FLIGHT TRAINING DEVICE (FTD) QUALIFICATION TEST CHECKLIST

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• FTD Organization Name				
• FTD Qualification Level	☐ 4	☐ 5	☐ 6	☐ 7
• FTD Qualification Type	☐ Initial Qualification	☐ Qualification renewal	☐ Modifications	☐ Re-location
• FTD Manufacturer Name				
• FTD Serial No				
• FTD Qualification Number				
• FTD Qualification Expiry Date (dd/mm/yy)				

				Compliance		
Entry Number	General FTD Requirements	FTD Level	Notes/Information	Yes	No	NA
1.	General Flight deck Configuration.	See next	NA	☐	☐	☐
1.a.	The FTD must have a flight deck that is a replica of the airplane simulated with controls, equipment, observable flight deck indicators, circuit breakers, and bulkheads properly located, functionally accurate and replicating the airplane. The direction of movement of controls and switches must be identical to that in the airplane. Pilot seat(s) must afford the capability for the occupant to be able to achieve the design “eye position.” Equipment for the operation of the flight deck windows must be included, but the actual windows need not be operable. Fire axes, extinguishers, and spare light bulbs must be available in the flight FTD but may be relocated to a suitable location as near as practical to the original position. Fire axes, landing gear pins, and any similar purpose instruments need only be represented in silhouette. The use of electronically displayed images with physical overlay or masking for FTD instruments and/or instrument panels is acceptable provided:	6,7	For FTD purposes, the flight deck consists of all that space forward of a cross section of the fuselage at the most extreme aft setting of the pilots' seats including additional, required flight crewmember duty stations and those required bulkheads aft of the pilot seats. For clarification, bulkheads containing only items such as landing gear pin storage compartments, fire axes and extinguishers, spare light bulbs, aircraft documents pouches are not considered essential and may be omitted. For Level 6 FTDs, flight deck windowpanes may be omitted where non-distracting and subjectively acceptable to conduct qualified training tasks.	☐	☐	☐
	(1) All instruments and instrument panel layouts are dimensionally correct with differences, if any, being imperceptible to the pilot;			☐	☐	☐
	(2) Instruments replicate those of the airplane including full instrument functionality and embedded logic;			☐	☐	☐
	(3) Instruments displayed are free of quantization (stepping);			☐	☐	☐
	(4) Instrument display characteristics replicate those of the airplane including resolution, colors, luminance, brightness, fonts, fill patterns, line styles and symbology;			☐	☐	☐
	(5) Overlay or masking, including bezels and bugs, as applicable, replicates the airplane panel(s);			☐	☐	☐
	(6) Instrument controls and switches replicate and operate with the same technique, effort, travel and in the same direction as those in the airplane;			☐	☐	☐
	(7) Instrument lighting replicates that of the airplane and is operated from the FSTD control for that lighting and, if applicable, is at a level commensurate with other lighting operated			☐	☐	☐

	by that same control; and					
	(8) As applicable, instruments must have faceplates that replicate those in the airplane; and			☐	☐	☐
	Level 7 FTD only. The display image of any three-dimensional instrument, such as an electro-mechanical instrument, should appear to have the same three-dimensional depth as the replicated instrument. The appearance of the simulated instrument, when viewed from the principal operator's angle, should replicate that of the actual airplane instrument. Any instrument reading inaccuracy due to viewing angle and parallax present in the actual airplane instrument should be duplicated in the simulated instrument display image. Viewing angle error and parallax must be minimized by shared instruments such as engine displays and standby indicators.			☐	☐	☐
1.b.	The FTD must have equipment (e.g., instruments, panels, systems, circuit breakers, and controls) simulated sufficiently for the authorized training/checking events to be accomplished. The installed equipment must be located in a spatially correct location and may be on a flight deck or an open flight deck area. Additional equipment required for the authorized training/checking events must be available in the FTD but may be located in a suitable location as near as practical to the spatially correct position. Actuation of equipment must replicate the appropriate function in the airplane. Fire axes, landing gear pins, and any similar purpose instruments need only be represented in silhouette.	4,5	None	☐	☐	☐
1.c.	Those circuit breakers that affect procedures or result in observable flight deck indications must be properly located and functionally accurate.	7	None	☐	☐	☐
2.	Programming	See next	None	☐	☐	☐
2.a.1.	The FTD must provide the proper effect of aerodynamic changes for the combinations of drag and thrust normally encountered in flight. This must include the effect of change in airplane attitude, thrust, drag, altitude, temperature, and configuration. Level 6 additionally requires the effects of changes in gross weight and center of gravity. Level 5 requires only generic aerodynamic programming. An SOC is required.	5,6	None	☐	☐	☐
2.a.2.	A flight dynamics model that accounts for various combinations of drag and thrust normally encountered in flight must correspond to actual flight conditions, including the effect of change in airplane attitude, thrust, drag, altitude, temperature, gross weight, moments of inertia, center of gravity location, and configuration. The effects of pitching attitude and of fuel slosh on the aircraft center of gravity must be simulated. An SOC is required.	7	None	☐	☐	☐
2.b.	The FTD must have the computer capacity, accuracy, resolution, and dynamic response needed to meet the qualification level sought. An SOC is required.	4,5,6,7	None	☐	☐	☐
2.c.1.	Relative responses of the flight deck instruments must be measured by latency tests, or transport delay tests, and may not exceed 300 milliseconds. The instruments must	5,6	The intent is to verify that the FTD provides instrument	☐	☐	☐

	respond to abrupt input at the pilot's position within the allotted time, but not before the time when the airplane responds under the same conditions. (1) Latency: The FTD instrument and, if applicable, the motion system and the visual system response must not be prior to that time when the airplane responds and may respond up to 300 milliseconds after that time under the same conditions.		cues that are, within the stated time delays, like the airplane responses. For airplane response, acceleration in the appropriate, corresponding rotational axis is preferred. Additional information regarding Latency and Transport Delay testing may be found in Appendix A, Attachment 2, paragraph 15.			
	(2) Transport Delay: As an alternative to the Latency requirement, a transport delay objective test may be used to demonstrate that the FTD system does not exceed the specified limit. The sponsor must measure all the delay encountered by a step signal migrating from the pilot's control through all the simulation software modules in the correct order, using a handshaking protocol, finally through normal output interfaces to the instrument display and, if applicable, the motion system, and the visual system.			☐	☐	☐
2.c.2.	Relative responses of the motion system, visual system, and flight deck instruments, measured by latency tests or transport delay tests. Motion onset should occur before the start of the visual scene change (the start of the scan of the first video field containing different information) but must occur before the end of the scan of that video field. Instrument response may not occur prior to motion onset. The test results must be within the following limits: 100 ms for the motion (if installed) and instrument systems; and 120 ms for the visual system.	7	The intent is to verify that the FTD provides instruments, motion, and visual cues that are, within the stated time delays, like the airplane responses. For airplane response, acceleration in the appropriate, corresponding rotational axis is preferred.	☐	☐	☐
2.d.	Ground handling and aerodynamic programming must include the following:	See next	None	☐	☐	☐
2.d.1.	Ground effect.	7	Ground effect includes modeling that accounts for round out, flare, touchdown, lift, drag, pitching moment, trim, and power while in ground effect.	☐	☐	☐
2.d.2.	Ground reaction	7	Ground reaction includes modeling that accounts for strut deflections, tire friction, and side forces. This is the reaction of the airplane upon contact with the runway during landing and may differ with changes in factors such as gross weight, air speed, or rate of descent on touchdown.	☐	☐	☐
2.d.3	Ground handling characteristics, including aerodynamic and ground reaction modeling including steering inputs, operations with crosswind, gusting crosswind, braking, thrust	7	None	☐	☐	☐

	reversing, deceleration, and turning radius.					
2.e.	If the aircraft being simulated is one of the aircraft listed in § 121.358, Low-altitude windshear system equipment requirements, the FTD must employ windshear models that provide training for recognition of windshear phenomena and the execution of recovery procedures. Models must be available to the instructor/evaluator for the following critical phases of flight: (1) Prior to takeoff rotation. (2) At liftoff. (3) During the initial climb; and (4) On final approach, below 500 ft AGL. The QTG must reference the GACA Windshear Training Aid or present alternate airplane related data, including the implementation method(s) used. If the alternate method is selected, wind models from the Royal Aerospace Establishment (RAE), the Joint Airport Weather Studies (JAWS) Project and other recognized sources may be implemented but must be supported and properly referenced in the QTG. The addition of realistic levels of turbulence associated with each required windshear profile must be available and selectable to the instructor. In addition to the four basic windshear models required for qualification, at least two additional "complex" windshear models must be available to the instructor which represent the complexity of actual windshear encounters. These models must be available in the takeoff and landing configurations and must consist of independent variable winds in multiple simultaneous components. The Windshear Training Aid provides two such example "complex" windshear models that may be used to satisfy this requirement.	7	Windshear models may consist of independent variable winds in multiple simultaneous components. The GACA Windshear Training Aid presents one acceptable means of compliance with FTD wind model requirements. The FTD should employ a method to ensure the required survivable and non-survivable windshear scenarios are repeatable in the training environment. For Level 7 FTDs, windshear training tasks may only be qualified for aircraft equipped with a synthetic stall warning system. The qualified windshear profile(s) are evaluated to ensure the synthetic stall warning (and not the stall buffet) is first indication of the stall.	☐	☐	☐
2.f.	The FTD must provide manual and automatic testing of FTD hardware and software programming to determine compliance with FTD objective tests as prescribed in Attachment 2 of this appendix. An SOC is required.	7	Automatic "flagging" of out-of- tolerance situations is encouraged.	☐	☐	☐
	The FTD must accurately reproduce the following runway conditions: (1) Dry;			☐	☐	☐
	(2) Wet;			☐	☐	☐
	(3) Icy;			☐	☐	☐
	(4) Patchy Wet;			☐	☐	☐
	(5) Patchy Icy; and			☐	☐	☐
	(6) Wet on Rubber Residue in Touchdown Zone. An SOC is required.			☐	☐	☐
2.h.	The FTD must simulate:		FTD pitch, side loading, and	☐	☐	☐

	(1) brake and tire failure dynamics, including antiskid failure; and	7	directional control characteristics should be representative of the airplane.			
	(2) decreased brake efficiency due to high brake temperatures, if applicable. An SOC is required			☐	☐	☐
2.i.	Engine and Airframe Icing Modeling that includes the effects of icing, where appropriate, on the airframe, aerodynamics, and the engine(s). Icing models must simulate the aerodynamic degradation effects of ice accretion on the airplane lifting surfaces including loss of lift, decrease in stall angle of attack, change in pitching moment, decrease in control effectiveness, and changes in control forces in addition to any overall increase in drag. Aircraft systems (such as the stall protection system and auto flight system) must respond properly to ice accretion consistent with simulated aircraft. Aircraft OEM data or other acceptable analytical methods must be utilized to develop ice accretion models that are representative of the simulated aircraft's performance degradation in a typical in-flight icing encounter. Acceptable analytical methods may include wind tunnel analysis and/or engineering analysis of the aerodynamic effects of icing on the lifting surfaces coupled with tuning and supplemental subjective assessment by a subject matter expert pilot. SOC required.	7	SOC should be provided describing the effects which provide training in the specific skills required for recognition of icing phenomena and execution of recovery. The SOC should describe the source data, and any analytical methods used to develop ice accretion models including verification that these effects have been tested. Icing effects simulation models are only required for those airplanes authorized for operations in icing conditions. Icing simulation models should be developed to provide training in the specific skills required for recognition of ice accumulation and execution of the required response. See Attachment 7 of this Appendix for further guidance material.	☐	☐	☐
2.j.	The aerodynamic modeling in the FTD must include: (1) Low-altitude level-flight ground effect.	7	See Attachment 2 of this appendix, paragraph 5, for further information on ground effect.	☐	☐	☐
	(2) Mach effect at high altitude;			☐	☐	☐
	(3) Normal and reverse dynamic thrust effect on control surfaces;			☐	☐	☐
	(4) Aeroelastic representations; and			☐	☐	☐
	(5) Nonlinearities due to sideslip.			☐	☐	☐
	An SOC is required and must include references to computations of aeroelastic representations and of nonlinearities due to sideslip.			☐	☐	☐
2.k.	The FTD must have aerodynamic and ground reaction modeling for the effects of reverse	7	None	☐	☐	☐

	thrust on directional control, if applicable. An SOC is required.					
3.	Equipment Operation.	See next	None	☐	☐	☐
3.a.	All relevant instrument indications involved in the simulation of the airplane must automatically respond to control movement or external disturbances to the simulated airplane, e.g., turbulence or windshear. Numerical values must be presented in the appropriate units. For Level 7 FTDs, instrument indications must also respond to effects resulting from icing.	5,6,7	None	☐	☐	☐
3.b.1	Navigation equipment must be installed and operated within the tolerances applicable for the airplane. Levels 6 must also include communication equipment (inter-phone and air/ground) like that in the airplane and, if appropriate to the operation being conducted, an oxygen mask microphone system. Level 5 need to have only that navigation equipment necessary to fly an instrument approach.	5,6	None	☐	☐	☐
3.b.2.	Communications, navigation, caution, and warning equipment must be installed and operated within the tolerances applicable for the airplane. Instructor control of internal and external navigational aids. Navigation aids must be usable within range or line-of-sight without restriction, as applicable to the geographic area.	7	See Attachment 3 of this appendix for further information regarding long-range navigation equipment.	☐	☐	☐
3.b.3.	Complete navigation database for at least 3 airports with corresponding precision and non-precision approach procedures, including navigational database updates.	7	None	☐	☐	☐
3.c.1.	Installed systems must simulate the applicable airplane system operation, both on the ground and in flight. Installed systems must be operative to the extent that applicable normal, abnormal, and emergency operating procedures included in the sponsor's training programs can be accomplished. Level 6 must simulate all applicable airplane flight, navigation, and systems operation. Level 5 must have at least functional flight and navigational controls, displays, and instrumentation. Level 4 must have at least one airplane system installed and functional.	4,5,6	None	☐	☐	☐
3.c.2.	Simulated airplane systems must operate as the airplane systems operate under normal, abnormal, and emergency operating conditions on the ground and in flight. Once activated, proper systems operation must result from system management by the crew member and not require any further input from the instructor's controls.	7	Airplane system operation should be predicated on, and traceable to, the system data supplied by the airplane manufacturer, original	☐	☐	☐

			equipment manufacturer or alternative approved data for the airplane system or component. At a minimum, alternate approved data should validate the operation of all normal, abnormal, and emergency operating procedures and training tasks the FSTD is qualified to conduct.			
3.d.	The lighting environment for panels and instruments must be sufficient for the operation being conducted.	4,5,6,7	Back-lighted panels and instruments may be installed but are not required.	☐	☐	☐
3.e.	The FTD must provide control forces and control travel that corresponds to the airplane being simulated. Control forces must react in the same manner as in the airplane under the same flight conditions. For Level 7 FTDs, control systems must replicate airplane operation for the normal and any non-normal modes including back-up systems and should reflect failures of associated systems. Appropriate cockpit indications and messages must be replicated.	6,7	None	☐	☐	☐
3.f.	The FTD must provide control forces and control travel of sufficient precision to manually fly an instrument approach.	5	None	☐	☐	☐
3.e.	FTD control feel dynamics must replicate the airplane. This must be determined by comparing a recording of the control feel dynamics of the FTD to airplane measurements. For initial and upgrade qualification evaluations, the control dynamic characteristics must be measured and recorded directly from the flight deck controls, and must be accomplished in takeoff, cruise, and landing flight conditions and configurations.	7	None	☐	☐	☐
4.	Instructor or Evaluator Facilities.	See next	None	☐	☐	☐
4.a.1	In addition to the flight crewmember stations, suitable seating arrangements for an instructor/check airman and GACA Inspector must be available. These seats must provide adequate view of crewmember's panel(s).	4,5,6	These seats need not be a replica of an aircraft seat and maybe as simple as an office chair placed in an appropriate position.	☐	☐	☐
4.a.2	In addition to the flight crewmember stations, the FTD must have at least two suitable seats for the instructor/check airman and GACA inspector. These seats must provide adequate vision to the pilot's panel and forward windows. All seats other than flight crew seats need not represent those found in the airplane but must be adequately secured to the floor and equipped with similar positive restraint devices.	7	The NSPM will consider alternatives to this standard for additional seats based on unique flight deck configurations.	☐	☐	☐
4.b.1	The FTD must have instructor controls that permit activation of normal, abnormal, and	4,5,6	None	☐	☐	☐

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	emergency conditions as appropriate. Once activated, proper system operation must result from system management by the crew and not require input from the instructor controls.					
4.b.2.	The FTD must have controls that enable the instructor/evaluator to control all required system variables and insert all abnormal or emergency conditions into the simulated airplane systems as described in the sponsor's GACA-approved training program; or as described in the relevant operating manual as appropriate.	7	None	☐	☐	☐
4.c.	The FTD must have instructor controls for all environmental effects expected to be available at the IOS, e.g., clouds, visibility, icing, precipitation, temperature, storm cells and microbursts, turbulence, and intermediate and high-altitude wind speed and direction.	7	None	☐	☐	☐
4.d.	The FTD must provide the instructor or evaluator with the ability to present ground and air hazards.	7	For example, another airplane crossing the active runway or converging airborne traffic.	☐	☐	☐
5.	Motion System.	See next		☐	☐	☐
5.a	The FTD may have a motion system, if desired, although it is not required. If a motion system is installed and additional training, testing, or checking credits are being sought on the basis of having a motion system, the motion system operation may not be distracting and must be coupled closely to provide integrated sensory cues. The motion system must also respond to abrupt input at the pilot's position within the allotted time, but not before the time when the airplane responds under the same conditions.	5,6,7	he motion system standards set out in part 60, Appendix A for at least Level A simulators is acceptable.	☐	☐	☐
5.b	If a motion system is installed, it must be measured by latent tests or transport delay tests and may not exceed 300 milliseconds. Instrument response may not occur prior to motion onset.	6,7	The motion system standards set out in part 60, Appendix A for at least Level A simulators is acceptable.	☐	☐	☐
6.	Visual System.	See next	None	☐	☐	☐
6.a	The FTD may have a visual system, if desired, although it is not required. If a visual system is installed, it must meet the following criteria:	4,5,6	None	☐	☐	☐
6.a.1	The visual system must respond to abrupt input at the pilot's position. An SOC is required.	5,6	None	☐	☐	☐
6.a.2	The visual system must have at least a single channel, non-collimated display. An SOC is required.	4,5,6	None	☐	☐	☐
6.a.3	The visual system must provide at least a field-of-view of 18° vertical / 24° horizontal for the pilot flying. An SOC is required.	4,5,6	None	☐	☐	☐
6.a.4	The visual system must provide for a maximum parallax of 10° per pilot. An SOC is required.	4,5,6	None	☐	☐	☐
6.a.5.	The visual scene content may not be distracting. An SOC is required.	4,5,6	None	☐	☐	☐
6.a.6.	The minimum distance from the pilot's eye position to the surface of a direct view display may not be less than the distance to any front panel instrument. An SOC is required.		None	☐	☐	☐

6.a.7.	The visual system must provide for a minimum resolution of 5 arc- minutes for both computed and displayed pixel size. An SOC is required.	4,5,6	None	☐	☐	☐
6.b	If a visual system is installed and additional training, testing, or checking credits are being sought on the basis of having a visual system, a visual system meeting the standards set out for at least a Level An FFS (see Appendix A of this part) will be required. A “direct-view,” non-collimated visual system (with the other requirements for a Level A visual system met) may be considered satisfactory for those installations where the visual system design “eye point” is appropriately adjusted for each pilot’s position such that the parallax error is at or less than 10º simultaneously for each pilot. An SOC is required.	6	Directly projected, non-collimated visual displays may prove to be unacceptable for dual pilot applications.	☐	☐	☐
6.c	The FTD must have a visual system providing an out-of-the-flight deck view.	7	None	☐	☐	☐
6.d	The FTD must provide a continuous visual field-of-view of at least 176° horizontally and 36° vertically or the number of degrees necessary to meet the visual ground segment requirement, whichever is greater. The minimum horizontal field-of-view coverage must be plus and minus one-half (½) of the minimum continuous field-of-view requirement, centered on the zero-degree azimuth line relative to the aircraft fuselage. An SOC is required and must explain the system geometry measurements including system linearity and field-of-view. Collimation is not required but parallax effects must be minimized (not greater than 10° for each pilot when aligned for the point midway between the left and right seat eyepoints).	7	The horizontal field-of-view is traditionally described as a 180º field-of-view. However, the field- of-view is technically no less than 176º. Additional field-of-view capability may be added at the sponsor’s discretion provided the minimum fields of view are retained.	☐	☐	☐
6.e	The visual system must be free from optical discontinuities and artifacts that create non-realistic cues.	7	Non-realistic cues might include image “swimming” and image “roll-off,” that may lead a pilot to make incorrect assessments of speed, acceleration, or situational awareness.	☐	☐	☐
6.f	The FTD must have operational landing lights for night scenes. Where used, dusk (or twilight) scenes require operational landing lights.	7	None	☐	☐	☐
6.g.	The FTD must have instructor controls for the following: (1) Visibility in statute miles (km) and runway visual range (RVR) in ft.(m);	7	None	☐	☐	☐
	(2) Airport selection; and			☐	☐	☐
	(3) Airport lighting.			☐	☐	☐
6.h.	The FTD must provide visual system compatibility with dynamic response programming.	7	None	☐	☐	☐
6.i.	The FTD must show that the segment of the ground visible from the FTD flight deck is the same as from the airplane flight deck (within established tolerances) when at the correct air speed, in the landing configuration, at the appropriate height above the touchdown zone, and with appropriate visibility.	7	This will show the modeling accuracy of RVR, glideslope, and localizer for a given weight, configuration, and	☐	☐	☐

			speed within the airplane's operational envelope for a normal approach and landing.			
6.j.	The FTD must provide visual cues necessary to assess sink rates (provide depth perception) during takeoffs and landings, to include: (1) Surface on runways, taxiways, and ramps; and	7	None	☐	☐	☐
	(2) Terrain features.			☐	☐	☐
6.k.	The FTD must provide for accurate portrayal of the visual environment relating to the FTD attitude.	7	Visual attitude vs. FTD attitude is a comparison of pitch and roll of the horizon as displayed in the visual scene compared to the display on the attitude indicator	☐	☐	☐
6.l.	The FTD must provide quick confirmation of visual system color, RVR, focus, and intensity. An SOC is required.	7	None	☐	☐	☐
6.m.	The FTD must be capable of producing at least 10 levels of occulting.	7	None	☐	☐	☐
6.n.	Night Visual Scenes. When used in training, testing, or checking activities, the FTD must provide night visual scenes with sufficient scene content to recognize the airport, the terrain, and major landmarks around the airport. The scene content must allow a pilot to successfully accomplish a visual landing. Scenes must include a definable horizon and typical terrain characteristics such as fields, roads and bodies of water and surfaces illuminated by airplane landing lights.	7	None	☐	☐	☐
6.o.	Dusk (or Twilight) Visual Scenes. When used in training, testing, or checking activities, the FTD must provide dusk (or twilight) visual scenes with sufficient scene content to recognize	7	None	☐	☐	☐
	the airport, the terrain, and major landmarks around the airport. The scene content must allow a pilot to successfully accomplish a visual landing. Dusk (or twilight) scenes, as a minimum, must provide full color presentations of reduced ambient intensity, sufficient surfaces with appropriate textural cues that include self-illuminated objects such as road networks, ramp lighting and airport signage, to conduct a visual approach, landing and airport movement (taxi). Scenes must include a definable horizon and typical terrain characteristics such as fields, roads and bodies of water and surfaces illuminated by airplane landing lights. If provided, directional horizon lighting must have correct orientation and be consistent with surface shading effects. Total night or dusk (twilight) scene content must be comparable in detail to that produced by 10,000 visible textured surfaces and 15,000 visible lights with sufficient system capacity to display 16 simultaneously moving objects. An SOC is required.			☐	☐	☐

6.p.	Daylight Visual Scenes. The FTD must provide daylight visual scenes with sufficient scene content to recognize the airport, the terrain, and major landmarks around the airport. The scene content must allow a pilot to successfully accomplish a visual landing. Any ambient lighting must not "washout" the displayed visual scene. Total daylight scene content must be comparable in detail to that produced by 10,000 visible textured surfaces and 6,000 visible lights with sufficient system capacity to display 16 simultaneously moving objects. The visual display must be free of apparent and distracting quantization and other distracting visual effects while the FTD is in motion. An SOC is required.	7	None	☐	☐	☐
6.q.	The FTD must provide operational visual scenes that portray physical relationships known to cause landing illusions to pilots.	7	For example: short runways, landing approaches over water, uphill or downhill runways, rising terrain on the approach path, unique topographic features.	☐	☐	☐
6.r.	The FTD must provide special weather representations of light, medium, and heavy precipitation near a thunderstorm on takeoff and during approach and landing. Representations need only be presented at and below an altitude of 2,000 ft. (610 m) above the airport surface and within 10 miles (16 km) of the airport.	7	None	☐	☐	☐
6.s.	The FTD must present visual scenes of wet and snow-covered runways, including runway lighting reflections for wet conditions, partially obscured lights for snow conditions, or suitable alternative effects.	7	None	☐	☐	☐
6.t.	The FTD must present realistic color and directionality of all airport lighting.	7	None	☐	☐	☐
6.u.	The following weather effects as observed on the visual system must be simulated and respective instructor controls provided. (1) Multiple cloud layers with adjustable bases, tops, sky coverage and scud effect;	7	Scud effects are low, detached, and irregular clouds below a defined cloud layer.	☐	☐	☐
	(2) Storm cells activation and/or deactivation			☐	☐	☐
	(3) Visibility and runway visual range (RVR), including fog and patchy fog effect;			☐	☐	☐
	(4) Effects on own ship external lighting;			☐	☐	☐
	(5) Effects on airport lighting (including variable intensity and fog effects);			☐	☐	☐
	(6) Surface contaminants (including wind blowing effect);			☐	☐	☐
	(7) Variable precipitation effects (rain, hail, snow);			☐	☐	☐
	(8) In-cloud airspeed effect; and			☐	☐	☐
	(9) Gradual visibility changes entering and breaking out of cloud.			☐	☐	☐
6.v.	The simulator must provide visual effects for: (1) Light poles.	7	Visual effects for light poles and raised edge lights are for the purpose of providing	☐	☐	☐
	(2) Raised edge lights as appropriate; and			☐	☐	☐

	(3) Glow associated with approach lights in low visibility before physical lights are seen,		additional depth perception during takeoff, landing, and taxi training tasks. Three-dimensional modeling of the actual poles and stanchions is not required.	☐	☐	☐
7.	Sound System.	See next	None	☐	☐	☐
7.a.	The FTD must provide flight deck sounds that result from pilot actions that correspond to those that occur in the airplane.	6,7	None	☐	☐	☐
7.b.	The volume control must have an indication of sound level setting which meets all qualification requirements.	7	This indication is of the sound level setting as evaluated during the FTD's initial evaluation.	☐	☐	☐
7.c.	The FTD must accurately simulate the sound of precipitation, windshield wipers, and other significant airplane noises perceptible to the pilot during normal and abnormal operations and include the sound of a crash (when the FTD is landed in an unusual attitude or in excess of the structural gear limitations); normal engine and thrust reversal sounds; and the sounds of flap, gear, and spoiler extension and retraction. Sounds must be directionally representative. An SOC is required.	7	None	☐	☐	☐
7.d	The FTD must provide realistic amplitude and frequency of flight deck noises and sounds. FTD performance must be recorded, subjectively assessed for the initial evaluation, and be made a part of the QTG.	7		☐	☐	☐

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GACAR PART – 60

QPS REQUIREMENTS						
In order to be qualified at the FTD qualification level indicated, the FTD must be able to perform at least the tasks associated with that level of qualification. See Notes 1, 2 and 3 at the end of the Table.						
				Compliance		
Entry Number	Subjective Requirements	FTD Level	Notes/Information	Yes	No	NA
1.	Preflight Procedures	See next	None	☐	☐	☐
1.a.	Preflight Inspection (flight deck only)	4(a),5(a),6,7	None	☐	☐	☐
1.b.	Engine Start	4(a),5(a),6,7	None	☐	☐	☐
1.c.	Taxiing	7(t)	None	☐	☐	☐
1.d.	Pre-takeoff Checks	4(a),5(a),6,7	None	☐	☐	☐
2.	Takeoff and Departure Phase.	See next	None	☐	☐	☐
2.a.	Normal and Crosswind Takeoff	7(t)	None	☐	☐	☐
2.b.	Instrument Takeoff	7(t)	None	☐	☐	☐
2.c.	Engine Failure During Takeoff	7(t)	None	☐	☐	☐
2.d.	Rejected Takeoff (requires visual system)	6(a),7	None	☐	☐	☐
2.e.	Departure Procedure	5,6,7	None	☐	☐	☐
3.	Inflight Maneuvers.	See next		☐	☐	☐
3.a.	Steep Turns	5,6,7		☐	☐	☐
3.b.	Approaches to Stalls	5(a),6,7	Approach to stall maneuvers qualified only where the aircraft does not exhibit stall buffet as the first indication of the stall.	☐	☐	☐
3.c.	Engine Failure-Multiengine Airplane	5(a),6,7	None	☐	☐	☐
3.d.	Engine Failure-Single-Engine Airplane	5(a),6,7	None	☐	☐	☐
3.e.	Specific Flight Characteristics incorporated into the user's GACA approved flight training program.	4(a),5(a),6(a),7(a)	Level 4 FTDs have no minimum requirement for aerodynamic programming and are generally not qualified to conduct in-flight maneuvers.	☐	☐	☐
3.f	Windshear Recovery	7(t)	For Level 7 FTD, windshear recovery may be qualified at	☐	☐	☐

			the Sponsor's option. See Table B1A for specific requirements and limitations.			
4.	Instrument Procedures	See next	None	☐	☐	☐
4.a	Standard Terminal Arrival / Flight Management System Arrivals Procedures	5(a),6,7	None	☐	☐	☐
4.b.	Holding	5(a),6,7		☐	☐	☐
4.c.	Precision Instrument			☐	☐	☐
4.c.1	All engines operating.	5(a),6,7		☐	☐	☐
4.c.2	One engine inoperative.	7(t)	e.g., Autopilot, Manual (Flt. Dir. Assisted), Manual (Raw Data)	☐	☐	☐
4.d.	Non-precision Instrument Approach	5(a),6,7	e.g., Manual (Flt. Dir. Assisted), Manual (Raw Data)	☐	☐	☐
4.e.	Circling Approach (requires visual system)	6(a),7	e.g., NDB, VOR, VOR/DME, VOR/TAC, RNAV, LOC, LOC/BC, ADF, and SDF.	☐	☐	☐
4.f.	Missed Approach		Specific authorization required.	☐	☐	☐
4.f.1	Normal.	5(a),6,7	None	☐	☐	☐
4.f.2	One engine Inoperative.	7(t)	None	☐	☐	☐
5.	Landings and Approaches to Landings.	See next	None	☐	☐	☐
5.a.	Normal and Crosswind Approaches and Landings	7(t)	None	☐	☐	☐
5.b.	Landing From a Precision / Non-Precision Approach	7(t)	None	☐	☐	☐
5.c.	Approach and Landing with (Simulated) Engine Failure – Multiengine Airplane	7(t)	None	☐	☐	☐
5.d.	Landing From Circling Approach	7(t)	None	☐	☐	☐
5.e.	Rejected Landing	7(t)	None	☐	☐	☐
5.f.	Landing From a No Flap or a Nonstandard Flap Configuration Approach	7(t)	None	☐	☐	☐
6.	Normal and Abnormal Procedures.	See next	None	☐	☐	☐
6.a.	Engine (including shutdown and restart)	4(a),5(a),6,7	None	☐	☐	☐
6.b.	Fuel System	4(a),5(a),6,7	None	☐	☐	☐

6.c.	Electrical System	4(a),5(a),6,7	None	☐	☐	☐
6.d.	Hydraulic System	4(a),5(a),6,7	None	☐	☐	☐
6.e.	Environmental and Pressurization Systems	4(a),5(a),6,7	None	☐	☐	☐
6.f.	Fire Detection and Extinguisher Systems	4(a),5(a),6,7	None	☐	☐	☐
6.g.	Navigation and Avionics Systems	4(a),5(a),6,7	None	☐	☐	☐
6.h.	Automatic Flight Control System, Electronic Flight Instrument System, and Related Subsystems	4(a),5(a),6,7	None	☐	☐	☐
6.i.	Flight Control Systems	4(a),5(a),6,7	None	☐	☐	☐
6.j.	Anti-ice and Deice Systems	4(a),5(a),6,7	None	☐	☐	☐
6.k.	Aircraft and Personal Emergency Equipment	4(a),5(a),6,7	None	☐	☐	☐
7.	Emergency Procedures.	5(a),6,7	None	☐	☐	☐
7.a.	Emergency Descent (Max. Rate)	5(a),6,7	None	☐	☐	☐
7.b.	Inflight Fire and Smoke Removal	5(a),6,7	None	☐	☐	☐
7.c.	Rapid Decompression	5(a),6,7	None	☐	☐	☐
7.d.	Emergency Evacuation	4(a),5(a),6,7	None	☐	☐	☐
8.	Postflight Procedures.	See next	None	☐	☐	☐
8.a.	After-Landing Procedures	4(a),5(a),6,7	None	☐	☐	☐
8.b.	Parking and securing	4(a),5(a),6,7	None	☐	☐	☐

Note 1: An “(a)” in the table indicates that the system, task, or procedure, although not required to be present, may be examined if the appropriate airplane system is simulated in the FTD and is working properly.
Note 2: Items not installed or not functional on the FTD and not appearing on the SOQ Configuration List, are not required to be listed as exceptions on the SOQ.
Note 3: A “(t)” in the table indicates that the task may only be qualified for introductory initial or recurrent qualification training. These tasks may not be qualified for proficiency testing or checking credits in a GACA approved flight training program.

FLIGHT TRAINING DEVICE (FTD) QUALIFICATION TEST CHECKLIST
GACAR PART – 60

QPS REQUIREMENTS						
In order to be qualified at the FTD qualification level indicated, the FTD must be able to perform at least the tasks associated with that level of qualification.						
				Compliance		
Entry Number	Subjective Requirements	FTD Level	Notes/Information	Yes	No	NA
1.	Instructor Operating Station (IOS).	See next	NA	☐	☐	☐
1.a.	Power switch(es).	4,5,6	NA	☐	☐	☐
1.b.	Airplane conditions.	4(a),5,6	e.g., GW, CG, Fuel loading, Systems, Ground. Crew	☐	☐	☐
1.c.	Airports / Runways.	4,5,6	e.g., Selection and Presets; Surface and Lighting controls if equipped with a visual system.	☐	☐	☐
1.d.	Environmental controls.	4,5,6	e.g., Temp, Wind.	☐	☐	☐
1.e.	Airplane system malfunctions (Insertion / deletion)	4(a),5,6	NA	☐	☐	☐
1.f.	Locks, Freezes, and Repositioning.	4,5,6	NA	☐	☐	☐
1.g.	Sound Controls. (On / off / adjustment)	4,5,6	NA	☐	☐	☐
1.h.	Motion / Control Loading System, as appropriate. On / off / emergency stop	4(a),5(a),6 (a)	NA	☐	☐	☐
2.	Observer Seats / Stations.	See next	NA	☐	☐	☐
2.a.	Position / Adjustment / Positive restraint system.	4,5,6	NA	☐	☐	☐
Note 1: An “(a)” in the table indicates that the system, task, or procedure, although not required to be present, may be examined if the appropriate system is in the FTD and is working properly						

FLIGHT TRAINING DEVICE (FTD) QUALIFICATION TEST CHECKLIST

GACAR PART – 60

							Compliance		
Test Entry Number	Test Title	Tolerance	Flight Conditions	Test Details	FTD Level	Notes/Information	Yes	No	NA
1.	Performance.	See next	See next	See next	See next	None	☐	☐	☐
1.a	Taxi.	See next	See next	See next	See next	None	☐	☐	☐
1.a.1	Minimum radius turn.	±0.9 m (3 ft) or ±20% of airplane turn radius.	Ground	Plot both main and nose gear lock and key engine parameter(s). Data for no brakes and the minimum thrust required to maintain a steady turn except for airplanes requiring asymmetric thrust or braking to achieve the minimum radius turn.	7	None	☐	☐	☐
1.a.2	Rate of turn versus nosewheel steering angle (NWA).	±10% or ±2°/s of turn rate.	Ground.	Record for a minimum of two speeds, greater than minimum turning radius speed with one at a typical taxi speed, and with a spread of at least 5 kt.	7	None	☐	☐	☐
1.b	Takeoff.	See next	See next	Note: For Level 7 FTD, all airplane manufacturer commonly used certificated take-off flap settings must be demonstrated at least once either in minimum unstick speed (1.b.3), normal take-off (1.b.4), critical engine failure on take-off (1.b.5) or crosswind take-off (1.b.6).	See next	None	☐	☐	☐
1.b.1	Ground acceleration time and distance.	±1.5 s or ±5% of time; and ±61 m (200 ft) or ±5% of distance. For Level 6 FTD: ±1.5 s or ±5% of time.		Acceleration time and distance must be recorded for a minimum of 80% of the total time from brake release to Vr. Preliminary aircraft certification data may be	6,7	May be combined with normal takeoff (1.b.4.) or rejected takeoff (1.b.7.). Plotted data should be shown using appropriate scales for each portion of the maneuver.	☐	☐	☐

				used.		For Level 6 FTD, this test is required only if RTO training credit is sought.			
1.b.2	Minimum control speed, ground (Vmcg) using aerodynamic controls only per applicable airworthiness requirement or alternative engine inoperative test to demonstrate ground control characteristics.	±25% of maximum airplane lateral deviation reached or ±1.5 m (5 ft). For airplanes with reversible flight control systems: ±10% or ±2.2 daN (5 lbf) rudder pedal force.	Takeoff.	Engine failure speed must be within ±1 kt of airplane engine failure speed. Engine thrust decay must be that resulting from the mathematical model for the engine applicable to the FTD under test. If the modeled engine is not the same as the airplane manufacturer's flight test engine, a further test may be run with the same initial conditions using the thrust from the flight test data as the driving parameter.	7	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 kt, 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, nosewheel steering must be disabled (i.e. castored) or the nosewheel held slightly off the ground.	☐	☐	☐
1.b.3	Minimums unstick speed (Vmu) or equivalent test to demonstrate early rotation take-off characteristics.	±3 kt air speed. ±1.5° pitch angle.	Takeoff.	Record time history data from 10 knots before start of rotation until at least 5 seconds after the occurrence of main gear lift-off.	7	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 takeoff run through main gear lift-off or an early rotation takeoff. If either of these alternative solutions is selected, aft body contact/tail strike protection functionality, if present on the airplane, it should be active.	☐	☐	☐
1.b.4	Normal take-off.	±3 kt air speed. ±1.5° pitch angle. ±1.5° AOA. ±6 m (20 ft) height. For airplanes with reversible flight control	Takeoff.	Data required for near maximum certificated takeoff weight at mid center of gravity location and light takeoff weight at an aft	7	The test may be used for ground acceleration time and distance (1.b.1). Plotted data should be shown using appropriate scales for each	☐	☐	☐

		systems: ±2.2 daN (5 lbf) or ±10% of column force.		center of gravity location. If the airplane has more than one certificated take-off configuration, a different configuration must be used for each weight. Record takeoff profile from brake release to at least 61 m (200 ft) AGL		portion of the maneuver.			
1.b.5	Critical engine failure on take-off	±3 kt air speed. ±1.5° pitch angle. ±1.5° AOA. ±6 m (20 ft) height. ±2° roll angle. ±2° side- slip angle. ±3° heading angle. For airplanes with reversible flight control systems: ±2.2 daN (5 lbf) or ±10% of column force; ±1.3 daN (3 lbf) or ±10% of wheel force; and ±2.2 daN (5 lbf) or ±10% of rudder pedal force	Takeoff.	Record takeoff profile to at least 61 m (200 ft) AGL. Engine failure speed must be within ±3 kt of airplane data. Test at near maximum takeoff weight	7	None	☐	☐	☐
1.b.6	Crosswind take-off	± 3 kt airspeed. ±1.5° pitch angle. ±1.5° AOA. ±6 m (20 ft) height. ±2° roll angle. ±2° side-slip angle. ±3° heading angle. Correct trends at ground speeds below 40 kt for rudder/pedal and heading angle. For airplanes with reversible flight control systems: ±2.2 daN (5 lbf) or ±10% of column force; ±1.3 daN (3 lbf) or ±10% of wheel force. and ±2.2 daN (5 lbf) or ±10% of rudder pedal force.	Takeoff.	Record takeoff profile from brake release to at least 61 m (200 ft) AGL. This test requires test data, including wind profile, for a crosswind component of at least 60% of the airplane performance data value measured at 10 m (33 ft) above the runway. Wind components must be provided as headwind and crosswind values with respect to the runway.	7	In those situations where a maximum crosswind or a maximum demonstrated crosswind is not known, contact GACA.	☐	☐	☐

1.b.7.a	Rejected Takeoff.	±5% of time or ±1.5 s. ±7.5% of distance or ±76 m (250 ft). For Level 6 FTD: ±5% of time or ±1.5 s.	Takeoff.	Record at mass near maximum takeoff weight. Speed for reject must be at least 80% of V1. Maximum braking effort, auto or manual. Where a maximum braking demonstration is not available, an acceptable alternative is a test using approximately 80% braking and full reverse, if applicable. Time and distance must be recorded from brake release to a full stop.	7	Autobrakes will be used where applicable.	☐	☐	☐
1.b.7.b	Rejected Takeoff.	±5% of time or ±1.5 s.	Takeoff.	Record time for at least 80% of the segment from initiation of the rejected takeoff to full stop.	6	For Level 6 FTD, this test is required only if RTO training credit is sought.	☐	☐	☐
1.b.8	Dynamic Engine Failure After Takeoff.	±2°/s or ±20% of body angular rates.	Takeoff.	Engine failure speed must be within ±3 kt of airplane data. Engine failure may be a snap deceleration to idle. Record hands-off from 5 s before engine failure to +5 s or 30° roll angle, whichever occurs first. CCA: Test in Normal and Non-normal control state.	7	For safety considerations, airplane flight test may be performed out of ground effect at a safe altitude, but with correct airplane configuration and airspeed.	☐	☐	☐
1.c	Climb.	See next	See next	See next	See next		☐	☐	☐
1.c.1	Normal Climb, all engines operating	±3 kt air speed. ±0.5 m/s (100 ft/ min) or ±5% of rate of climb.	Clean.	Flight test data are preferred; however, airplane performance manual data are an acceptable alternative. Record at nominal climb speed and mid initial climb altitude. FTD performance is to be	5,6,7	For Level 5 and Level 6 FTDs, this may be a snapshot test result.	☐	☐	☐

				recorded over an interval of at least 300 m (1,000 ft).					
1.c.2	One-engine-inoperative 2nd segment climb.	±3 kt air speed. ±0.5 m/s (100 ft/ min or ±5% of rate of climb, but not less than airplane performance data requirements.	2nd segment climb	Flight test data is preferred; however, airplane performance manual data is an acceptable alternative. Record at nominal climb speed. FTD performance is to be recorded over an interval of at least 300 m (1,000 ft). Test at WAT (weight, altitude, or temperature) limiting condition.	7	None	☐	☐	☐
1.c.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.	7	None	☐	☐	☐
1.c.4	One Engine Inoperative Approach Climb for airplanes with icing accountability if provided in the airplane performance data for this phase of flight.	±3 kt air speed. ±0.5 m/s (100 ft/ min) or ±5% rate of climb, but not less than airplane performance data.	Approach	Flight test data or airplane performance manual data may be used. FTD 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.	7	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 airplane performance data for an approach in icing conditions, should be applied.	☐	☐	☐
1.d	Cruise/Descent.	See next	See next	See next	See next	None	☐	☐	☐
1.d.1	Level flight acceleration	±5% Time	Cruise	Time required to increase air speed a minimum of 50 kt, using maximum continuous thrust rating or equivalent. For airplanes with a small operating speed range, speed change may be	7	None	☐	☐	☐

				reduced to 80% of operational speed change.					
1.d.2	Level flight deceleration.	±5% Time	Cruise	Time required to decrease air speed a minimum of 50 kt, using idle power. For airplanes with a small operating speed range, speed change may be reduced to 80% of operational speed change.	7	None	☐	☐	☐
1.d.3	Cruise Performance	±.05 EPR or ±3% N1 or ±5% of torque. ±5% of fuel flow.	Cruise	The test 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.	7	None	☐	☐	☐
1.d.4	Idle descent	±3 kt air speed. ±1.0 m/s (200 ft/min) or ±5% of rate of descent.	Clean.	Idle power stabilized descent at normal descent speed at mid altitude. FTD performance to be recorded over an interval of at least 300 m (1,000 ft).	7	None	☐	☐	☐
1.d.5	Emergency descent.	±5 kt air speed. ±1.5 m/s (300 ft/min) or ±5% of rate of descent.	As per airplane performance data.	FTD performance to be recorded over an interval of at least 900 m (3,000 ft).	7	Stabilized descent to be conducted with speed brakes extended if applicable, at mid altitude and near Vmo or according to emergency descent procedure.	☐	☐	☐
1.e	Stopping.	See next	See next	See next	See next	None	☐	☐	☐
1.e.1	Deceleration time and distance, manual wheel brakes, dry runway, no reverse thrust.	±1.5 s or ±5% of the time. For distances up to 1,220 m (4,000 ft), the smaller of ±61 m (200 ft) or ±10% of distance. For distances greater than 1,220 m (4,000 ft), ±5% of distance.	Landing.	Time and distance must be recorded for at least 80% of the total time from touchdown to a full stop. The position of ground spoilers and brake system pressure must be plotted (if applicable). Data required for medium and near maximum certificated landing weight.	7	None	☐	☐	☐

				Engineering data may be used for the medium weight condition.			☐	☐	☐
1.e.2	Deceleration time and distance, reverse thrust, no wheel brakes, dry runway.	±1.5 s or ±5% of the time. and the smaller of ±61 m (200 ft) or ±10% of distance.	Landing	Time and distance must be recorded for at least 80% of the total time from initiation of reverse thrust to full thrust reverser minimum operating speed. The position of ground spoilers must be plotted (if applicable). Data required for medium and near maximum certificated landing weight. Engineering data may be used for the medium weight condition.	7	None	☐	☐	☐
1.e.3	Stopping distance, wheel brakes, wet runway.	±61 m (200 ft) or ±10% of distance.	Landing	Either flight test or manufacturer’s performance manual data must be used, where available. Engineering data, based on dry runway flight test stopping distance and the effects of contaminated runway braking coefficients, are an acceptable alternative.	7	None	☐	☐	☐
1.e.4	Stopping distance, wheel brakes, icy runway.	±61 m (200 ft) or ±10% of distance.	Landing	Either flight test or manufacturer’s performance manual data must be used, where available. Engineering data, based on dry runway flight test stopping distance and the effects of contaminated runway braking coefficients, are an acceptable alternative.	7	None	☐	☐	☐
1.f	Engines.	See next	See next	See next	See next	None	☐	☐	☐

1.f.1	Acceleration	For Level 7 FTD: ±10% Ti or ±0.25 s; and ±10% Tt or ±0.25 s. For Level 6 FTD: ±10% Tt or ±0.25 s. For Level 5 FTD: ±1 s	Approach or landing	Total response is the incremental change in the critical engine parameter from idle power to ground power.	5,6,7	See Appendix F of this part for definitions of Ti, and Tt.	☐	☐	☐
1.f.2	Deceleration.	For Level 7 FTD: ±10% Ti or ±0.25 s; and ±10% Tt or ±0.25 s. For Level 6 FTD: ±10% Tt or ±0.25 s. For Level 5 FTD: ±1 s	Ground	Total response is the incremental change in the critical engine parameter from maximum take-off power to idle power.	5,6,7	See Appendix F of this part for definitions of Ti, and Tt.	☐	☐	☐
2.	Handling Qualities	See next	See next	See next	See next	None	☐	☐	☐

2.a	Static Control Tests.	See next	See next	Note.1 — Testing of position versus force is not applicable if forces are generated solely by use of airplane hardware in the FTD. Note 2 — Pitch, roll and yaw controller position versus force or time should be measured at the control. An alternative method in lieu of external test fixtures at the flight controls would be to have recording and measuring instrumentation built into the FTD. The force and position data from this instrumentation could be directly recorded and matched to the airplane data. Provided the instrumentation was verified by using external measuring equipment while conducting the static control checks, or equivalent means, and that evidence of the satisfactory comparison is included in the MQTG, the instrumentation could be used for both initial and recurrent evaluations for the measurement of all required control checks. Verification of the instrumentation by using external measuring equipment should be repeated if major modifications and/or repairs are made to the control loading system. Such a permanent installation could	See next	None	☐	☐	☐

				be used without any time being lost for the installation of external devices. Static and dynamic flight control tests should be accomplished at the same feel or impact pressures as the validation data where applicable. Note 3 — (Level 7 FTD only) FTD static control testing from the second set of pilot controls is only required if both sets of controls are not mechanically interconnected on the FTD. A rationale is required from the data provider if a single set of data is applicable to both sides. If controls are mechanically interconnected in the FTD, a single set of tests is sufficient.						

2.a.1.a	Pitch controller position versus force and surface position calibration.	±0.9 daN (2 lbf) breakout. ±2.2 daN (5 lbf) or ±10% of force. ±2° elevator angle.	Ground	Record results for an uninterrupted control sweep to the stops.	6,7	Test results should be validated with in-flight data from tests such as longitudinal static stability, stalls, etc.	☐	☐	☐
2.a.1.b	Pitch controller position versus force	±0.9 daN (2 lbf) breakout. ±2.2 daN (5 lbf) or ±10% of force.	As determined by sponsor	Record results during initial qualification evaluation for an uninterrupted control sweep to the stops. The recorded tolerances apply to subsequent comparisons on continuing qualification evaluations.	5	Applicable only on continuing qualification evaluations. The intent is to design the control feel for Level 5 to be able to manually fly an instrument approach; and not to compare results to flight test or other such data.	☐	☐	☐
2.a.2.a	Roll controller position versus force and surface position calibration.	±0.9 daN (2 lbf) breakout. ±1.3 daN (3 lbf) or ±10% of force. ±2° aileron angle. ±3° spoiler angle.	Ground	Record results for an uninterrupted control sweep to the stops.	6,7	Test results should be validated with in-flight data from tests such as engine-out trims, steady state sideslips, etc.	☐	☐	☐
2.a.2.b	Roll controller position versus force	±0.9 daN (2 lbf) breakout. ±1.3 daN (3 lbf) or ±10% of force.	As determined by sponsor	Record results during initial qualification evaluation for an uninterrupted control sweep to the stops. The recorded tolerances apply to subsequent comparisons on continuing qualification evaluations.	5	Applicable only on continuing qualification evaluations. The intent is to design the control feel for Level 5 to be able to manually fly an instrument approach; and not to compare results to flight test or other such data.	☐	☐	☐
2.a.3.a	Rudder pedal position versus force and surface position calibration.	±2.2 daN (5 lbf) breakout. ±2.2 daN (5 lbf) or ±10% of force. ±2° rudder angle.	Ground.	Record results for an uninterrupted control sweep to the stops.	6,7	Test results should be validated with in-flight data from tests such as engine-out trims, steady state sideslips, etc.	☐	☐	☐
2.a.3.b	Rudder pedal position versus force	±2.2 daN (5 lbf) breakout. ±2.2 daN (5 lbf) or ±10% of force.	As determined by sponsor	Record results during initial qualification evaluation for an uninterrupted control sweep to the stops. The recorded tolerances apply to subsequent comparisons on continuing qualification evaluations.	5	Applicable only on continuing qualification evaluations. The intent is to design the control feel for Level 5 to be able to manually fly an instrument approach; and not to compare results to flight test or other such data.	☐	☐	☐

2.a.4.a	Nosewheel Steering Controller Force and Position Calibration.	±0.9 daN (2 lbf) breakout. ±1.3 daN (3 lbf) or ±10% of force. ±2° NWA.	Ground.	Record results of an uninterrupted control sweep to the stops.	7	None	☐	☐	☐
2.a.4.b	Nosewheel Steering Controller Force	±0.9 daN (2 lbf) breakout. ±1.3 daN (3 lbf) or ±10% of force.	Ground.	Record results of an uninterrupted control sweep to the stops.	6	None	☐	☐	☐
2.a.5	Rudder Pedal Steering Calibration.	±2° NWA.	Ground.	Record results of an uninterrupted control sweep to the stops.	6,7	None	☐	☐	☐
2.a.6	Pitch Trim Indicator vs. Surface Position Calibration.	±0.5° trim angle.	Ground.		6,7	The purpose of the test is to compare FSTD surface position indicator against the FSTD flight controls model computed value.	☐	☐	☐
2.a.7	Pitch Trim Rate.	±10% of trim rate (°/s) or ±0.1°/s trim rate.	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. For CCA, representative flight test conditions must be used.	7	None	☐	☐	☐
2.a.8	Alignment of cockpit throttle lever versus selected engine parameter.	When matching engine parameters: ±5° of TLA. When matching detents: ±3% N1 or ±.03 EPR or ±3% torque, or ±3% maximum rated manifold pressure, or equivalent. Where the 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. For airplanes with throttle detents, all detents to be presented and at least one position between detents/ endpoints (where practical). For airplanes without detents, end points and at least three other positions are to be presented.	6,7	Data from a test airplane or engineering test bench are acceptable, provided the correct engine controller (both hardware and software) is used. 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. This test may be a series of snapshot tests.	☐	☐	☐
2.a.9.a	Brake pedal position versus	±2.2 daN (5 lbf) or ±10% of force.	Ground.	Relate the hydraulic system pressure to pedal position in	7	FTD computer output results may be used to show	☐	☐	☐

	force and brake system pressure calibration.	±1.0 MPa (150 psi) or ±10% of brake system pressure.		a ground static test. Both left and right pedals must be checked.		compliance.			
2.a.9.b	Brake pedal position versus force	±2.2 daN (5 lbf) or ±10% of force.	Ground.	Two data points are required: zero and maximum deflection. Computer output results may be used to show compliance.	6	FTD computer output results may be used to show compliance. Test is not required unless RTO credit is sought.	☐	☐	☐
2.b	Dynamic Control Tests	See next	See next	Note: Tests 2.b.1, 2.b.2 and 2.b.3 are not applicable for FTDs where the control forces are completely generated within the airplane controller unit installed in the FTD. Power setting may be required for level flight unless otherwise specified. See paragraph 4 of the Appendix A, Attachment 2.	See next	None	☐	☐	☐

2.b.1	Pitch Control	For underdamped systems: T(P0) ±10% of P0 or ±0.05 s. T(P1) ±20% of P1 or ±0.05 s. T(P2) ±30% of P2 or ±0.05 s. T(Pn) ±10*(n+1)% of Pn or ±0.05 s. T(An) ±10% of Amax, where Amax is the largest amplitude or ±0.5% of the total control travel (stop to stop). T(Ad) ±5% of Ad = residual band or ±0.5% of the maximum control travel = residual band. ±1 significant overshoots (minimum of 1 significant overshoot). Steady state position within residual band. Note 1: Tolerances should not be applied on period or amplitude after the last significant overshoot. Note 2: Oscillations within the residual band are not considered significant and are not subject to tolerance. For overdamped and critically damped systems only, the following tolerance applies: T(P0) ±10% of P0 or ±0.05 s.	Takeoff, Cruise, and Landing	Data must be for normal control displacements in both directions (approximately 25% to 50% of 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).	7	n = the sequential period of a full oscillation. Refer to paragraph 4 of Appendix A, Attachment 2 for additional information. For overdamped and critically damped systems, see Figure A2B of Appendix A for an illustration of the reference measurement.	☐	☐	☐
2.b.2	Roll Control	Same as 2.b.1	Takeoff, Cruise, and Landing	Data must 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	7	Refer to paragraph 4 of Appendix A, Attachment 2 for additional information. For overdamped and critically damped systems, see Figure A2B of Appendix A for an illustration of the reference measurement.	☐	☐	☐

				envelope).					
2.b.3	Yaw Control.	Same as 2.b.1	Takeoff, Cruise, and Landing.	Data must be for normal control displacement (approximately 25% to 50% of full throw).	7	Refer to paragraph 4 of Appendix A, Attachment 2 for additional information. For overdamped and critically damped systems, see Figure A2B of Appendix A for an illustration of the reference measurement.	☐	☐	☐
2.b.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 must 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 s before until at least 5 s after initiation of control input. If a single test is used to demonstrate both directions, there must be a minimum of 5 s before control reversal to the opposite direction. CCA: Test in normal and non-normal control state.	7	None	☐	☐	☐
2.b.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 must 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 s before until at least 5 s after initiation of control input. If a single test is used to	7	None	☐	☐	☐

				demonstrate both directions, there must be a minimum of 5 s before control reversal to the opposite direction. CCA: Test in normal and non-normal control state.					
2.b.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 must be typical of minor corrections made while established on an ILS approach (approximately 0.5 to 2°/s yaw rate). Test in both directions. Show time history data from 5 s before until at least 5 s after initiation of control input. If a single test is used to demonstrate both directions, there must be a minimum of 5 s before control reversal to the opposite direction. CCA: Test in normal and non-normal control state.	7	None	☐	☐	☐
2.c	Longitudinal Control Tests.	See next	See next	Power setting is required for level flight unless otherwise specified.			☐	☐	☐
2.c.1.a	Power Change Dynamics.	±3 kt air speed. ±30 m (100 ft) altitude. ±1.5° or ±20% of pitch angle.	Approach.	Power changes 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 s before initiation of the power change to the completion of the power change + 15 s. CCA: Test in normal and non-normal control mode	7	None	☐	☐	☐

2.c.1.b	Power Change Force.	±5 lb. (2.2 daN) or, ±20% pitch control force.	Approach.	May be a series of snapshot test results. Power change dynamics test as described in test 2.c.1.a. will be accepted. CCA: Test in Normal and Non-normal control mode.	5,6	None	☐	☐	☐
2.c.2.a	Flap/Slat Change Dynamics.	±3 kt air speed. ±30 m (100 ft) altitude. ±1.5° or ±20% of pitch angle	Takeoff through initial flap retraction, and approach to landing.	Time history of uncontrolled free response for a time increment equal to at least 5 s before initiation of the reconfiguration change to the completion of the reconfiguration change + 15 s. CCA: Test in normal and non-normal control mode	7	None	☐	☐	☐
2.c.2.b	Flap/Slat Change Force.	±5 lb (2.2 daN) or, ±20% pitch control force.	Takeoff through initial flap retraction, and approach to landing	May be a series of snapshot test results. Flap/Slat change dynamics test as described in test 2.c.2.a. will be accepted. CCA: Test in Normal and Non-normal control mode.	5,6	None	☐	☐	☐
2.c.3	Spoiler/Speed brake Change Dynamics.	±3 kt air speed. ±30 m (100 ft) altitude. ±1.5° or ±20% of pitch angle.	Cruise.	Time history of uncontrolled free response for a time increment equal to at least 5 s before initiation of the configuration change to the completion of the configuration change +15 s. Results required for both extension and retraction. CCA: Test in normal and non-normal control mode	7	None	☐	☐	☐
2.c.4.b	Gear Change Force.	±5 lb. (2.2 daN) or, ±20% pitch control force	Takeoff (retraction) and Approach (extension).	May be a series of snapshot test results. The Gear change dynamics test as described in test 2.c.4.a. will be accepted. CCA: Test in Normal and Non-normal control mode.	5,6	None	☐	☐	☐

2.c.5	Longitudinal Trim	±1° elevator angle. ±0.5° stabilizer or trim surface angle. ±1° pitch angle. ±5% of net thrust or equivalent.	Cruise, Approach, and Landing.	Steady-state wings level trim with thrust for level flight. This test may be a series of snapshot tests. Level 5 FTD may use equivalent stick and trim controllers in lieu of elevator and trim surface. CCA: Test in normal or non-normal control mode, as applicable.	5,6,7	None	☐	☐	☐
2.c.6	Longitudinal Maneuvering Stability (Stick Force/g).	±2.2 daN (5 lbf) or ±10% of pitch controller force. Alternative method: ±1° or ±10% of the change of elevator angle.	Cruise, Approach, and Landing.	Continuous time history data or a series of snapshot tests may be used. Test up to approximately 30 roll angles for approach and landing configurations. Test up to approximately 45 roll angles for the cruise configuration. Force tolerance is not applicable if forces are generated solely by the use of airplane hardware in the FTD. Alternative method applies to airplanes which do not exhibit stick-force-per-g characteristics. CCA: Test in normal or non-normal control mode	6,7	None	☐	☐	☐
2.c.4.a	Gear Change Dynamics.	±3 kt air speed. ±30 m (100 ft) altitude. ±1.5° or ±20% of pitch angle.	Takeoff (retraction), and Approach (extension).	Time history of uncontrolled free response for a time increment equal to at least 5 s before initiation of the configuration change to the completion of the configuration change + 15 s. CCA: Test in normal and non-normal control mode	7	None	☐	☐	☐
2.c.7	Longitudinal Static Stability.	±2.2 daN (5 lbf) or ±10% of pitch controller force. Alternative method: ±1° or ±10% of the change of	Approach.	Data for at least two speeds above and two speeds below trim speed. The speed range must be	5,6,7	None	☐	☐	☐

		elevator angle.		sufficient to demonstrate stick force versus speed characteristics. This test may be a series of snapshot tests. Force tolerance is not applicable if forces are generated solely by the use of airplane hardware in the FTD. Alternative method applies to airplanes which do not exhibit speed stability characteristics. Level 5 must exhibit positive static stability but need not comply with the numerical tolerance. CCA: Test in normal or non-normal control mode, as applicable.					

2.c.8.a	Approach to Stall Characteristics	±3 kt air speed for initial buffet, stall warning, and stall speeds. Control inputs must be plotted and demonstrate correct trend and magnitude. ±2.0° pitch angle ±2.0° angle of attack ±2.0° bank angle ±2.0° sideslip angle Additionally, for those simulators with reversible flight control systems: ±10% or ±5 lb. (2.2 daN)) Stick/Column force (prior to "g break" only).	Second Segment Climb, High Altitude Cruise (Near Performance Limited Condition), and Approach or Landing	Each of the following stall entry methods must be demonstrated in at least one of the three required flight conditions: ♣ Stall entry at wings level (1g) ♣ Stall entry in turning flight of at least 25° bank angle (accelerated stall) ♣ Stall entry in a power-on condition (required only for turboprop aircraft) The required cruise condition must be conducted in a flap-up (clean) configuration. The second segment climb, and approach/landing conditions must be conducted at different flap settings. For airplanes that exhibit stall buffet as the first indication of a stall, for qualification of this task, the FTD must be equipped with a vibration system that meets the applicable subjective and objective requirements in Appendix A of this Part.	7	Tests may be conducted at centers of gravity typically required for airplane certification stall testing.	☐	☐	☐
2.c.8.b	Stall Warning (actuation of stall warning device.)	±3 kts. airspeed, ±2° bank for speeds greater than actuation of stall warning device or initial buffet.	Second Segment Climb, and Approach or Landing.	The stall maneuver must be entered with thrust at or near idle power and wings level (1g). Record the stall warning signal and initial buffet if applicable. CCA: Test in Normal and Non-normal control states.	5,6	None	☐	☐	☐
2.c.9.a	Phugoid Dynamics.	±10% of the period. ±10% of time to one half or double amplitude or ±0.02	Cruise.	The test must include three full cycles or that necessary to determine time to one	6,7	None	☐	☐	☐

		of damping ratio.		half or double amplitude, whichever is less. CCA: Test in non-normal control mode.					
2.c.9.b	Phugoid Dynamics.	±10% period, Representative damping.	Cruise.	The test must include whichever is less of the following: Three full cycles (six overshoots after the input is completed), or the number of cycles sufficient to determine representative damping. CCA: Test in non-normal control mode.	5	None	☐	☐	☐
2.c.10	Short Period Dynamics.	±1.5° pitch angle or ±2°/s pitch rate. ±0.1 g normal acceleration	Cruise.	CCA: (Level 7 FTD) Test in normal and non-normal control mode. (Level 6 FTD) Test in non-normal control mode.	6,7	None	☐	☐	☐
2.c.11	(Reserved)						☐	☐	☐
2.d	Lateral Directional Tests.	See next	See next	Power setting is required for level flight unless otherwise specified.	See next	None	☐	☐	☐
2.d.1	Minimum control speed, air (Vmca) or landing (Vmcl), per applicable airworthiness requirement or low speed engine-inoperative handling characteristics in the air.	±3 kt airspeed.	Takeoff or Landing (whichever is most critical in the	Takeoff thrust must be set on the operating engine(s). Time history or snapshot data may be used. CCA: Test in normal or non-normal control state, as applicable.	7	Minimum speed may be defined by a performance or control limit which prevents demonstration of Vmca or Vmcl in the conventional manner.	☐	☐	☐
2.d.2	Roll Response (Rate).	±2°/s or ±10% of roll rate. For airplanes with reversible flight control systems (Level 7 FTD only): ±1.3 daN (3 lbf) or	Cruise, and Approach or Landing.	Test with normal roll control displacement (approximately one-third of maximum roll controller travel).	5,6,7	None	☐	☐	☐

		±10% of wheel force.		This test may be combined with step input of flight deck roll controller test 2.d.3.					
2.d.3	Step input of flight deck roll controller.	±2° or ±10% of roll angle.	Approach or Landing.	This test may be combined with roll response (rate) test 2.d.2. CCA: (Level 7 FTD) Test in normal and non-normal control mode. (Level 6 FTD) Test in non-normal control mode.	6,7	With wings level, apply a step roll control input using approximately one-third of the roll controller travel. When reaching approximately 20° to 30° of bank, abruptly return the roll controller to neutral and allow approximately 10 seconds of airplane free response.	☐	☐	☐
2.d.4.a	Spiral Stability.	Correct trend and ±2° or ±10% of roll angle in 20 s. If alternate test is used: correct trend and ±2° aileron angle.	Cruise, and Approach or Landing.	Airplane data averaged from multiple tests may be used. Test for both directions. As an alternative test, showing lateral control is required to maintain a steady turn with a roll angle of approximately 30°. CCA: Test in non-normal control mode.	7	None	☐	☐	☐
2.d.4.b	Spiral Stability	Correct trend and ±3° or ±10% of roll angle in 20 s.	Cruise	Airplane data averaged from multiple tests may be used. Test for both directions. As an alternative test, showing lateral control is required to maintain a steady turn with a roll angle of approximately 30°. CCA: Test in non-normal control mode.	6	None	☐	☐	☐
2.d.4.c	Spiral Stability	Correct trend	Cruise	Airplane data averaged from multiple tests may be used. CCA: Test in non-normal control mode.	5	None	☐	☐	☐
2.d.5	Engine Inoperative Trim.	±1° rudder angle or ±1° tab angle or equivalent rudder pedal. ±2° side-slip angle.	Second Segment Climb, and Approach or Landing.	This test may consist of snapshot tests.	7	Tests should be performed in a manner similar to that for which a pilot is trained to trim an engine failure condition. The 2nd segment climb test	☐	☐	☐

						should be at takeoff thrust. Approach or landing test should be at thrust for level flight.			
2.d.6.a	Rudder Response.	±2°/s or ±10% of yaw rate.	Approach or Landing.	For Level 7 FTD: Test with stability augmentation on and off. Test with a step input at approximately 25% of full rudder pedal throw. Not required if rudder input and response is shown in Dutch Roll test (test 2.d.7). CCA: Test in normal and non-normal control mode	6,7	None	☐	☐	☐
2.d.6.b	Rudder Response.	Roll rate ±2°/sec, bank angle ±3°.	Approach or Landing.	May be roll response to a given rudder deflection. CCA: Test in Normal and Non-normal control states	5	May be accomplished as a yaw response test, in which case the procedures and requirements of test 2.d.6.a. will apply	☐	☐	☐
2.d.7	Dutch Roll	±0.5 s or ±10% of period. ±10% of time to one half or double amplitude or ±.02 of damping ratio. (Level 7 FTD only): ±1 s or ±20% of time difference between peaks of roll angle and side- slip angle.	Cruise, and Approach or Landing.	Test for at least six cycles with stability augmentation off. CCA: Test in non-normal control mode.	6,7	None	☐	☐	☐
2.d.8	Steady State Sideslip.	For a given rudder position: ±2° roll angle. ±1° side-slip angle; ±2° or ±10% of aileron angle; and ±5° or ±10% of spoiler or equivalent roll controller position or force. For airplanes with reversible flight control systems (Level 7 FTD only): ±1.3 daN (3 lbf) or ±10% of wheel force. ±2.2 daN (5 lbf) or ±10% of	Approach or Landing.	This test may be a series of snapshot tests using at least two rudder positions (in each direction for propeller-driven airplanes), one of which must be near maximum allowable rudder. (Level 5 and Level 6 FTD only): Sideslip angle is matched only for repeatability and only on continuing qualification evaluations.	5,6,7	None	☐	☐	☐

		rudder pedal force.							
2.e	Landings	See next	See next	See next	See next	None	☐	☐	☐
2.e.1	Normal Landing	±3 kt air speed. ±1.5° pitch angle. ±1.5° AOA. ±3 m (10 ft) or ±10% of height. For airplanes with reversible flight control systems: ±2.2 daN (5 lbf) or ±10% of column force.	Landing.	Test from a minimum of 61 m (200 ft) AGL to nosewheel touchdown. CCA: Test in normal and non-normal control mode, if applicable.	7	Two tests should be shown, including two normal landing flaps (if applicable) one of which should be near maximum certificated landing mass, the other at light or medium mass.	☐	☐	☐
2.e.2	Minimum Flap Landing.	±3 kt air speed. ±1.5° pitch angle. ±1.5° AOA. ±3 m (10 ft) or ±10% of height. For airplanes with reversible flight control systems: ±2.2 daN (5 lbf) or ±10% of column force.	Minimum Certified Landing Flap Configuratio n on.	Test from a minimum of 61 m (200 ft) AGL to nosewheel touchdown. Test at near maximum certificated landing weight.	7	None	☐	☐	☐
2.e.3	Crosswind Landing.	±3 kt air speed. ±1.5° pitch angle. ±1.5° AOA. ±3 m (10 ft) or ±10% of height. ±2° roll angle. ±2° side-slip angle. ±3° heading angle. For airplanes with reversible flight control systems: ±2.2 daN (5 lbf) or ±10% of column force. ±1.3 daN (3 lbf) or ±10% of wheel force. ±2.2 daN (5 lbf) or ±10% of rudder pedal force.	Landing.	Test from a minimum of 61 m (200 ft) AGL to a 50% decrease in main landing gear touchdown speed. It requires test data, including wind profile, for a crosswind component of at least 60% of airplane performance data value measured at 10 m (33 ft) above the runway. Wind components must be provided as headwind and crosswind values with respect to the runway.	7	In those situations where a maximum crosswind or a maximum demonstrated crosswind is not known, contact GACA.	☐	☐	☐
2.e.4	One Engine Inoperative Landing.	±3 kt air speed. ±1.5° pitch angle. ±1.5° AOA. ±3 m (10 ft) or ±10% of height. ±2° roll angle. ±2° side- slip 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.	7	None	☐	☐	☐
2.e.5	Autopilot landing (if	±1.5 m (5 ft) flare height. ±0.5 s or ± 10% of Tf.	Landing.	If autopilot provides roll-out guidance, record lateral	7	See Appendix F of this part for definition of Tf.	☐	☐	☐

	applicable).	±0.7 m/s (140 ft/min) rate of descent at touchdown. ±3 m (10 ft) lateral deviation during roll-out.		deviation from touchdown to a 50% decrease in main landing gear touchdown speed. Time of autopilot flare mode engage, and main gear touchdown must be noted.					
2.e.6	All-engine autopilot go around	±3 kt air speed. ±1.5° pitch angle. ±1.5° AOA.	As per airplane performance data.	Normal all-engine autopilot go-around must be demonstrated (if applicable) at medium weight.	7	None	☐	☐	☐
2.e.7	One engine inoperative go around.	±3 kt air speed. ±1.5° pitch angle. ±1.5° AOA. ±2° roll angle. ±2° side-slip angle.	As per airplane performance data.	Engine inoperative go-around required near maximum certificated landing weight with critical engine inoperative. Provide one test with autopilot (if applicable) and one without autopilot. CCA: Non-autopilot test to be conducted in non-normal mode.	7	None	☐	☐	☐
2.e.8	Directional control (rudder effectiveness) with symmetric reverse thrust.	±5 kt air speed. ±2°/s yaw rate.	Landing.	Apply rudder pedal input in both directions using full reverse thrust until reaching full thrust reverser minimum operating speed.	7	None	☐	☐	☐
2.e.9	Directional control (rudder effectiveness) with asymmetric reverse thrust.	±5 kt air speed. ±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 operation speed is reached.			☐	☐	☐
2.f	Ground Effect.	See next	See next	See next	See next	None	☐	☐	☐
	Test to demonstrate Ground Effect.	±1° elevator angle. ±0.5° stabilizer angle. ±5% of net thrust or equivalent. ±1° AOA. ±1.5 m (5 ft) or ±10% of	Landing.	A rationale must be provided with justification of results. CCA: Test in normal or non-normal control mode, as applicable.	7	See paragraph on Ground Effect in this attachment for additional information.	☐	☐	☐

		height. ±3 kt air speed. ±1° pitch angle.							
2.g	Reserved						☐	☐	☐
2.h	Flight Maneuver and Envelope Protection Functions			*Note: The requirements of 2.h are 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 their function is different) are required. Set thrusts as required to reach the envelope protection function.*		None	☐	☐	☐
2.h.1	Overspeed.	±5 kt airspeed.	Cruise.		7	None	☐	☐	☐
2.h.2	Minimum Speed.	±3 kt airspeed.	Takeoff, Cruise, and Approach or Landing.		7	None	☐	☐	☐
2.h.3	Load Factor.	±0.1g normal load factor	Takeoff, Cruise.		7	None	☐	☐	☐
2.h.4	Pitch Angle	±1.5° pitch angle	Cruise, Approach.		7	None	☐	☐	☐
2.h.5	Back Angle.	±2° or ±10% bank angle	Approach.		7	None	☐	☐	☐
2.h.6	Angle of Attack.	±1.5° angle of attack	Second Segment Climb, and Approach or Landing.		7	None	☐	☐	☐
3.	Reserved					None	☐	☐	☐
4.	Visual System	See next	See next	See next	See next	None	☐	☐	☐
4.a	Visual scene quality	See next	See next	See next	See next	None	☐	☐	☐
4.a.1	Continuous	Visual display providing	Not	Required as part of MQTG	7	Field of view should be	☐	☐	☐

	cross- cockpit visual field of view.	each pilot with a minimum of 176° horizontal and 36° vertical continuous field of view.	applicable.	but not required as part of continuing evaluations.		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 an SOC (this would generally consist of results from acceptance testing).			
4.a.2	System Geometry	Geometry of image should have no distracting discontinuities.			7	None	☐	☐	☐
4.a.3	Surface resolution (object detection).	Not greater than 4 arc minutes.	Not applicable.		7	Resolution will 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 eyepoint. The object will subtend 4 arc minutes to the eye. This may be demonstrated using threshold bars for a horizontal test. A vertical test should also be demonstrated. The subtended angles should be confirmed by calculations in an SOC.	☐	☐	☐
4.a.4	Light point size.	Not greater than 8 arc minutes.	Not applicable.		7	Light point size should be measured using a test pattern consisting of a centrally located single row of white light points displayed as both a horizontal and vertical row. It should be possible to move the light points relative to the eyepoint in all axes. At a point where modulation is just discernible in each visual channel, a	☐	☐	☐

						calculation should be made to determine the light spacing. An SOC is required to state test method and calculation.			
4.a.5	Raster surface contrast ratio.	Not less than 5:1.	Not applicable.		7	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 center of each channel. Measurement should be made on the center bright square for each channel using a 1° spot photometer. This value should have a minimum brightness of 7 cd/m2 (2 ft-lamberts). Measure any adjacent dark squares. The contrast ratio is the bright square value divided by the dark square value. Note 1. — During contrast ratio testing, FTD aft-cab and flight deck ambient light levels should be as low as possible. Note 2. — Measurements should be taken at the center of squares to avoid light spilling into the measurement device.	☐	☐	☐
4.a.6	Light point contrast ratio	Not less than 10:1.	Not applicable		7	Light point contrast ratio should be measured using a test pattern demonstrating an area of greater than 1° area filled with white light points and should be compared to	☐	☐	☐

						the adjacent background. Note. — Light point modulation should be just discernible on calligraphic systems but will not be discernable on raster systems. Measurements of the background should be taken such that the bright square is just out of the light meter FOV. Note. — During contrast ratio testing, FTD aft-cab and flight deck ambient light levels should be as low as practical.			
4.a.7	Light point brightness	Not less than 20 cd/m2 (5.8 ft- lamberts).	Not applicable.		7	Light points should be displayed as a matrix creating a square. On calligraphic systems the light points should just merge. On raster systems the light points should overlap such that the square is continuous (individual light points will not be visible).	☐	☐	☐
4.a.8	Surface brightness.	Not less than 14 cd/m2 (4.1 ft- lamberts) on the display.	Not applicable.		7	Surface brightness should be measured on a white raster, measuring the brightness using the 1° spot photometer. Light points are not acceptable. The use of calligraphic capabilities to enhance raster brightness is acceptable.	☐	☐	☐
4.b	Head-Up Display (HUD)	See next	See next	See next	See next		☐	☐	☐
4.b.1	Static Alignment.	Static alignment with displayed image. HUD bore sight must align with the center of the displayed image spherical pattern. Tolerance +/- 6 arc min.			7	Alignment requirement only applies to the pilot flying.	☐	☐	☐

4.b.2	System display.	All functionality in all flight modes must be demonstrated.			7	A statement of the system capabilities should be provided, and the capabilities demonstrated	☐	☐	☐
4.b.3	HUD attitude versus FTD attitude indicator (pitch and roll of horizon).	Pitch and roll align with aircraft instruments.	Flight		7	Alignment requirement only applies to the pilot flying.	☐	☐	☐
4.c	Enhanced Flight Vision System (EFVS)	See next	See next	See next	See next	None	☐	☐	☐
4.c.1	Registration test.	Alignment between EFVS display and out of the window image must represent the alignment typical of the aircraft and system type	Takeoff point and on approach at 200 ft.		7	Alignment requirement only applies to the pilot flying. *Note: The effects of the alignment tolerance in 4.b.1 should be taken into account.*	☐	☐	☐
4.c.2	EFVS RVR and visibility calibration.	The scene represents the EFVS view at 350 m (1,200 ft) and 1,609 m (1 sm) RVR including correct light intensity	Flight		7	Infra-red scene representative of both 350 m (1,200 ft), and 1,609 m (1 sm) RVR. Visual scene may be removed.	☐	☐	☐
4.c.3	Thermal crossover.	Demonstrate thermal crossover effects during the day-to-night transition.	Day and night		7	The scene will correctly represent the thermal characteristics of the scene during a day to night transition.	☐	☐	☐
4.d	Visual ground segment	See next	See next	See next	See next	None	☐	☐	☐
4.d.1	Visual ground segment (VGS).	Near end: the correct number of approach lights within the computed VGS must be visible. Far end: ±20% of the computed VGS. The threshold lights computed to be visible must be visible in the FTD.	Trimmed in the landing configuration at 30 m (100 ft) wheel height above touchdown	This test is designed to assess items impacting the accuracy of the visual scene presented to a pilot at DH on an ILS approach. These items include: 1) RVR/Visibility; 2) Glide slope (G/S) and localizer modeling accuracy (location	7	Pre-position for this test is encouraged but may be achieved via manual or autopilot control to the desired position.	☐	☐	☐

			zone on glide slope at an RVR setting of 300 m (1,000 ft) or 350 m (1,200 ft).	and slope) for an ILS; 3) For a given weight, configuration and speed representative of a point within the airplane's operational envelope for a normal approach and landing; and 4) Radio altimeter. Note: If non-homogeneous fog is used, the vertical variation in horizontal visibility should be described and included in the slant range visibility calculation used in the VGS computation.					
4.e	Visual System Capacity	See next	See next	See next	See next	None	☐	☐	☐
4.e.1	System capacity – Day mode.	Not less than: 10,000 visible textured surfaces, 6,000 light points, 16 moving models.	Not applicable		7	Demonstrated through use of a visual scene rendered with the same image generator modes used to produce scenes for training. The required surfaces, light points, and moving models should be displayed simultaneously.	☐	☐	☐
4.e.2	System capacity – Twilight/night mode.	Not less than: 10,000 visible textured surfaces, 15,000 light points, 16 moving models.	Not applicable		7	Demonstrated through use of a visual scene rendered with the same image generator modes used to produce scenes for training. The required surfaces, light points, and moving models should be displayed simultaneously.	☐	☐	☐
5.	Sound System.	See next	See next	The sponsor will not be required to repeat the operational sound tests (i.e., tests 5.a.1. through 5.a.8. (Or 5.b.1. through 5.b.9.) and 5.c., as appropriate)	See next	None	☐	☐	☐

				during continuing qualification evaluations if frequency response and background noise test results are within tolerance when compared to the initial qualification evaluation results, and the sponsor shows that no software changes have occurred that will affect the FTD's sound system. If the frequency response test method is chosen and fails, the sponsor may elect to fix the frequency response problem and repeat the test or the sponsor may elect to repeat the operational sound tests. If the operational sound tests are repeated during continuing qualification evaluations, the results may be compared against initial qualification evaluation results. All tests in this section must be presented using an unweighted 1/3-octave band format from band 17 to 42 (50 Hz to 16 kHz). A minimum 20 second average must be taken at a common location from where the initial evaluation sound results were gathered.					
5.a	Turbo-jet airplanes.	See next	See next	See next	See next	All tests in this section should be presented using an unweighted 1/3- octave band format from at least band 17 to 42 (50 Hz to 16 kHz).	☐	☐	☐

						A measurement of a minimum of 20 s should be taken at the location corresponding to the approved data set. Refer to paragraph 7 of Appendix A, Attachment 2.			
5.a.1	Ready for engine start.	Initial evaluation: Subjective assessment of 1/3 octave bands. Recurrent evaluation: cannot exceed ±5 dB difference 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.	Ground	Normal condition prior to engine start. The APU must be on if appropriate.	7	None	☐	☐	☐
5.a.2	All engines at idle.	Initial evaluation: Subjective assessment of 1/3 octave bands. Recurrent evaluation: cannot exceed ±5 dB difference 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.	Ground	Normal condition prior to takeoff.	7	None	☐	☐	☐
5.a.3	All engines at maximum allowable thrust with brakes set.	Initial evaluation: Subjective assessment of 1/3 octave bands. Recurrent evaluation: cannot exceed ±5 dB difference on three consecutive bands when compared to initial evaluation and the average	Ground.	Normal condition prior to takeoff.	7	None	☐	☐	☐

		of the absolute differences between initial and recurrent evaluation results cannot exceed 2 dB.							
5.a.4	Climb	Initial evaluation: Subjective assessment of 1/3 octave bands. Recurrent evaluation: cannot exceed ±5 dB difference 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.	En-route climb.	Medium altitude.	7	None	☐	☐	☐
5.a.5	Cruise	Initial evaluation: Subjective assessment of 1/3 octave bands. Recurrent evaluation: cannot exceed ±5 dB difference 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.	Cruise	Normal cruise configuration.	7	None	☐	☐	☐
5.a.6	Speed brake/spoilers extended (as appropriate).	Initial evaluation: Subjective assessment of 1/3 octave bands. Recurrent evaluation: cannot exceed ±5 dB difference on three consecutive bands when compared to initial evaluation and the average of the absolute differences between initial and recurrent evaluation results	Cruise	Normal and constant speed brake deflection for descent at a constant airspeed and power setting.	7	None	☐	☐	☐

		cannot exceed 2 dB.							
5.a.7	Initial approach.	Initial evaluation: Subjective assessment of 1/3 octave bands. Recurrent evaluation: cannot exceed ±5 dB difference 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.	Approach	Constant airspeed, gear up, flaps/slats as appropriate.	7	None	☐	☐	☐
5.b	Propeller-driven airplanes	See next	See next	See next	See next	All tests in this section should be presented using an unweighted 1/3- octave band format from at least band 17 to 42 (50 Hz to 16 kHz). A measurement of a minimum of 20 s should be taken at the location corresponding to the approved data set. Refer to paragraph 7 of Appendix A, Attachment 2.	☐	☐	☐
5.b.1	Ready for engine start.	Initial evaluation: Subjective assessment of 1/3 octave bands. Recurrent evaluation: cannot exceed ±5 dB difference 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.	Ground.	Normal condition prior to engine start. The APU must be on if appropriate.	7	None	☐	☐	☐
5.b.2	All propellers feathered, if applicable.	Initial evaluation: Subjective assessment of 1/3 octave bands.	Ground.	Normal condition prior to take-off.	7	None	☐	☐	☐

		Recurrent evaluation: cannot exceed ±5 dB difference 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.							
5.b.3	Ground idle or equivalent.	Initial evaluation: Subjective assessment of 1/3 octave bands. Recurrent evaluation: cannot exceed ±5 dB difference 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.	Ground.	Normal condition prior to takeoff.	7	None	☐	☐	☐
5.b.4	Flight idle or equivalent.	Initial evaluation: Subjective assessment of 1/3 octave bands Recurrent evaluation: cannot exceed ±5 dB difference 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.	Ground.	Normal condition prior to takeoff.	7	None	☐	☐	☐
5.b.5	All engines at maximum allowable power with brakes set.	Initial evaluation: Subjective assessment of 1/3 octave bands. Recurrent evaluation: cannot exceed ±5 dB difference on three	Ground	Normal condition prior to takeoff	7	None	☐	☐	☐

		consecutive bands when compared to initial evaluation and the average of the absolute differences between initial and recurrent evaluation results cannot exceed 2 dB.							
5.b.6	Climb	Initial evaluation: Subjective assessment of 1/3 octave bands. Recurrent evaluation: cannot exceed ±5 dB difference 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.	En-route climb.	Medium altitude	7	None	☐	☐	☐
5.b.7	Cruise	Initial evaluation: Subjective assessment of 1/3 octave bands. Recurrent evaluation: cannot exceed ±5 dB difference 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.	Cruise	Normal cruise configuration	7	None	☐	☐	☐
5.b.8	Initial approach	Initial evaluation: Subjective assessment of 1/3 octave bands. Recurrent evaluation: cannot exceed ±5 dB difference on three consecutive bands when compared to initial	Approach	Constant air speed, gear up, flaps extended as appropriate, RPM as per operating manual.	7	None	☐	☐	☐

		evaluation and the average of the absolute differences between initial and recurrent evaluation results cannot exceed 2 dB.							
5.b.9	Final approach	Initial evaluation: Subjective assessment of 1/3 octave bands. Recurrent evaluation: cannot exceed ±5 dB difference 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.	Landing	Constant air speed, gear down, landing configuration flaps, RPM as per operating manual.	7	None	☐	☐	☐
5.c	Special cases.	Initial evaluation: Subjective assessment of 1/3 octave bands. Recurrent evaluation: cannot exceed ±5 dB difference 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.	As appropriate.		7	This applies to special steady-state cases identified as particularly significant to the pilot, important in training, or unique to a specific airplane type or model.	☐	☐	☐
5.d	FTD background noise	Initial evaluation: background noise levels must fall below the sound levels described in Appendix A, Attachment 2, Paragraph 7.c (5). Recurrent evaluation: ±3 dB per 1/3 octave band compared to initial evaluation.		Results of the background noise at initial qualification must be included in the QTG document and approved by the NSPM. The measurements are to be made with the simulation running, the sound muted and a dead cockpit.	7	The simulated sound will be evaluated to ensure that the background noise does not interfere with training. Refer to paragraph 7 of Appendix A, Attachment 2. This test should be presented using an unweighted 1/3 octave band format from band 17 to 42 (50 Hz to 16 kHz).	☐	☐	☐

5.e	Frequency response	Initial evaluation: not applicable. Recurrent evaluation: cannot exceed ±5 dB difference 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.			7	Only required if the results are to be used during continuing qualification evaluations in lieu of airplane tests. The results must be approved by the NSPM during the initial qualification. This test should be presented using an unweighted 1/3 octave band format from band 17 to 42 (50 Hz to 16 kHz).	☐	☐	☐
6	SYSTEMS INTEGRATION	See next	See next	See next	See next	None	☐	☐	☐
6.a	System response time	See next	See next	See next	See next	None	☐	☐	☐
6.a.1	Transport delay	Instrument response: 100 ms (or less) after airplane response. Visual system response: 120 ms (or less) after airplane response.	Pitch, roll and yaw.		7	One separate test is required in each axis. Where EFVS systems are installed, the EFVS response should be within + or - 30 ms from visual system response, and not before motion system response. Note. — The delay from the airplane EFVS electronic elements should be added to the 30 ms tolerance before comparison with visual system reference.	☐	☐	☐
6.a.2	Transport delay	300 milliseconds or less after controller movement.			5,6	If transport delay is the chosen method to demonstrate relative responses, the sponsor and the NSPM will use the latency values to ensure proper FTD response when reviewing those existing tests where latency can be	☐	☐	☐

						identified (e.g., short period, roll response, rudder response)			

FLIGHT TRAINING DEVICE (FTD) QUALIFICATION TEST CHECKLIST

GACAR PART – 60

ALTERNATIVE DATA SOURCE FOR FTD LEVEL 5 SMALL, SINGLE ENGINE (RECIPROCATING) AIRPLANE					
QPS REQUIRMENT					
			Compliance		
Entry Number	Applicable Test Title and Procedure	Authorized Performance Range	Yes	No	NA
1.	Performance	NA	☐	☐	☐
1.c	Climb	NA	☐	☐	☐
1.c.1	Normal climb with nominal gross weight, at best rate-of-climb airspeed	Climb rate = 500 - 1200 fpm (2.5 - 6 m/sec).	☐	☐	☐
1.f	Engines	NA	☐	☐	☐
1.f.1	Acceleration; idle to takeoff power	2 - 4 Seconds.	☐	☐	☐
1.f.2	Deceleration; takeoff power to idle	2 - 4 Seconds.	☐	☐	☐
2.	Handling Qualities	NA	☐	☐	☐
2.c	Longitudinal Tests	NA	☐	☐	☐
2.c.1	Power Charge Force	Test (a) or (b) Required	☐	☐	☐
2.c.1 (a)	Power change force (a): Trim for straight and level flight at 80% of normal cruise airspeed with necessary power. Reduce power to flight idle. Do not change trim or configuration. After stabilized, record column force necessary to maintain original airspeed.	5 - 15 lbs. (2.2 - 6.6 daN) of force (Push).	☐	☐	☐
2.c.1 (b)	Power change force (b): Trim for straight and level flight at 80 percent of normal cruise airspeed with necessary power. Add power to maximum setting. Do not change trim or configuration. After stabilized, record column force necessary to maintain original airspeed.	5 - 15 lbs. (2.2 - 6.6 daN) of force (Pull).	☐	☐	☐
2.c.2	Flap/Slat Change force.	Test (a) or (b) Required	☐	☐	☐
2.c.2 (a)	Flap/slat change force. (a): Trim for straight and level flight with flaps fully retracted at a constant airspeed within the flaps-extended airspeed range. Do not adjust trim or power. Extend the flaps to 50 percent of full flap travel. After stabilized, record stick force necessary to maintain original airspeed	5 - 15 lbs. (2.2 - 6.6 daN) of force (Push).	☐	☐	☐
2.c.2 (b)	Flap/slat change force. (b): Trim for straight and level flight with flaps extended to 50% of full flap travel, at a constant airspeed within the flaps extended airspeed range. Do not adjust trim or power. Retract the flaps to zero. After stabilized, record stick force necessary to maintain original airspeed.	5 - 15 lbs. (2.2 - 6.6 daN) of force (Pull).	☐	☐	☐
2.c.4	Gear Change Force	Test (a) or (b) Required	☐	☐	☐
2.c.4 (a)	Gear change force (a): Trim for straight and level flight with landing gear retracted at a constant airspeed within the landing gear-extended airspeed range. Do not adjust trim or power. Extend the landing gear. After stabilized, record stick force	2 - 12 lbs. (0.88 - 5.3 daN) of force (Push).	☐	☐	☐

	necessary to maintain original airspeed.				
2.c.4 (b)	Gear change force (b): Trim for straight and level flight with landing gear extended, at a constant airspeed within the landing gear-extended airspeed range. Do not adjust trim or power. Retract the landing gear. After stabilized, record stick force necessary to maintain original airspeed.	2 - 12 lbs. (0.88 - 5.3 daN) of force (Pull).	☐	☐	☐
2.c.5	Longitudinal trim.	Must be able to trim longitudinal stick force to “zero” in each of the following configurations: cruise; approach; and landing.	☐	☐	☐
2.c.7	Longitudinal static stability.	Must exhibit positive static stability	☐	☐	☐
2.c.8	Stall warning (actuation of stall warning device) with nominal gross weight; wings level; and a deceleration rate of not more than three (3) knots per second. a) Landing configuration. b) clean configuration.	Landing configuration: 40 - 60 knots; ± 5° of bank. Clean configuration: Landing configuration speed + 10 - 20%.	☐	☐	☐
2.c.9.b	Phugoid dynamics.	Must have a phugoid with a period of 30 - 60 seconds. May not reach ½ or double amplitude in less than 2 cycles.	☐	☐	☐
2.d	Lateral Directional Tests.	NA	☐	☐	☐
2.d.2	Roll response (rate). Roll rate must be measured through at least 30 degrees of roll. Aileron control must be deflected 1/3 (33.3 percent) of maximum travel.	Must have a roll rate of 4° - 25°/second.	☐	☐	☐
2.d.4.c	Spiral stability. Cruise configuration and normal cruise air speed. Establish a 20 degree - 30-degree bank. When stabilized, neutralize the aileron control and release. Must be completed in both directions of turn.	Initial bank angle (+/- 5°) after 20 seconds.	☐	☐	☐
2.d.6.b	Rudder response. Use 25 percent of maximum rudder deflection. (Applicable to approach or landing configuration.)	2° - 6° /second yaw rate.	☐	☐	☐
2.d.8	Steady state sideslip. Use 50 percent rudder deflection. (Applicable to approach and landing configurations.)	2 percent – 10 percent of bank; 4 percent - 10 percent of sideslip; and 2 percent -10 percent of aileron.	☐	☐	☐
6.	FTD System Response Time	NA	☐	☐	☐
6.a	Flight deck instrument systems response to an abrupt pilot controller input. One test is required in each axis (pitch, roll, yaw).	300 milliseconds or less.	☐	☐	☐

FLIGHT TRAINING DEVICE (FTD) QUALIFICATION TEST CHECKLIST
GACAR PART – 60

ALTERNATIVE DATA SOURCE FOR FTD LEVEL 5 SMALL, MULTI ENGINE (RECIPROCATING) AIRPLANE					
QPS REQUIRMENT					
			Compliance		
Entry Number	Applicable Test Title and Procedure	Authorized Performance Range	Yes	No	NA
1.	Performance.	See next	☐	☐	☐
1.c	Climb.	See next	☐	☐	☐
1.c.1	Normal climb with nominal gross weight, at best rate-of-climb airspeed.	Climb airspeed = 95 – 115 knots. Climb rate = 500 – 1500 fpm (2.5 – 7.5 m/sec)	☐	☐	☐
1.f	Engines.	See next	☐	☐	☐
1.f.1	Acceleration; idle to takeoff power.	2 - 5 Seconds.	☐	☐	☐
1.f.2	Deceleration; takeoff power to idle.	2 - 5 Seconds.	☐	☐	☐
2.	Handling Qualities.	See next	☐	☐	☐
2.c	Longitudinal Tests	See next	☐	☐	☐
2.c.1	Power change force.	Test (a) or (b) required	☐	☐	☐
2.c.1 (a)	(a) Trim for straight and level flight at 80 percent of normal cruise airspeed with necessary power. Reduce power to flight idle. Do not change trim or configuration. After stabilized, record column force necessary to maintain original airspeed.	10 - 25 lbs. (2.2 - 6.6 daN) of force (Push).	☐	☐	☐
2.c.1 (b)	(b) Trim for straight and level flight at 80 percent of normal cruise airspeed with necessary power. Add power to maximum setting. Do not change trim or configuration. After stabilized, record column force necessary to maintain original airspeed.	5 - 15 lbs. (2.2 - 6.6 daN) of force (Pull).	☐	☐	☐
2.c.2	Flap/slat change force.	Test (a) or (b) required	☐	☐	☐
2.c.2 (a)	(a) Trim for straight and level flight with flaps fully retracted at a constant airspeed within the flaps-extended airspeed range. Do not adjust trim or power. Extend the flaps to 50 percent of full flap travel. After stabilized, record stick force necessary to maintain original airspeed.	5 - 15 lbs. (2.2 - 6.6 daN) of force (Push).	☐	☐	☐
2.c.2 (b)	(b) Trim for straight and level flight with flaps extended to 50 percent of full flap travel, at a constant airspeed within the flaps-extended airspeed range. Do not adjust trim or power. Retract the flaps to zero. After stabilized, record stick force necessary to maintain original airspeed.	5 - 15 lbs. (2.2 - 6.6 daN) of force (Pull).	☐	☐	☐
2.c.4	Gear change force	Test (a) or (b) required	☐	☐	☐
2.c.4 (a)	(a) Trim for straight and level flight with landing gear retracted at a constant airspeed within the landing gear-extended airspeed range. Do not adjust trim or	2 - 12 lbs. (0.88 - 5.3 daN) of force (Push).	☐	☐	☐

	power. Extend the landing gear. After stabilized, record stick force necessary to maintain original airspeed.				
2.c.4 (b)	(b) Trim for straight and level flight with landing gear extended, at a constant airspeed within the landing gear-extended airspeed range. Do not adjust trim or power. Retract the landing gear. After stabilized, record stick force necessary to maintain original airspeed.	2 - 12 lbs. (0.88 - 5.3 daN) of force (Pull).	☐	☐	☐
2.c.5	Longitudinal trim.	Must be able to trim longitudinal stick force to “zero” in each of the following configurations: cruise; approach; and landing.	☐	☐	☐
2.c.7	Longitudinal static stability	Must exhibit positive static stability.	☐	☐	☐
2.c.8	Stall warning (actuation of stall warning device) with nominal gross weight; wings level; and a deceleration rate of not more than three (3) knots per second.	See next	☐	☐	☐
2.c.8 (a)	(a) Landing configuration.	60 - 90 knots; ± 5 degrees of bank.	☐	☐	☐
2.c.8 (b)	(b) Clean configuration.	Landing configuration speed + 10 - 20%.	☐	☐	☐
2.c.9.b	Phugoid dynamics.	Must have a phugoid with a period of 30 - 60 seconds. May not reach ½ or double amplitude in less than 2 cycles	☐	☐	☐
2.d	Lateral Directional Tests.	See next	☐	☐	☐
2.d.2	Roll response. Roll rate must be measured through at least 30 degrees of roll. Aileron control must be deflected 1/3 (33.3 percent) of maximum travel.	Must have a roll rate of 4- 25 degrees /second.	☐	☐	☐
2.d.4.c	Spiral stability. Cruise configuration and normal cruise air speed. Establish a 20 degree – 30-degree bank. When stabilized, neutralize the aileron control and release. Must be completed in both directions of turn	Initial bank angle (± 5 degrees) after 20 seconds.	☐	☐	☐
2.d.6.b	Rudder response. Use 25 percent of maximum rudder deflection. (Applicable to approach or landing configuration.)	3 - 6 degree /second yaw rate.	☐	☐	☐
2.d.8	Steady state sideslip. Use 50 percent rudder deflection. (Applicable to approach and landing configurations.)	2 - 10 degrees of bank; 4 - 10 degrees of sideslip; and 2 - 10 degrees of aileron.	☐	☐	☐
6.	FTD System Response Time.	See next	☐	☐	☐
6.a	Flight deck instrument systems response to an abrupt pilot controller input. One test is required in each axis (pitch, roll, yaw)	300 milliseconds or less.	☐	☐	☐

FLIGHT TRAINING DEVICE (FTD) QUALIFICATION TEST CHECKLIST

GACAR PART – 60

ALTERNATIVE DATA SOURCE FOR FTD LEVEL 5 SMALL, SINGLE ENGINE (TURBO-PROPELLER) AIRPLANE					
QPS REQUIRMENT					
			Compliance		
Entry Number	Applicable Test Title and Procedure	Authorized Performance Range	Yes	No	NA
1.	Performance	See next	☐	☐	☐
1.c	Climb	See next	☐	☐	☐
1.c.1	Normal climb with nominal gross weight, at best rate-of-climb airspeed.	Climb airspeed = 95 – 115 knots. Climb rate = 800 – 1800 fpm (4 - 9 m/sec)	☐	☐	☐
1.f	Engines		☐	☐	☐
1.f.1	Acceleration; idle to takeoff power	4 - 8 Seconds.	☐	☐	☐
1.f.2	Deceleration; takeoff power to idle	3 - 7 Seconds.	☐	☐	☐
2.	Handling Qualities	See next	☐	☐	☐
2.c	Longitudinal Tests.	See next	☐	☐	☐
2.c.1	Power change force	Test (a) or (b) required	☐	☐	☐
2.c.1(a)	a) Trim for straight and level flight at 80 percent of normal cruise airspeed with necessary power. Reduce power to flight idle. Do not change trim or configuration. After stabilized, record column force necessary to maintain original airspeed.	8 lbs. (3.5 daN) of Push force – 8 lbs. (3.5 daN) of Pull force.	☐	☐	☐
2.c.1(b)	b) Trim for straight and level flight at 80 percent of normal cruise airspeed with necessary power. Add power to maximum setting. Do not change trim or configuration. After stabilized, record column force necessary to maintain original airspeed.	12 - 22 lbs. (5.3 – 9.7 daN) of force (Pull)	☐	☐	☐
2.c.2	Flap/slat change force	Test (a) or (b) required	☐	☐	☐
2.c.2(a)	a) Trim for straight and level flight with flaps fully retracted at a constant airspeed within the flaps-extended air speed range. Do not adjust trim or power. Extend the flaps to 50 percent of full flap travel. After stabilized, record stick force necessary to maintain original airspeed.	5 - 15 lbs. (2.2 - 6.6 daN) of force (Push).	☐	☐	☐
2.c.2(b)	b) Trim for straight and level flight with flaps extended to 50 percent of full flap travel, at a constant airspeed within the flaps-extended airspeed range. Do not adjust trim or power. Retract the flaps to zero. After stabilized, record stick force necessary to maintain original airspeed.	5 - 15 lbs. (2.2 - 6.6 daN) of force (Pull)	☐	☐	☐
2.c.4	Gear change force.	Test (a) or (b) required	☐	☐	☐
2.c.4(a)	a) Trim for straight and level flight with landing gear retracted at a constant airspeed within the landing gear-extended airspeed range. Do not adjust trim	2 - 12 lbs. (0.88 - 5.3 daN) of force (Push).	☐	☐	☐

	or power. Extend the landing gear. After stabilized, record stick force necessary to maintain original airspeed.				
2.c.4(b)	b) Trim for straight and level flight with landing gear extended, at a constant airspeed within the landing gear-extended airspeed range. Do not adjust trim or power. Retract the landing gear. After stabilized, record stick force necessary to maintain original airspeed.	2 - 12 lbs. (0.88 - 5.3 daN) of force (Pull).	☐	☐	☐
2.c.5	Longitudinal trim.	Must be able to trim longitudinal stick force to “zero” in each of the following configurations: cruise; approach; and landing.	☐	☐	☐
2.c.7	Longitudinal static stability.	Must exhibit positive static stability.	☐	☐	☐
2.c.8	Stall warning (actuation of stall warning device) with nominal gross weight; wings level; and a deceleration rate of not more than three (3) knots per second.	See next	☐	☐	☐
2.c.8(a)	a) Landing configuration.	60 - 90 knots; ± 5 degrees of bank.	☐	☐	☐
2.c.9.b	Phugoid dynamics.	Must have a phugoid with a period of 30 - 60 seconds. May not reach ½ or double amplitude in less than 2 cycles.	☐	☐	☐
2.d	Lateral Directional Tests.	See next	☐	☐	☐
2.d.2	Roll response. Roll rate must be measured through at least 30° of roll. Aileron control must be deflected 1/3 (33.3 percent) of maximum travel.	Must have a roll rate of 4 - 25 degree /second.	☐	☐	☐
2.d.4.c	Spiral stability. Cruise configuration and normal cruise air speed. Establish a 20° - 30° bank. When stabilized, neutralize the aileron control and release. Must be completed in both directions of turn.	Initial bank angle (± 5 degrees) after 20 seconds.	☐	☐	☐
2.d.6.b	Rudder response. Use 25 percent of maximum rudder deflection. (Applicable to approach or landing configuration.)	3 - 6 degree /second yaw rate.	☐	☐	☐
2.d.8	Steady state sideslip. Use 50 percent rudder deflection. (Applicable to approach and landing configurations.)	2 - 10 degrees of bank; 4 - 10 degree of sideslip; and 2 - 10 degree of aileron.	☐	☐	☐
6	FTD System Response Time.	See next	☐	☐	☐
6.a	Flight deck instrument systems response to an abrupt pilot controller input. One test is required in each axis (pitch, roll, yaw).	300 milliseconds or less.	☐	☐	☐

FLIGHT TRAINING DEVICE (FTD) QUALIFICATION TEST CHECKLIST

GACAR PART – 60

ALTERNATIVE DATA SOURCE FOR FTD LEVEL 5 MULTI ENGINE (TURBO-PROPELLER) AIRPLANE					
QPS REQUIRMENT					
			Compliance		
Entry Number	Applicable Test Title and Procedure	Authorized Performance Range	Yes	No	NA
1.	Performance.	See next	☐	☐	☐
1.c	Climb.	See next	☐	☐	☐
1.c.1	Normal climb with nominal gross weight, at best rate-of-climb airspeed.	Climb airspeed = 120 – 140 knots. Climb rate = 1000 – 3000 fpm (5 - 15 m/sec)	☐	☐	☐
1.f	Engines.	See next	☐	☐	☐
1.f.1	Acceleration; idle to takeoff power.	2 - 6 Seconds.	☐	☐	☐
1.f.2	Deceleration; takeoff power to idle	1 - 5 Seconds	☐	☐	☐
2.	Handling Qualities.	See next	☐	☐	☐
2.c	Longitudinal Tests.	See next	☐	☐	☐
2.c.1	Power change force.	Test (a) or (b) required	☐	☐	☐
2.c.1(a)	a) Trim for straight and level flight at 80 percent of normal cruise airspeed with necessary power. Reduce power to flight idle. Do not change trim or configuration. After stabilized, record column force necessary to maintain original airspeed	8 lbs. (3.5 daN) of Push force to 8 lbs. (3.5 daN) of Pull force.	☐	☐	☐
2.c.1(b)	b) Trim for straight and level flight at 80 percent of normal cruise airspeed with necessary power. Add power to maximum setting. Do not change trim or configuration. After stabilized, record column force necessary to maintain original airspeed.	12 - 22 lbs. (5.3 – 9.7 daN) of force (Pull).	☐	☐	☐
2.c.2	Flap/slat change force.	Test (a) or (b) required	☐	☐	☐
2.c.2(a)	a) Trim for straight and level flight with flaps fully retracted at a constant airspeed within the flaps-extended airspeed range. Do not adjust trim or power. Extend the flaps to 50 percent of full flap travel. After stabilized, record stick force necessary to maintain original airspeed.	5 - 15 lbs. (2.2 - 6.6 daN) of force (Push).	☐	☐	☐
2.c.2(b)	b) Trim for straight and level flight with flaps extended to 50 percent of full flap travel, at a constant airspeed within the flaps extended airspeed range. Do not adjust trim or power. Retract the flaps to zero. After stabilized, record stick force necessary to maintain original airspeed.	5 - 15 lbs. (2.2 - 6.6 daN) of force (Pull).	☐	☐	☐
2.c.4	Gear change force.	Test (a) or (b) required	☐	☐	☐
2.c.4(a)	a) Trim for straight and level flight with landing gear retracted at a constant airspeed within the landing gear-extended airspeed range. Do not adjust trim or power. Extend the landing gear. After stabilized, record stick force necessary to	2 - 12 lbs. (0.88 - 5.3 daN) of force (Push).	☐	☐	☐

	maintain original airspeed.				
2.c.4(b)	b) Trim for straight and level flight with landing gear extended, at a constant airspeed within the landing gear-extended airspeed range. Do not adjust trim or power. Retract the landing gear. After stabilized, record stick force necessary to maintain original airspeed.	2 - 12 lbs. (0.88 - 5.3 daN) of force (Pull).	☐	☐	☐
2.c.5	Longitudinal trim.	Must be able to trim longitudinal stick force to "zero" in each of the following configurations: cruise; approach; and landing.	☐	☐	☐
2.c.7	Longitudinal static stability.	Must exhibit positive static stability	☐	☐	☐
2.c.8	Stall warning (actuation of stall warning device) with nominal gross weight; wings level; and a deceleration rate of not more than three (3) knots per second.	See next	☐	☐	☐
2.c.8(a)	a) Landing configuration.	80 - 100 knots; ± 5° of bank.	☐	☐	☐
2.c.9.b	Phugoid dynamics.	Must have a phugoid with a period of 30 - 60 seconds. May not reach ½ or double amplitude in less than 2 cycles.	☐	☐	☐
2.d	Lateral Directional Tests.	See next	☐	☐	☐
2.d.2	Roll response. The roll rate must be measured through at least 30 degrees of roll. Aileron control must be deflected 1/3 (33.3 percent) of maximum travel.	Must have a roll rate of 4 - 25 degree /second.	☐	☐	☐
2.d.4.c	Spiral stability. Cruise configuration and normal cruise air speed. Establish a 20 - 30- degree bank. When stabilized, neutralize the aileron control and release. Must be completed in both directions of turn	Initial bank angle (± 5°) after 20 seconds.	☐	☐	☐
2.d.6.b	Rudder response. Use 25 percent of maximum rudder deflection. (Applicable to approach or landing configuration.)	3 - 6 degree /second yaw rate.	☐	☐	☐
2.d.8	Steady state sideslip. Use 50 percent rudder deflection. (Applicable to approach and landing configurations.)	2 - 10 degrees of bank; 4 - 10 degrees of sideslip; and 2 - 10 degrees of aileron	☐	☐	☐
6.	FTD System Response Time.	See next	☐	☐	☐
6.a	Flight deck instrument systems response to an abrupt pilot controller input. One test is required in each axis (pitch, roll, yaw).	300 milliseconds or less.	☐	☐	☐

ALTERNATIVE DATA SOURCES, PROCEDURES, AND INSTRUMENTATION LEVEL 6 FTD					
QPS REQUIRMENT					
			Compliance		
Objective Test Reference Number and Title	Alternative Data Sources, Procedures, and Instrumentation	Notes/Information	Yes	No	NA
1.b.1 Performance. Take off. Ground acceleration time	Data may be acquired through a synchronized video recording of a stopwatch and the calibrated airplane air speed indicator. Hand-record the flight conditions and airplane configuration.	This test is required only if RTO is sought.	☐	☐	☐
1.b.7. Performance. Take off. Rejected takeoff.	Data may be acquired through a synchronized video recording of a stopwatch and the calibrated airplane air speed indicator. Hand-record the flight conditions and airplane configuration.	This test is required only if RTO is sought.	☐	☐	☐
1.c.1. Performance. Climb. Normal climb all engines operating.	Data may be acquired with a synchronized video of calibrated airplane instruments and engine power throughout the climb range.		☐	☐	☐
1.f.1. Performance. Engines. Acceleration	Data may be acquired with a synchronized video recording of engine instruments and throttle position.		☐	☐	☐
1.f.2. Performance. Engines. Deceleration	Data may be acquired with a synchronized video recording of engine instruments and throttle position.		☐	☐	☐
2.a.1.a. Handling qualities. Static control tests. Pitch controller position vs. force and surface position calibration	Surface position data may be acquired from flight data recorder (FDR) sensor or, if no FDR sensor, at selected, significant column positions (encompassing significant column position data points), acceptable to the NSPM, using a control surface protractor on the ground. Force data may be acquired by using a handheld force gauge at the same column position data points.	For airplanes with reversible control systems, surface position data acquisition should be accomplished with winds less than 5 kts.	☐	☐	☐
2.a.2.a. Handling qualities. Static control tests. Wheel position vs. force and surface position calibration.	Surface position data may be acquired from flight data recorder (FDR) sensor or, if there is no FDR sensor, at selected, significant wheel positions (encompassing significant wheel position data points), acceptable to the NSPM, using a control surface protractor on the ground. Force data may be acquired by using a handheld force gauge at the same wheel position data points.	For airplanes with reversible control systems, surface position data acquisition should be accomplished with winds less than 5 kts.	☐	☐	☐
2.a.3.a. Handling qualities. Static control tests.	Surface position data may be acquired from flight data recorder (FDR) sensor or, if no FDR sensor, at selected, significant rudder pedal positions (encompassing significant rudder pedal position data points),	For airplanes with reversible control systems, surface position data acquisition should be accomplished	☐	☐	☐

Rudder pedal position vs. force and surface position calibration.	acceptable to the NSPM, using a control surface protractor on the ground. Force data may be acquired by using a handheld force gauge at the same rudder pedal position data points.	with winds less than 5 kts.			
2.a.4. Handling qualities. Static control tests. Nosewheel steering force.	Breakout data may be acquired with a handheld force gauge. The remainder of the force to the stops may be calculated if the force gauge and a protractor are used to measure force after breakout for at least 25% of the total displacement capability.		☐	☐	☐
2.a.5. Handling qualities. Static control tests. Rudder pedal steering calibration.	Data may be acquired through the use of force pads on the rudder pedals and a pedal position measurement device, together with design data for nosewheel position.		☐	☐	☐
2.a.6. Handling qualities. Static control tests. Pitch trim indicator vs. surface position calibration.	Data may be acquired through calculations.		☐	☐	☐
2.a.8. Handling qualities. Static control tests. Alignment of power lever angle vs. selected engine parameter (e.g., EPR, N1, Torque, Manifold pressure).	Data may be acquired through the use of a temporary throttle quadrant scale to document throttle position. Use a synchronized video to record steady state instrument readings or hand-record steady state engine performance readings.		☐	☐	☐
2.a.9. Handling qualities. Static control tests. Brake pedal position vs. force.	Use of design or predicted data is acceptable. Data may be acquired by measuring deflection at “zero” and at “maximum.”		☐	☐	☐
2.c.1. Handling qualities. Longitudinal control tests. Power change force.	Data may be acquired by using an inertial measurement system and a synchronized video of the calibrated airplane instruments, throttle position, and the force/position measurements of flight deck controls.	Power change dynamics test is acceptable using the same data acquisition methodology.	☐	☐	☐
2.c.2. Handling qualities. Longitudinal control tests. Flap/slat change force.	Data may be acquired by using an inertial measurement system and a synchronized video of calibrated airplane instruments, flap/slat position, and the force/position measurements of flight deck controls.	Flap/slat change dynamics test is acceptable using the same data acquisition methodology	☐	☐	☐
2.c.4. Handling qualities. Longitudinal control tests. Gear change force.	Data may be acquired by using an inertial measurement system and a synchronized video of the calibrated airplane instruments, gear position, and the force/position measurements of flight deck controls.	Gear change dynamics test is acceptable using the same data acquisition methodology.	☐	☐	☐
2.c.5.	Data may be acquired through use of an inertial measurement system		☐	☐	☐

Handling qualities. Longitudinal control tests. Longitudinal trim.	and a synchronized video of flight deck controls position (previously calibrated to show related surface position) and engine instrument readings.				
2.c.6. Handling qualities. Longitudinal control tests. Longitudinal maneuvering stability (stick force/g).	Data may be acquired through the use of an inertial measurement system and a synchronized video of the calibrated airplane instruments; a temporary, high resolution bank angle scale affixed to the attitude indicator; and a wheel and column force measurement indication.		☐	☐	☐
2.c.7. Handling qualities. Longitudinal control tests. Longitudinal static stability	Data may be acquired through the use of a synchronized video of the airplane flight instruments and a handheld force gauge.		☐	☐	☐
2.c.8. Handling qualities. Longitudinal control tests. Stall Warning (activation of stall warning device).	Data may be acquired through a synchronized video recording of a stopwatch and the calibrated airplane air speed indicator. Hand-record the flight conditions and airplane configuration.		☐	☐	☐
2.c.9.a. Handling qualities. Longitudinal control tests. Phugoid dynamics.	Data may be acquired by using an inertial measurement system and a synchronized video of the calibrated airplane instruments and the force/position measurements of flight deck controls.		☐	☐	☐
2.c.10. Handling qualities. Longitudinal control tests. Short period dynamics.	Data may be acquired by using an inertial measurement system and a synchronized video of the calibrated airplane instruments and the force/position measurements of flight deck controls.		☐	☐	☐
2.c.11. Handling qualities. Longitudinal control tests. Gear and flap/slat operating	May use design data, production flight test schedule, or maintenance specification, together with an SOC.		☐	☐	☐
2.d.2. Handling qualities. Lateral directional tests. Roll response (rate).	Data may be acquired by using an inertial measurement system and a synchronized video of the calibrated airplane instruments and the force/position measurements of flight deck lateral controls.		☐	☐	☐
2.d.3. Handling qualities. Lateral directional tests. (a) Roll overshoot. OR (b) Roll response to flight deck roll controller step input.	Data may be acquired by using an inertial measurement system and a synchronized video of the calibrated airplane instruments and the force/position measurements of flight deck lateral controls.		☐	☐	☐
2.d.4.	Data may be acquired by using an inertial measurement system and a		☐	☐	☐

Handling qualities. Lateral directional tests. Spiral stability.	synchronized video of the calibrated airplane instruments; the force/position measurements of flight deck controls; and a stopwatch.				
2.d.6.a. Handling qualities. Lateral directional tests. Rudder response.	Data may be acquired by using an inertial measurement system and a synchronized video of the calibrated airplane instruments; the force/position measurements of rudder pedals.		☐	☐	☐
2.d.7. Handling qualities. Lateral directional tests. Dutch roll, (yaw damper OFF).	Data may be acquired by using an inertial measurement system and a synchronized video of the calibrated airplane instruments and the force/position measurements of flight deck controls.		☐	☐	☐
2.d.8. Handling qualities. Lateral directional tests. Steady state sideslip.	Data may be acquired by using an inertial measurement system and a synchronized video of the calibrated airplane instruments and the force/position measurements of flight deck controls.		☐	☐	☐

TABLE OF FUNCTIONS AND SUBJECTIVE TESTS LEVEL 6 FTD				
QPS REQUIRMENT				
		Compliance		
Entry Number	Operations Tasks	Yes	No	NA
1.	Preflight. Accomplish functions check of all installed switches, indicators, systems, and equipment at all crewmembers' and instructors' stations, and determine that the flight deck (or flight deck area) design and functions replicate the appropriate airplane.	☐	☐	☐
2.	Surface Operations (pre-take-off).	☐	☐	☐
2.a	Engine start:	☐	☐	☐
2.a.1	Normal start.	☐	☐	☐
2.a.2	Alternative procedures start.	☐	☐	☐
2.a.3	Abnormal procedures start / shut down.	☐	☐	☐
2.b	Pushback / Power back (power back requires visual system).	☐	☐	☐
3.	Takeoff (requires appropriate visual system as set out in Table B1A, entry 6; Appendix B, Attachment 1.).	☐	☐	☐
3.a	Instrument takeoff:	☐	☐	☐
3.a.1	Engine checks (e.g., engine parameter relationships, propeller/mixture controls).	☐	☐	☐
3.a.2	Acceleration characteristics.	☐	☐	☐
3.a.3	Nosewheel / rudder steering.	☐	☐	☐
3.a.4	Landing gear, wing flap, leading edge device operation.	☐	☐	☐
3.b	Rejected takeoff	☐	☐	☐
3.b.1	Deceleration characteristics.	☐	☐	☐
3.b.2	Brakes / engine reverser / ground spoiler operation.	☐	☐	☐
3.b.3	Nosewheel / rudder steering.	☐	☐	☐
4.	In-Flight Operations.	☐	☐	☐
4.a	Normal climb.	☐	☐	☐
4.b	Cruise:	☐	☐	☐
4.b.1	Demonstration of performance characteristics (speed vs. power).	☐	☐	☐
4.b.2	Normal turns	☐	☐	☐
4.b.3	Demonstration of high-altitude handling.	☐	☐	☐
4.b.4	Demonstration of high airspeed handling / overspeed warning	☐	☐	☐

4.b.5	Demonstration of Mach effects on control and trim.	☐	☐	☐
4.b.6	Steep turns.	☐	☐	☐
4.b.7	In-Flight engine shutdown (procedures only).	☐	☐	☐
4.b.8	In-Flight engine restart (procedures only).	☐	☐	☐
4.b.9	Specific flight characteristics	☐	☐	☐
4.b.10	Response to loss of flight control power.	☐	☐	☐
4.b.11	Response to other flight control system failure modes.	☐	☐	☐
4.b.12	Operations during icing conditions.	☐	☐	☐
4.b.13	Effects of airframe / engine icing.	☐	☐	☐
4.c	Other flight phase	☐	☐	☐
4.c.1	Approach to stalls in the following configurations:	☐	☐	☐
4.c.1.a	Cruise.	☐	☐	☐
4.c.1.b	Takeoff or approach.	☐	☐	☐
4.c.1.c	Landing.	☐	☐	☐
4.c.2	High angle of attack maneuvers in the following configurations:	☐	☐	☐
4.c.2.a	Cruise.	☐	☐	☐
4.c.2.b	Takeoff or approach.	☐	☐	☐
4.c.2.c	Landing.	☐	☐	☐
4.c.3	Slow flight.	☐	☐	☐
4.c.4	Holding.	☐	☐	☐
5.	Approaches.	☐	☐	☐
5.a	Non-precision Instrument Approaches:	☐	☐	☐
5.a.1	With use of autopilot and autothrottle, as applicable.	☐	☐	☐
5.a.2	Without use of autopilot and autothrottle, as applicable.	☐	☐	☐
5.a.3	With 10 knot tail wind.	☐	☐	☐
5.a.4	With 10 knot crosswinds.	☐	☐	☐
5.b	Precision Instrument Approaches:	☐	☐	☐
5.b.1	With use of autopilot, autothrottle, and Autoland, as applicable.	☐	☐	☐
5.b.2	Without use of autopilot, autothrottle, and Autoland, as applicable.	☐	☐	☐

5.b.3	With 10 knot tail wind.	☐	☐	☐
5.b.4	With 10 knot crosswinds.	☐	☐	☐
6.	Missed Approach.	☐	☐	☐
6.a	Manually controlled.	☐	☐	☐
6.b	Automatically controlled (if applicable).	☐	☐	☐
7.	Any Flight Phase, as appropriate	☐	☐	☐
7.a	Normal system operation (installed systems)	☐	☐	☐
7.b	Abnormal/Emergency system operation (installed systems)	☐	☐	☐
7.c	Flap operation.	☐	☐	☐
7.d	Landing gear operation.	☐	☐	☐
7.e	Engine Shutdown and Parking	☐	☐	☐
7.e.1	Systems operation.	☐	☐	☐
7.e.2	Parking brake operation.	☐	☐	☐
8.	Instructor Operating Station (IOS), as appropriate. Functions in this section are subject to evaluation only if appropriate for the airplane and/or installed on the specific FTD involved.	☐	☐	☐
8.a	Power Switch(es).	☐	☐	☐
8.b	Airplane conditions.	☐	☐	☐
8.b.1	Gross weight, center of gravity, and fuel loading and allocation.	☐	☐	☐
8.b.2	Airplane systems status.	☐	☐	☐
8.b.3	Ground crew functions (e.g., external power, push back)	☐	☐	☐
8.c	Airports.	☐	☐	☐
8.c.1	Selection.	☐	☐	☐
8.c.2	Runway selection.	☐	☐	☐
8.c.3	Preset positions (e.g., ramp, over FAF)	☐	☐	☐
8.d	Environmental controls.	☐	☐	☐
8.d.1	Temperature	☐	☐	☐
8.d.2	Climate conditions (e.g., ice, rain).	☐	☐	☐
8.d.3	Wind speed and direction.	☐	☐	☐
8.e	Airplane system malfunctions	☐	☐	☐
8.e.1	Insertion/ deletion	☐	☐	☐

8.e.2	Problem clear.	☐	☐	☐
8.f	Locks, Freezes, and Repositioning	☐	☐	☐
8.f.1	Problem (all) freeze/ release.	☐	☐	☐
8.f.2	Position (geographic) freeze/ release.	☐	☐	☐
8.f.3	Repositioning (locations, freezes, and releases).	☐	☐	☐
8.f.4	Ground speed control.	☐	☐	☐
8.f.5	Remote IOS, if installed.	☐	☐	☐
9.	Sound Controls. On/off/ adjustment	☐	☐	☐
10.	Control Loading System (as applicable) On/ off/ emergency stop.	☐	☐	☐
11.	Observer Stations.	☐	☐	☐
11.a	Position.	☐	☐	☐
11.b	Adjustments.	☐	☐	☐

FLIGHT TRAINING DEVICE (FTD) QUALIFICATION TEST CHECKLIST

GACAR PART – 60

TABLE OF FUNCTIONS AND SUBJECTIVE TESTS LEVEL 5 FTD				
QPS REQUIRMENT				
		Compliance		
Entry Number	Operations Tasks	Yes	No	NA
1.	Preflight. Accomplish functions check of all installed switches, indicators, systems, and equipment at all crewmembers' and instructors' stations, and determine that the flight deck (or flight deck area) design and functions replicate the appropriate airplane.	☐	☐	☐
2.	Surface Operations (pre-take-off).	☐	☐	☐
2.a	Engine start (if installed):	☐	☐	☐
2.a.1	Normal start.	☐	☐	☐
2.a.2	Alternative procedures start.	☐	☐	☐
2.a.3	Abnormal/Emergency procedures start / shut down.	☐	☐	☐
3.	In-Flight Operations.	☐	☐	☐
3.a	Normal climb.	☐	☐	☐
3.b	Cruise:	☐	☐	☐
3.b.1	Performance characteristics (speed vs. power)	☐	☐	☐
3.b.2	Normal turns.	☐	☐	☐
3.c	Normal descent.	☐	☐	☐
4.	Approaches.	☐	☐	☐
4.a	Coupled instrument approach maneuvers (as applicable for the systems installed).	☐	☐	☐
5.	Any Flight Phase.	☐	☐	☐
5.a	Normal system operation (Installed systems).	☐	☐	☐
5.b	Abnormal/Emergency system operation (installed systems).	☐	☐	☐
5.c	Flap operation	☐	☐	☐
5.d	Landing gear operation	☐	☐	☐
5.e	Engine Shutdown and Parking (if installed).	☐	☐	☐
5.e.1	Systems operation.	☐	☐	☐
5.e.2	Parking brake operation.	☐	☐	☐
6.	Instructor Operating Station (IOS).	☐	☐	☐
6.a	Power Switch(es).	☐	☐	☐

6.b	Preset positions – ground, air.	☐	☐	☐
6.c	Airplane system malfunctions (Installed systems).	☐	☐	☐
6.c.1	Insertion / deletion.	☐	☐	☐
6.c.2	Problem clear.	☐	☐	☐

TABLE OF FUNCTIONS AND SUBJECTIVE TESTS LEVEL 4 FTD				
QPS REQUIRMENT				
		Compliance		
Entry Number	Operations Tasks	Yes	No	NA
1.	Level 4 FTDs are required to have at least one operational system. GACA will accomplish functions check of all installed systems, switches, indicators, and equipment at all crewmembers' and instructors' stations, and determine that the flight deck (or flight deck area) design and functions replicate the appropriate airplane.	☐	☐	☐

FLIGHT TRAINING DEVICE (FTD) QUALIFICATION TEST CHECKLIST

GACAR PART – 60

TABLE OF FUNCTIONS AND SUBJECTIVE TESTS LEVEL 7 FTD				
QPS REQUIRMENT				
		Compliance		
Entry Number	Operations Tasks	Yes	No	NA
1.	Preparation For Flight	☐	☐	☐
1.a	Pre-flight. Accomplish functions check of all switches, indicators, systems, and equipment at all crew members’ and instructors’ stations and determine that:	☐	☐	☐
1.a.1	The flight deck design and functions are identical to that of the airplane simulated.	☐	☐	☐
2.	Surface Operations (pre-flight).	☐	☐	☐
2.a	Engine Start.	☐	☐	☐
2.a.1	Normal start.	☐	☐	☐
2.a.2	Alternate start procedures.	☐	☐	☐
2.a.3	Abnormal starts and shutdowns (e.g., hot/hung start, tail pipe fire).	☐	☐	☐
2.b	Taxi.	☐	☐	☐
2.b.1	Pushback/power back	☐	☐	☐
2.b.2	Thrust response.	☐	☐	☐
2.b.3	Power lever friction.	☐	☐	☐
2.b.4	Ground handling	☐	☐	☐
2.b.5	Reserved	☐	☐	☐
2.b.6	Taxi aids (e.g. taxi camera, moving map)	☐	☐	☐
2.b.7	Low visibility (taxi route, signage, lighting, markings, etc.)	☐	☐	☐
2.c	Brake Operation	☐	☐	☐
2.c.1	Brake operation (normal and alternate/ emergency)	☐	☐	☐
2.c.2	Brake fade (if applicable).	☐	☐	☐
3.	Take-off	☐	☐	☐
3.a	Normal	☐	☐	☐
3.a.1	Airplane/ engine parameter relationships, including run-up.	☐	☐	☐
3.a.2	Nosewheel and rudder steering.	☐	☐	☐
3.a.3	Crosswind (maximum demonstrated and gusting crosswind).	☐	☐	☐

3.a.4	Special performance	☐	☐	☐
3.a.4.a	Reduced V1	☐	☐	☐
3.a.4.b	Maximum engine de-rate	☐	☐	☐
3.a.4.c	Soft surface.	☐	☐	☐
3.a.4.d	Short field/ short take-off and landing (STOL) operations.	☐	☐	☐
3.a.4.e	Obstacle (performance over visual obstacle).	☐	☐	☐
3.a.5	Low visibility take-off	☐	☐	☐
3.a.6	Landing gear, wing flap leading edge device operation.	☐	☐	☐
3.a.7	Contaminated runway operation.	☐	☐	☐
3.b	Abnormal/ emergency.	☐	☐	☐
3.b.1	Rejected Take-off.	☐	☐	☐
3.b.2	Rejected special performance (e.g., reduced V1, max de-rate, short field operations).	☐	☐	☐
3.b.3	Rejected take-off with contaminated runway.	☐	☐	☐
3.b.4	Takeoff with a propulsion system malfunction (allowing an analysis of causes, symptoms, recognition, and the effects on aircraft performance and handling) at the following points: (iii) Prior to V1 decision speed. (iv) Between V1 and Vr (rotation speed). (iii) Between Vr and 500 feet above ground level.	☐	☐	☐
3.b.5	Flight control system failures, reconfiguration modes, manual reversion and associated handling.	☐	☐	☐
4.	Climb.	☐	☐	☐
4.a	Normal.	☐	☐	☐
4.b	One or more engines inoperative.	☐	☐	☐
4.c	Approach climbs in icing (for airplanes with icing accountability).	☐	☐	☐
5.	Cruise.	☐	☐	☐
5.a	Performance characteristics (speed vs power, configuration, and attitude)	☐	☐	☐
5.a.1	Straight and level flight.	☐	☐	☐
5.a.2	Change of airspeed.	☐	☐	☐
5.a.3	High altitude handling.	☐	☐	☐
5.a.4	High Mach number handling (Mach tuck, Mach buffet) and recovery (trim change).	☐	☐	☐
5.a.5	Overspeed warning (in excess of Vmo or Mmo).	☐	☐	☐

5.a.6	High IAS handling.	☐	☐	☐
5.b	Maneuvers.	☐	☐	☐
5.b.1	High Angle of Attack	☐	☐	☐
5.b.1.a	High angle of attack, approach to stalls, stall warning, and stall buffet (take-off, cruise, approach, and landing configuration) including reaction of the auto flight system and stall protection system.	☐	☐	☐
5.b.1.b	Reserved	☐	☐	☐
5.b.2	Slow flight	☐	☐	☐
5.b.3	Reserved	☐	☐	☐
5.b.4	Flight envelope protection (high angle of attack, bank limit, overspeed, etc.)	☐	☐	☐
5.b.6	Normal and standard rate turns.	☐	☐	☐
5.b.7	Steep turns	☐	☐	☐
5.b.8	Performance turn	☐	☐	☐
5.b.9	In flight engine shutdown and restart (assisted and windmill).	☐	☐	☐
5.b.10	Maneuvering with one or more engines is inoperative, as appropriate.	☐	☐	☐
5.b.11	Specific flight characteristics (e.g., direct lift control).	☐	☐	☐
5.b.12	Flight control system failures, reconfiguration modes, manual reversion and associated handling.	☐	☐	☐
5.b.13	Gliding to a forced landing.	☐	☐	☐
5.b.14	Visual resolution and FSTD handling and performance for the following (where applicable by aircraft type and training program):	☐	☐	☐
5.b.14.a	Terrain accuracy for forced landing area selection.	☐	☐	☐
5.b.14.b	Terrain accuracy for VFR Navigation.	☐	☐	☐
5.b.14.c	Eights on pylons (visual resolution).	☐	☐	☐
5.b.14.d	Turns about a point.	☐	☐	☐
5.b.14.e	S-turns about a road or section line.	☐	☐	☐
6.	Descent.	☐	☐	☐
6.a	Normal.	☐	☐	☐
6.b	Maximum rate/emergency (clean and with speed brake, etc.).	☐	☐	☐
6.c	With autopilot.	☐	☐	☐
6.d	Flight control system failures, reconfiguration modes, manual reversion and associated handling.	☐	☐	☐
7.	Instrument Approaches and Landing. Those instrument approach and landing tests relevant to the simulated airplane type are selected from the following list. Some tests are done with limiting wind velocities, under windshear conditions, and with relevant system failures, including the failure of the Flight	☐	☐	☐

	Director. If Standard Operating Procedures allow use autopilot for non-precision approaches, evaluation of the autopilot will be included.			
7.a	Precision approach	☐	☐	☐
7.a.1	CAT, I published approaches.	☐	☐	☐
7.a.1.a	Manual approach with/without flight director including landing.	☐	☐	☐
7.a.1.b	Autopilot/autothrottle coupled approach and manual landing.	☐	☐	☐
7.a.1.c	Autopilot/autothrottle coupled approach, engine(s) inoperative.	☐	☐	☐
7.a.1.d	Manual approach, engine(s) inoperative.	☐	☐	☐
7.a.1.e	HUD/EFVS	☐	☐	☐
7.a.2	CAT II published approaches.	☐	☐	☐
7.a.2.a	Autopilot/autothrottle coupled approach to DH and landing (manual and Autoland).	☐	☐	☐
7.a.2.b	Autopilot/autothrottle coupled approach with one-engine-inoperative approach to DH and go-around (manual and autopilot).	☐	☐	☐
7.a.2.c	HUD/EFVS	☐	☐	☐
7.a.3	CAT III published approaches.	☐	☐	☐
7.a.3.a	Autopilot/autothrottle coupled approach to landing and roll-out (if applicable) guidance (manual and Autoland).	☐	☐	☐
7.a.3.b	Autopilot/autothrottle coupled approach to DH and go-around (manual and autopilot).	☐	☐	☐
7.a.3.c	Autopilot/autothrottle coupled approach to land and roll-out (if applicable) guidance with one engine inoperative (manual and Autoland).	☐	☐	☐
7.a.3.d	Autopilot/autothrottle coupled approach to DH and go-around with one engine inoperative (manual and autopilot).	☐	☐	☐
7.a.3.e	HUD/EFVS	☐	☐	☐
7.a.4	Autopilot/autothrottle coupled approach (to a landing or to a go-around):	☐	☐	☐
7.a.4.a	With generator failure.	☐	☐	☐
7.a.4.b.1	With maximum tail wind component certified or authorized.	☐	☐	☐
7.a.4.b.2	Reserved	☐	☐	☐
7.a.4.c.1	With maximum crosswind component demonstrated or authorized.	☐	☐	☐
7.a.4.c.2	Reserved	☐	☐	☐
7.a.5	PAR approach, all engine(s) operating and with one or more engine(s) inoperative.	☐	☐	☐
7.a.6	MLS, GBAS, all engine(s) operating and with one or more engine(s) inoperative.	☐	☐	☐
7.b	Non-precision approach.	☐	☐	☐
7.b.1	Surveillance radar approach, all engine(s) operating and with one or more engine(s) inoperative.	☐	☐	☐
7.b.2	NDB approach, all engine(s) operating and with one or more engine(s) inoperative.	☐	☐	☐

7.b.3	VOR, VOR/DME, TACAN approach, all engines(s) operating and with one or more engine(s) inoperative.	☐	☐	☐
7.b.4	RNAV / RNP / GNSS (RNP at nominal and minimum authorized temperatures) approach, all engine(s) operating and with one or more engine(s) inoperative.	☐	☐	☐
7.b.5	ILS LLZ (LOC), LLZ back course (or LOC-BC) approach, all engine(s) operating and with one or more engine(s) inoperative.	☐	☐	☐
7.b.6	ILS offset localizer approach, all engine(s) operating and with one or more engine(s) inoperative.	☐	☐	☐
7.c	Approach procedures with vertical guidance (APV), e.g. SBAS, flight path vector.	☐	☐	☐
7.c.1	APV/baro-VNAV approach, all engine(s) operating and with one or more engine(s) inoperative.	☐	☐	☐
7.c.2	Area navigation (RNAV) approach procedures based on SBAS, all engine(s) operating and with one or more engine(s) inoperative.	☐	☐	☐
8.	Visual Approaches (Visual Segment) And Landings. Flight simulators with visual systems, which permit completing a special approach procedure in accordance with applicable regulations, may be approved for that particular approach procedure.	☐	☐	☐
8.a	Maneuvering, normal approach and landing, all engines operating with and without visual approach aid guidance.	☐	☐	☐
8.b	Approach and landing with one or more engines inoperative.	☐	☐	☐
8.c	Operation of landing gear, flap/slats and speed brakes (normal and abnormal).	☐	☐	☐
8.d	Approach and landing with crosswind (max. demonstrated and gusting crosswind).	☐	☐	☐
8.e	Approach and landing with flight control system failures, reconfiguration modes, manual reversion and associated handling (most significant degradation which is probable).	☐	☐	☐
8.e.1	Approach and landing with trim malfunctions.	☐	☐	☐
8.e.1.a	Longitudinal trim malfunction.	☐	☐	☐
5.b.5	Turns with/without speed brake/spoilers deployed.	☐	☐	☐
8.e.1.b	Lateral-directional trim malfunction.	☐	☐	☐
8.f	Approach and landing with standby (minimum) electrical/hydraulic power.	☐	☐	☐
8.g	Approach and landing from circling conditions (circling approach).	☐	☐	☐
8.h	Approach and landing from visual traffic pattern.	☐	☐	☐
8.i	Approach and landing from non-precision approach.	☐	☐	☐
8.j	Approach and landing from precision approach.	☐	☐	☐
9.	Missed Approach.	☐	☐	☐
9.a	All engines, manual and autopilot.	☐	☐	☐
9.b	Engine(s) inoperative, manual and autopilot.	☐	☐	☐
9.c	Rejected landing	☐	☐	☐
9.d	With flight control system failures, reconfiguration modes, manual reversion, and associated handling.	☐	☐	☐

9.e	Reserved	☐	☐	☐
10.	Surface Operations (landing, after-landing and post-flight).	☐	☐	☐
10.a	Landing roll and taxi.	☐	☐	☐
10.a.1	HUD/EFVS.	☐	☐	☐
10.a.2	Spoiler operation.	☐	☐	☐
10.a.3	Reverse thrust operation.	☐	☐	☐
10.a.4	Directional control and ground handling, both with and without reverse thrust.	☐	☐	☐
10.a.5	Reduction of rudder effectiveness with increased reverse thrust (rear pod-mounted engines).	☐	☐	☐
10.a.6	Brake and anti-skid operation	☐	☐	☐
10.a.6.a	Brake and anti-skid operation with dry, patchy wet, wet on rubber residue, and patchy icy conditions.	☐	☐	☐
10.a.6.b	Reserved	☐	☐	☐
10.a.6.c	Reserved	☐	☐	☐
10.a.6.d	Auto-braking system operation.	☐	☐	☐
10.b	Engine shutdown and parking.	☐	☐	☐
10.b.1	Engine and systems operation.	☐	☐	☐
10.b.2	Parking brake operation.	☐	☐	☐
11.	Any Flight Phase.	☐	☐	☐
11.a	Airplane and engine systems operation (where fitted)	☐	☐	☐
11.a.1	Air conditioning and pressurization (ECS)	☐	☐	☐
11.a.2	De-icing/anti-icing.	☐	☐	☐
11.a.3	Auxiliary power unit (APU).	☐	☐	☐
11.a.4	Communications.	☐	☐	☐
11.a.5	Electrical.	☐	☐	☐
11.a.6	Fire and smoke detection and suppression.	☐	☐	☐
11.a.7	Flight controls (primary and secondary)	☐	☐	☐
11.a.8	Fuel and oil	☐	☐	☐
11.a.9	Hydraulic	☐	☐	☐
11.a.10	Pneumatic	☐	☐	☐
11.a.11	Landing gear.	☐	☐	☐

11.a.12	Oxygen.	☐	☐	☐
11.a.13	Engine.	☐	☐	☐
11.a.14	Airborne radar.	☐	☐	☐
11.a.15	Autopilot and Flight Director.	☐	☐	☐
11.a.16	Terrain awareness warning systems and all collision avoidance systems (e.g. EGPWS, GPWS, TCAS).	☐	☐	☐
11.a.17	Flight control computers including stability and control augmentation.	☐	☐	☐
11.a.18	Flight display systems.	☐	☐	☐
11.a.19	Flight management computers.	☐	☐	☐
11.a.20	Head-up displays (including EFVS, if appropriate).	☐	☐	☐
11.a.21	Navigation systems	☐	☐	☐
11.a.22	Stall warning/ avoidance	☐	☐	☐
11.a.23	Wind shear avoidance/ recovery guidance equipment	☐	☐	☐
11.a.24	Flight envelope protections	☐	☐	☐
11.a.25	Electronic flight bag	☐	☐	☐
11.a.26	Automatic checklists (normal, abnormal, and emergency procedures)	☐	☐	☐
11.a.27	Runway alerting and advisory system	☐	☐	☐
11.b	Airborne procedures	☐	☐	☐
11.b.1	Holding	☐	☐	☐
11.b.2	Air hazard avoidance (traffic, weather, including visual correlation).	☐	☐	☐
11.b.3	Windshear	☐	☐	☐
11.b.3.a	Prior to take-off rotation.	☐	☐	☐
11.b.3.b	At lift-off	☐	☐	☐
11.b.3.c	During initial climb	☐	☐	☐
11.b.3.d	On final approach, below 150 m (500 ft) AGL.	☐	☐	☐
11.b.4	Reserved	☐	☐	☐

FLIGHT TRAINING DEVICE (FTD) QUALIFICATION TEST CHECKLIST
GACAR PART – 60

		Compliance		
Entry Number	Airport Modeling Requirements	Yes	No	NA
1.	Reserved	☐	☐	☐
2.a	Functional test content requirements	☐	☐	☐
2.a.1	Airport scenes	☐	☐	☐
2.a.1.a	A minimum of three (3) real-world airport models to be consistent with published data used for airplane operations and capable of demonstrating all the visual system features below. Each model should be in a different visual scene to permit assessment of FSTD automatic visual scene changes. The model identifications must be acceptable to the sponsor's TPAA, selectable from the IOS, and listed on the SOQ.	☐	☐	☐
2.a.1.b	Reserved	☐	☐	☐
2.a.1.c	Reserved	☐	☐	☐
2.a.1.d	Airport model content. For circling approaches, all tests apply to the runway used for the initial approach and to the runway of intended landing. If all runways in an airport model used to meet the requirements of this attachment are not designated as "in use," then the "in use" runways must be listed on the SOQ (e.g., KORD, Rwys 9R, 14L, 22R). Models of airports with more than one runway must have all significant runways not "in-use" visually depicted for airport and runway recognition purposes. The use of white or off-white light strings that identify the runway threshold, edges, and ends for twilight and night scenes are acceptable for this requirement. Rectangular surface depictions are acceptable for daylight scenes. A visual system's capabilities must be balanced between providing airport models with an accurate representation of the airport and a realistic representation of the surrounding environment. Airport model detail must be developed using airport pictures, construction drawings and maps, or other similar data, or developed in accordance with published regulatory material; however, this does not require that such models contain details that are beyond the design capability of the currently qualified visual system. Only one "primary" taxi route from parking to the runway end will be required for each "in-use" runway.	☐	☐	☐
2.a.2	Visual scene fidelity.	☐	☐	☐
2.a.2.a	The visual scene must correctly represent the parts of the airport, and its surroundings used in the training program.	☐	☐	☐
2.a.2.b	Reserved	☐	☐	☐
2.a.2.c	Reserved	☐	☐	☐
2.a.3	Runways and taxiways	☐	☐	☐
2.a.3.a	Reserved	☐	☐	☐
2.a.3.b	Representative runways and taxiways	☐	☐	☐
2.a.3.c	Reserved	☐	☐	☐
2.a.4	Reserved	☐	☐	☐
2.a.5	Runway threshold elevations and locations must be modeled to provide correlation with airplane systems (e.g. HUD, GPS, compass, altimeter).	☐	☐	☐

2.a.6	Reserved	☐	☐	☐
2.a.7	Runway surface and markings for each “in-use” runway must include the following, if appropriate:	☐	☐	☐
2.a.7.a	Threshold markings	☐	☐	☐
2.a.7.b	Runway numbers	☐	☐	☐
2.a.7.c	Touchdown zone markings	☐	☐	☐
2.a.7.d	Fixed distance markings	☐	☐	☐
2.a.7.e	Edge markings	☐	☐	☐
2.a.7.f	Center line markings	☐	☐	☐
2.a.7.g	Reserved	☐	☐	☐
2.a.7.h	Reserved	☐	☐	☐
2.a.7.i	Windsock that gives appropriate wind cues	☐	☐	☐
2.a.8	Runway lighting of appropriate colors, directionality, behavior and spacing for the “in-use” runway including the following:	☐	☐	☐
2.a.8.a	Threshold lights	☐	☐	☐
2.a.8.b	Edge lights	☐	☐	☐
2.a.8.c	End lights	☐	☐	☐
2.a.8.d	Center line lights	☐	☐	☐
2.a.8.e	Touchdown zone lights	☐	☐	☐
2.a.8.f	Lead-off lights	☐	☐	☐
2.a.8.g	Appropriate visual landing aid(s) for that runway.	☐	☐	☐
2.a.8.h	Appropriate approach lighting system for that runway.	☐	☐	☐
2.a.9	Taxiway surface and markings (associated with each “in-use” runway):	☐	☐	☐
2.a.9.a	Edge markings	☐	☐	☐
2.a.9.b	Center line markings	☐	☐	☐
2.a.9.c	Runway holding position markings.	☐	☐	☐
2.a.9.d	ILS critical area markings.	☐	☐	☐
2.a.9.e	Reserved.	☐	☐	☐
2.a.10	Taxiway lighting of appropriate colors, directionality, behavior and spacing (associated with each “in-use” runway):	☐	☐	☐
2.a.10.a	Edge lights.	☐	☐	☐
2.a.10.b	Center line lights.	☐	☐	☐

2.a.10.c	Runway holding position and ILS critical area lights.	☐	☐	☐
2.a.11	Required visual model correlation with other aspects of the airport environment simulation.	☐	☐	☐
2.a.11.a	The airport model must be properly aligned with the navigational aids that are associated with operations at the runway “in-use”.	☐	☐	☐
2.a.11.b	Reserved	☐	☐	☐
2.a.12	Airport buildings, structures, and lighting.	☐	☐	☐
2.a.12.a	Buildings, structures, and lighting:	☐	☐	☐
2.a.12.a.1	Reserved	☐	☐	☐
2.a.12.a.2	Representative airport buildings, structures, and lighting.	☐	☐	☐
2.a.12.a.3	Reserved	☐	☐	☐
2.a.12.b	Reserved	☐	☐	☐
2.a.12.c	Representative moving and static airport clutter (e.g. other airplanes, power carts, tugs, fuel trucks, additional gates).	☐	☐	☐
2.a.13	Terrain and obstacles	☐	☐	☐
2.a.13.a	Reserved	☐	☐	☐
2.a.13.b	Representative depiction of terrain and obstacles within 46 km (25 NM) of the reference airport.	☐	☐	☐
2.a.14	Significant, identifiable natural and cultural features.	☐	☐	☐
2.a.14.a	Reserved	☐	☐	☐
2.a.14.b	Representative depiction of significant and identifiable natural and cultural features within 46 km (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	☐	☐	☐
2.a.14.c	Representative moving airborne traffic (including the capability to present air hazards – e.g. airborne traffic on a possible collision course).	☐	☐	☐
2.b	Visual scene management.	☐	☐	☐
2.b.1	Reserved	☐	☐	☐
2.b.2	Airport runway, approach and taxiway lighting and cultural 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 must fade into view appropriately.	☐	☐	☐
2.b.3	Reserved	☐	☐	☐
2.c	Visual feature recognition. Note. — The following are 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.	☐	☐	☐
2.c.1	Runway definition, strobe lights, approach lights, and runway edge white lights from 8 km (5 sm) of the runway threshold.	☐	☐	☐
2.c.2	Visual approach aids lights.	☐	☐	☐

2.c.2.a	Reserved	☐	☐	☐
2.c.2.b	Visual approach aids lights from 4.8 km (3 sm) of the runway threshold.	☐	☐	☐
2.c.3	Runway center line lights and taxiway definition from 4.8 km (3 sm).	☐	☐	☐
2.c.4	Threshold lights and touchdown zone lights from 3.2 km (2 sm).	☐	☐	☐
2.c.5	Reserved	☐	☐	☐
2.c.6	For circling approaches, the runway of intended landing and associated lighting must fade into view in a non-distracting manner.	☐	☐	☐
2.d	Selectable airport visual scene capability for:	☐	☐	☐
2.d.1	Night	☐	☐	☐
2.d.2	Twilight	☐	☐	☐
2.d.3	Day	☐	☐	☐
2.d.4	Dynamic effects — the capability to present multiple ground and air hazards such as another airplane crossing the active runway or converging airborne traffic; hazards must be selectable via controls at the instructor station.	☐	☐	☐
2.d.5	Reserved	☐	☐	☐
2.e	Correlation with airplane and associated equipment.	☐	☐	☐
2.e.1	Visual cues relate to actual airplane responses.	☐	☐	☐
2.e.2	Visual cues during take-off, approach, and landing.	☐	☐	☐
2.e.2.a	Visual cues to assess sink rate and depth perception during landings.	☐	☐	☐
2.e.2.b	Reserved	☐	☐	☐
2.e.3	Accurate portrayal of environment relating to airplane attitudes.	☐	☐	☐
2.e.4	The visual scene must correlate with integrated airplane systems, where fitted (e.g. terrain, traffic, and weather avoidance systems and HUD/EFVS).	☐	☐	☐
2.e.5	Reserved	☐	☐	☐
2.f	Scene Quality	☐	☐	☐
2.f.1	Quantization.	☐	☐	☐
2.f.1.a	Surfaces and textural cues must be free from apparent quantity (aliasing).	☐	☐	☐
2.f.1.b	Reserved	☐	☐	☐
2.f.2	System capable of portraying full color realistic textural cues.	☐	☐	☐
2.f.3	The system light points must be free from distracting jitter, smearing, or streaking.	☐	☐	☐
2.f.4	Reserved	☐	☐	☐
2.f.5	System capable of providing light point perspective growth (e.g. relative size of runway and taxiway edge lights increase as the lights are approached).	☐	☐	☐

2.g	Environmental effects.	☐	☐	☐
2.g.1	Reserved	☐	☐	☐
2.g.2	Reserved	☐	☐	☐
2.g.3	Reserved	☐	☐	☐
2.g.4	Reserved	☐	☐	☐
2.g.5	Reserved	☐	☐	☐
2.g.6	Reserved	☐	☐	☐
2.g.7	Visibility and RVR measured in terms of distance. Visibility/RVR must be checked at and below a height of 600 m (2 000 ft) above the airport and within a radius of 16 km (10 sm) from the airport.	☐	☐	☐
2.g.8	Reserved	☐	☐	☐
2.g.9	Reserved	☐	☐	☐
2.g.10	Reserved	☐	☐	☐
2.g.11	Reserved	☐	☐	☐
3.	An example of being able to “combine two airport models to achieve two “in-use” runways: One runway designated as the “in use” runway in the first model of the airport, and the second runway designated as the “in use” runway in the second model of the same airport. For example, the clearance is for the ILS approach to Runway 27, Circle to Land on Runway 18 right. Two airport visual models might be used: the first with Runway 27 designated as the “in use” runway for the approach to runway 27, and the second with Runway 18 Right designated as the “in use” runway. When the pilot breaks off the ILS approach to runway 27, the instructor may change to the second airport visual model in which runway 18 Right is designated as the “in use” runway, and the pilot would make a visual approach and landing. This process is acceptable to the GACA as long as the temporary interruption due to the visual model change is not distracting to the pilot, does not cause changes in navigational radio frequencies, and does not cause undue instructor/evaluator time.	☐	☐	☐
4.	Sponsors are not required to provide every detail of a runway, but the detail that is provided should be correct within the capabilities of the system.	☐	☐	☐

FLIGHT TRAINING DEVICE (FTD) QUALIFICATION TEST CHECKLIST
GACAR PART – 60

		Compliance		
Entry Number	Sound System Requirements	Yes	No	NA
1.	Precipitation	☐	☐	☐
2.	Reserved	☐	☐	☐
3.	Significant airplane noises perceptible to the pilot during normal operations.	☐	☐	☐
4.	Abnormal operations for which there are associated sound cues including engine malfunctions, landing gear/tire malfunctions, tail and engine pod strike and pressurization malfunction.	☐	☐	☐
5.	Sound of a crash when the flight simulator is landed in excess of limitations.	☐	☐	☐

FLIGHT TRAINING DEVICE (FTD) QUALIFICATION TEST CHECKLIST
GACAR PART – 60

		Compliance		
Entry Number	Instructor Operating Station (IOS) Requirements	Yes	No	NA
1.	Simulator Power Switch(es)	☐	☐	☐
2.	Airplane conditions.	☐	☐	☐
2.a	Gross weight, center of gravity, fuel loading and allocation	☐	☐	☐
2.b	Airplane system status.	☐	☐	☐
2.c	Ground crew functions (e.g., ext. power, push back)	☐	☐	☐
3.	Airports.	☐	☐	☐
3.a	Number and selection.	☐	☐	☐
3.b	Runway selection.	☐	☐	☐
3.c	Runway surface condition (e.g., rough, smooth, icy, wet)	☐	☐	☐
3.d	Preset positions (e.g., ramp, gate, #1 for takeoff, takeoff position, over FAF)	☐	☐	☐
3.e	Lighting controls	☐	☐	☐
4.	Environmental controls.	☐	☐	☐
4.a	Visibility (statute miles (kilometers)).	☐	☐	☐
4.b	Runway visual range (in feet (meters)).	☐	☐	☐
4.c	Temperature.	☐	☐	☐
4.d	Climate conditions (e.g., ice, snow, rain).	☐	☐	☐
4.e	Wind speed and direction.	☐	☐	☐
4.f	Windshear.	☐	☐	☐
4.g	Clouds (base and tops)	☐	☐	☐
5.	Airplane system malfunctions (Inserting and deleting malfunctions into the simulator).	☐	☐	☐
6.	Locks, Freezes, and Repositioning.	☐	☐	☐
6.a	Problem (all) freeze/ release.	☐	☐	☐
6.b	Position (geographic) freeze/ release.	☐	☐	☐
6.c	Repositioning (locations, freezes, and releases).	☐	☐	☐
6.d	Ground speed control.	☐	☐	☐
7.	Remote IOS. (if installed).	☐	☐	☐

8.	Sound Controls. On/off/adjustment	☐	☐	☐
9.	Control Loading System.	☐	☐	☐
9.a	On/ off/ emergency stop.	☐	☐	☐
10.	Observer Seats/ Stations. Position/ Adjustment	☐	☐	☐

Remarks	
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Inspection Result	
☐ Satisfactory	☐ Unsatisfactory

Inspector Name	Signature	Date