° spot photometer. This value should have a minimum brightness of 7 cd/m2 (2 foot lamberts). Measure any adjacent dark squares. The contrast ratio is the bright square value divided by the dark square value. Note. During contrast ratio testing, simulator aft-cab and flight deck ambient light levels should be zero		
	(4) High light Brightness	Not less than 20 cd/m2 (6 ft-lamberts) on the display	Not Applicable			✓	✓	Highlight brightness should be measured by maintaining the full test pattern described in paragraph 4.b 3) above, superimposing a highlight on the centre white square of each channel and measuring the brightness using the 1° spot photometer. Light points are not acceptable. Use of calligraphic capabilities to enhance raster brightness is acceptable		

4. VISUAL SYSTEM										
No	**Tests**	**Tolerance**	**Flight Conditions**	**FFS**				**COMMENTS**	**Result**	
				A	**B**	**C**	**D**		**YES**	**NO**
	(5) Vernier Resolution	Not greater than 2 arc minutes	Not Applicable			✓	✓	Vernier resolution should be demonstrated by a test of objects shown to occupy the required visual angle in each visual display used on a scene from the pilot's eye-point. The eye will subtend two arc minutes (arc tan (4/6 876)x60) when positioned on a 3 degree 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-ft gaps in-between. This should be confirmed by calculations in a statement of compliance.		
	(6) Light point Size	Not greater than 5 arc minutes	Not Applicable			✓	✓	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.		
	(7) Light point Contrast Ratio	Not less than 10:1 Not less than 25:1	Not Applicable	✓	✓	 ✓		Light point contrast ratio should be measured using a test pattern demonstrating a 1° area filled with light points (i.e. light point modulation just discernible) and should be compared to the adjacent background. Note. During contrast ratio testing, simulator aft-cab and flight deck ambient light levels should be zero.		
c	**VISUAL GROUND SEGMENT**	Near end. The lights computed to be visible should be visible in the FSTD. Far end: ± 20% of the computed VGS	Trimmed in the landing Configuration at 30 m (100 ft) wheel height above touchdown zone elevation on glide slope at a RVR setting of 300 m (1000 ft) or 350m (1200ft)	✓	✓	✓	✓	Visual Ground Segment. This test is designed to assess items impacting the accuracy of the visual scene presented to a pilot at DH on an ILS approach. Those items include RVR, glide slope (G/S) and localizer modeling accuracy (location and slope) for an ILS, For a given weight, configuration and speed representative of a point within the airplane's operational envelope for a normal approach 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 VGS computation.		

5. SOUND SYSTEMS

No	Tests	Tolerance	Flight Conditions	FFS A	FFS B	FFS C	FFS D	COMMENTS	Result YES	Result NO
								All tests in this section should be presented using a un weighted 1/3-octave band format from band 17 to 42 (50 Hz to 16 kHz). A minimum 20 second average should be taken at the location corresponding to the airplane data set. The airplane and flight simulator results should be produced using comparable data analysis techniques		
								See AC FSTD A.030 Para 2.4.5		
a	**TURBO-JET AEROPLANES**									
	(1) Ready for engine start	± 5 dB per 1/3 octave band	Ground				✓	Normal condition prior to engine start. The APU should be on if appropriate		
	(2) All engines at idle	± 5 dB per 1/3 octave band	Ground				✓	Normal condition prior to take-off.		
	(3) All engines at Maximum allowable thrust with brakes set	± 5 dB per 1/3 octave band	Ground				✓	Normal condition prior to take-off.		
	(4) Climb	± 5 dB per 1/3 octave band	En-route climb				✓	Medium altitude		
	(5) Cruise	± 5 dB per 1/3 octave band	Cruise				✓	Normal cruise configuration		
	(6) Speed brake/ spoilers extended (as appropriate)	± 5 dB per 1/3 octave band	Cruise				✓	Normal and constant speed brake deflection for descent at a constant airspeed and power setting		
	(7) Initial approach	± 5 dB per 1/3 octave band	Approach				✓	Constant airspeed, gear up, flaps/slats as appropriate		
	(8) Final approach	± 5 dB per 1/3 octave band	Landing				✓	Constant airspeed, gear down, full flaps.		
b	**PROPELLER AEROPLANES**									
	(1) Ready for engine start	± 5 dB per 1/3 octave band	Ground				✓	Normal condition prior to engine start. The APU should be on if appropriate.		
	(2) All propellers feathered	± 5 dB per 1/3 octave band	Ground				✓	Normal condition prior to take-off.		
	(3) Ground idle or equivalent	± 5 dB per 1/3 octave band	Ground				✓	Normal condition prior to take-off		
	(4) Flight idle or equivalent	± 5 dB per 1/3 octave band	Ground				✓	Normal condition prior to take-off		
	(5) All engines at Maximum allowable power with brakes set	± 5 dB per 1/3 octave band	Ground				✓	Normal condition prior to take-off.		
	(6) Climb	± 5 dB per 1/3 octave band	En-route climb				✓	Medium altitude		
	(7) Cruise	± 5 dB per 1/3 octave band	Cruise				✓	Normal cruise configuration.		

5. SOUND SYSTEMS										
No	Tests	Tolerance	Flight Conditions	FFS				COMMENTS	Result	
				A	B	C	D		YES	NO
	(8) Initial approach	± 5 dB per 1/3 octave band	Approach				✓	Constant airspeed, gear up, flaps extended as appropriate, RPM as per operating manual		
	(9) Final approach	± 5 dB per 1/3 octave band	Landing				✓	Constant airspeed, gear down, full flaps, RPM as per operating manual		
c	**SPECIAL CASES**	± 5 dB per 1/3 octave band					✓	Special cases identified as particularly significant to the pilot, important in training, or unique to a specific airplane type or variant.		
d	**FLIGHT SIMULATOR BACKGROUND NOISE**	Initial evaluation: not applicable. Recurrent evaluation: ± 3dB per 1/3 octave band compared to initial evaluation					✓	Results of the background noise at initial qualification should be included in the QTG document and approved by CARC. The simulated sound will be evaluated to ensure that the background noise does not interfere with training. Refer to AC FSTD A.030 Para 2.4.5.6. The measurements are to be made with the simulation running, the sound muted and a dead cockpit		
e	**FREQUENCY RESPONSE**	Initial evaluation: not applicable. Recurrent evaluation: cannot exceed ± 5 dB on three consecutive bands when compared to initial evaluation and the average of the absolute differences between initial and recurrent evaluation results cannot exceed 2 dB.				✓	✓	Only required if the results are to be used during recurrent evaluations according to AC FSTD A.030 Para 2.4.5.7. The results shall be acknowledged by CARC at initial qualification		

Remarks	

Inspector Name	Date	Signature