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**PLIEGO DE PRESCRIPCIONES TÉCNICAS PARTICULARES  
PARA LA ADJUDICACIÓN DEL CONTRATO PRIVADO DE  
SUMINISTRO Y MANTENIMIENTO DEL SIMULADOR  
DIAMOND DA42 NG FSTD**

EXPEDIENTE NÚMERO 02-2024

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## 1. OBJETO

El presente pliego de prescripciones técnicas (en adelante, PPTP) tiene por objeto establecer las condiciones técnicas que deben regir el contrato privado de suministro y mantenimiento del simulador **Diamond DA42 NG FSTD**.

## 2. CARACTERÍSTICAS TÉCNICAS Y REQUISITOS PARA EL SIMULADOR

El simulador tiene que cumplir las características técnicas y los requisitos para un dispositivo FNPT II, de acuerdo con el Appendix 1 de la CS FSTD(A).300 de la normativa **EASA CS-FSTD(A) Issue 2**. Dicha normativa se encuentra recogida en el ANEXO 1.

El simulador debe reproducir el modelo Diamond DA42 NG y tener el siguiente equipamiento:

- Cabina original de la Diamond DA42 NG con dos asientos y controles duales
- Aviónica Garmin G1000 NXI original, incluyendo el GFC700 autopilot
- Long Range Fuel Tanks
- Capacidad PBN(A) y SBAS que permita RNP APCH hasta LNAV, L/VNAV y LPV mínima
- Honeywell KN 63 remote DME receiver
- Becker 3500 remote ADF receiver
- Gear warning horn muting system
- 1 puerto USB para cada uno de los dos asientos
- Un equipo SAI (UPS) que soporte un corte eléctrico y permita cerrar el sistema correctamente y con seguridad
- TKS Deicing System Panel

El sistema visual debe consistir en:

- Global Canvas Image Generator Software + Computer Hardware
- Display System incluyendo Cylindrical Screen (FoV 200º x 35º) y 3 Full HD DLP Projectors.
- Los siguientes 5 aeropuertos preparados para la cualificación inicial:
  - LERS
  - LEDA
  - LEGE
  - LEBL
  - LESO

La estación operativa del instructor debe contener:

- 2 monitores táctiles de 19” y una impresora laser

El fabricante debe dar soporte a la cualificación inicial del dispositivo con AESA (NAA española), incluyendo el Manual MQTG y al menos una visita presencial del equipo de Diamond.



### 3. DOCUMENTACIÓN DE CERTIFICACIÓN DEL SIMULADOR

El fabricante será el responsable de elaborar y entregar toda la documentación técnica: MQTG, Manual de Mantenimiento, Manual del simulador, etc.

También dará asistencia técnica al equipo de CESDA durante el proceso de cualificación inicial del simulador ante el equipo evaluador designado por la CAA española, AESA (Agencia Estatal de Seguridad Aérea).

El objetivo es superar la cualificación y obtener el Certificado FSTD del simulador.

#### 4. REQUISITOS DE MANTENIMIENTO DEL SIMULADOR

El servicio de mantenimiento que ofrezca el fabricante tiene que poder extenderse como mínimo hasta los cinco (5) años, y tiene que contar con los siguientes servicios:

- Actualizaciones periódicas del IOS NAVDATA, esencial para el uso del dispositivo en vuelo PBN(A).
- Asistencia técnica por teléfono ilimitada.
- Posibilidad de asistencia técnica más profunda en remoto o presencial.
- Posibilidad de actualización anual del Software del simulador.
- Posibilidad de entrenamiento FSTD a personal de CESDA.

Asimismo, la garantía del dispositivo tiene que ser de mínimo 24 meses.

## 5. PLAZO DE ENTREGA

El fabricante debe comprometerse a un plazo de entrega e instalación máximo de siete (7) meses, a partir de la fecha de formalización del contrato.

CESDA se compromete a tener listas todas las instalaciones necesarias para la ubicación del simulador en las condiciones técnicas que especifique el fabricante.

Por la presente, firmo en Reus a 15 de noviembre de 2024.

Yuri Masó Uzcudun  
Head of Training  
E-ATO-247 Fundació Rego

# **ANEXO 1**

NORMATIVA EASA CS-FSTD(A) Issue 2

## Appendix 1 to CS FSTD(A).300 Flight Simulation Training Device Standards

ED Decision 2018/006/R

This Appendix describes the minimum full flight simulator (FFS), flight training device (FTD), flight and navigation procedures trainer (FNPT) and basic instrument training devices (BITD) requirements for qualifying devices to the required qualification levels. Certain requirements included in this CS should be supported with a statement of compliance (SOC) and, in some designated cases, an objective test. The SOC shall describe how the requirement was met. The test results should show that the requirement has been attained. In the following tabular listing of FSTD standards, statements of compliance are indicated in the compliance column.

For FNPT use in multi-crew cooperation (MCC) training the general technical requirement are expressed in the MCC column with additional systems, instrumentation and indicators as required for MCC training and operation.

For MCC the minimum technical requirements are as for FNPT level II, with the following additions or amendments:

|                                                                                                          |                                                                                                                                                           |
|----------------------------------------------------------------------------------------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------|
| 1                                                                                                        | Turbo-jet or turbo-prop engines                                                                                                                           |
| 2                                                                                                        | Performance reserves, in the case of an engine failure, to be in accordance with CS-25. These may be simulated by a reduction in the aeroplane gross mass |
| 3                                                                                                        | Retractable landing gear                                                                                                                                  |
| 4                                                                                                        | Pressurisation system                                                                                                                                     |
| 5                                                                                                        | De-icing systems                                                                                                                                          |
| 6                                                                                                        | Fire detection / suppression system                                                                                                                       |
| 7                                                                                                        | Dual controls                                                                                                                                             |
| 8                                                                                                        | Autopilot with automatic approach mode                                                                                                                    |
| 9                                                                                                        | 2 VHF transceivers including oxygen masks intercom system                                                                                                 |
| 10                                                                                                       | 2 VHF NAV receivers (VOR, ILS, DME)                                                                                                                       |
| 11                                                                                                       | 1 ADF receiver                                                                                                                                            |
| 12                                                                                                       | 1 Marker receiver                                                                                                                                         |
| 13                                                                                                       | 1 transponder                                                                                                                                             |
| The following indicators shall be located in the same positions on the instrument panels of both pilots: |                                                                                                                                                           |
| 1                                                                                                        | Airspeed                                                                                                                                                  |
| 2                                                                                                        | Flight attitude with flight director                                                                                                                      |
| 3                                                                                                        | Altimeter                                                                                                                                                 |

|   |                                    |
|---|------------------------------------|
| 4 | Flight director with ILS (HSI)     |
| 5 | Vertical speed                     |
| 6 | ADF                                |
| 7 | VOR                                |
| 8 | Marker indication (as appropriate) |
| 9 | Stop watch (as appropriate)        |

| FLIGHT SIMULATION TRAINING DEVICE STANDARDS |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      | FFS LEVEL |   |   |   | FTD LEVEL |   | FNPT LEVEL |    |     | BITD | COMPLIANCE                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     |
|---------------------------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-----------|---|---|---|-----------|---|------------|----|-----|------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
|                                             |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      | A         | B | C | D | 1         | 2 | I          | II | MCC |      |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                |
|                                             | <b>1. General</b>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    |           |   |   |   |           |   |            |    |     |      |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                |
| a.1                                         | A fully enclosed flight deck.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        | ✓         | ✓ | ✓ | ✓ |           |   |            |    |     |      |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                |
| a.2                                         | A cockpit/flight deck sufficiently enclosed to exclude distraction, which will replicate that of the aeroplane or class of aeroplane simulated.                                                                                                                                                                                                                                                                                                                                                                                                      |           |   |   |   |           | ✓ | ✓          | ✓  | ✓   | ✓    |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                |
| a.3                                         | Flight deck, a full-scale replica of the aeroplane simulated.<br>Equipment for operation of the cockpit windows shall be included in the FSTD, but the actual windows need not be operable.<br>The flight deck, for FSTD purposes, consists of all that space forward of a cross section of the fuselage at the most extreme aft setting of the pilot seats. Additional required flight crew member duty stations and those required bulkheads aft of the pilot seats are also considered part of the flight deck and shall replicate the aeroplane. | ✓         | ✓ | ✓ | ✓ |           |   |            |    |     |      | Flight deck observer seats are not considered to be additional flight crew member duty stations and may be omitted.<br>Bulkheads containing items such as switches, circuit breakers, supplementary radio panels, etc., to which the flight crew may require access during any event after preflight cockpit preparation is complete are considered essential and may not be omitted.<br>Bulkheads containing only items such as landing gear pin storage compartments, fire axes or extinguishers, spare light bulbs, aeroplane document pouches, etc., are not considered essential and may be omitted. Such items, or reasonable facsimile, shall still be available in the |

| FLIGHT SIMULATION TRAINING DEVICE STANDARDS |                                                                                                                                                                                                                                                                                                                | FFS LEVEL |   |   |   | FTD LEVEL |   | FNPT LEVEL |    |     | BITD | COMPLIANCE                                                                                                                                                                                                                                                          |
|---------------------------------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-----------|---|---|---|-----------|---|------------|----|-----|------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
|                                             |                                                                                                                                                                                                                                                                                                                | A         | B | C | D | 1         | 2 | I          | II | MCC |      |                                                                                                                                                                                                                                                                     |
|                                             |                                                                                                                                                                                                                                                                                                                |           |   |   |   |           |   |            |    |     |      | FSTD but may be relocated to a suitable location as near as practical to the original position. Fire axes and any similar purpose instruments need only be represented in silhouette.                                                                               |
| a.4                                         | Direction of movement of controls and switches identical to that in the aeroplane.                                                                                                                                                                                                                             | ✓         | ✓ | ✓ | ✓ |           |   |            |    |     |      |                                                                                                                                                                                                                                                                     |
| a.5                                         | A full-size panel of replicated system(s) which will have actuation of controls and switches that replicate those of the aeroplane simulated.                                                                                                                                                                  |           |   |   |   | ✓         | ✓ |            |    |     |      | The use of electronically displayed images with physical overlay incorporating operable switches, knobs, buttons replicating aeroplane instrument panels may be acceptable to the competent authority.                                                              |
| a.6                                         | Cockpit/flight deck switches, instruments, equipment, panels, systems, primary and secondary flight controls sufficient for the training events to be accomplished shall be located in a spatially correct flight deck area and will operate as, and represent those in, that aeroplane or class of aeroplane. |           |   |   |   |           |   | ✓          | ✓  | ✓   | ✓    | For Multi-Crew Cooperation (MCC) qualification, additional instrumentation and indicators may be required. See table at start of this Appendix.<br>For BITDs, the switches' and controls' size and shape and their location in the cockpit shall be representative. |
| a.7                                         | Crew member seats shall be provided with sufficient adjustment to allow the occupant to achieve the design eye reference position appropriate to the aeroplane or class of aeroplane and for the visual system to be installed to align with that eye position.                                                |           |   |   |   |           | ✓ |            | ✓  | ✓   |      |                                                                                                                                                                                                                                                                     |
| b.1                                         | Circuit breakers that affect procedures and/or result in observable cockpit indications properly located and functionally accurate.                                                                                                                                                                            | ✓         | ✓ | ✓ | ✓ | ✓         | ✓ |            | ✓  | ✓   |      |                                                                                                                                                                                                                                                                     |
| c.1                                         | Flight dynamics model that accounts for various combinations of drag and thrust normally encountered in flight corresponding to actual flight conditions, including the effect of change in aeroplane attitude, sideslip, thrust, drag, altitude, temperature,                                                 | ✓         | ✓ | ✓ | ✓ | ✓         | ✓ | ✓          | ✓  | ✓   | ✓    | For FTD levels 1 and 2 aerodynamic modelling sufficient to permit accurate systems operation and indication is acceptable.<br>For FNPTs and BITDs, class-specific modelling is acceptable.                                                                          |

| FLIGHT SIMULATION TRAINING DEVICE STANDARDS |                                                                                                                                                                                                                                                                                 | FFS LEVEL |   |   |   | FTD LEVEL |   | FNPT LEVEL |    |     | BITD | COMPLIANCE                                                                                                                                                                                                                                     |
|---------------------------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-----------|---|---|---|-----------|---|------------|----|-----|------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
|                                             |                                                                                                                                                                                                                                                                                 | A         | B | C | D | 1         | 2 | I          | II | MCC |      |                                                                                                                                                                                                                                                |
|                                             | gross weight, moments of inertia, centre of gravity location, and configuration.                                                                                                                                                                                                |           |   |   |   |           |   |            |    |     |      |                                                                                                                                                                                                                                                |
| d.1                                         | All relevant instrument indications involved in the simulation of the applicable aeroplane shall automatically respond to control movement by a flight crew member or induced disturbance to the simulated aeroplane, e.g. turbulence or wind shear.                            | ✓         | ✓ | ✓ | ✓ | ✓         | ✓ | ✓          | ✓  | ✓   | ✓    | For FNPTs, instrument indications sufficient for the training events to be accomplished. Reference: AMC3 FSTD(A).300.<br>For BITDs, instrument indications sufficient for the training events to be accomplished. Reference: AMC4 FSTD(A).300. |
| d.2                                         | Lighting environment for panels and instruments shall be sufficient for the operation being conducted.                                                                                                                                                                          |           |   |   |   | ✓         | ✓ | ✓          | ✓  | ✓   | ✓    | For FTD level 2 lighting environment shall be as per aeroplane.                                                                                                                                                                                |
| d.3                                         | Instrument indications respond appropriately to icing effects.                                                                                                                                                                                                                  |           |   | ✓ | ✓ |           |   |            | ✓  | ✓   |      |                                                                                                                                                                                                                                                |
| e.1                                         | Communications, navigation, and caution and warning equipment corresponding to that installed in the applicant's aeroplane with operation within the tolerances prescribed for the applicable airborne equipment.                                                               | ✓         | ✓ | ✓ | ✓ | ✓         | ✓ |            |    |     |      | For FTD level 1 applies where the appropriate systems are replicated.                                                                                                                                                                          |
| e.2                                         | Navigation equipment corresponding to that of the replicated aeroplane or class of aeroplanes, with operation within the tolerances prescribed for the actual airborne equipment. This shall include communication equipment (interphone and air-ground communication systems). |           |   |   |   |           |   | ✓          | ✓  | ✓   | ✓    |                                                                                                                                                                                                                                                |
| e.3                                         | Navigational data with the corresponding approach facilities. Navigation aids should be usable within range without restriction.                                                                                                                                                | ✓         | ✓ | ✓ | ✓ | ✓         | ✓ | ✓          | ✓  | ✓   | ✓    | For FTD level 1 applies where navigation equipment is replicated.<br>For all FFSs and FTDs level 2 where used for area or airfield competence training or checking, navigation data should be updated within 28 days.                          |



| FLIGHT SIMULATION TRAINING DEVICE STANDARDS |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   | FFS LEVEL |   |   |   | FTD LEVEL |   | FNPT LEVEL |    |     | BITD | COMPLIANCE                                                                                                                                                                                                                                                                                                |
|---------------------------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-----------|---|---|---|-----------|---|------------|----|-----|------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
|                                             |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   | A         | B | C | D | 1         | 2 | I          | II | MCC |      |                                                                                                                                                                                                                                                                                                           |
|                                             |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   |           |   |   |   |           |   |            |    |     |      | For FNPTs and BITDs, complete navigational data for at least five different European airports with corresponding precision and non-precision approach procedures including current updating within a period of three months.                                                                              |
| f.1                                         | In addition to the flight crew member duty stations, three suitable seats for the instructor, delegated examiner and competent authority inspector. The competent authority shall consider options to this standard based on unique cockpit configurations. These seats shall provide adequate vision to the pilot's panel and forward windows. Observer seats need not represent those found in the aeroplane but in the case of FSTDs fitted with a motion system, the seats shall be adequately secured to the floor of the FSTD, fitted with positive restraint devices and be of sufficient integrity to safely restrain the occupant during any known or predicted motion system excursion. | ✓         | ✓ | ✓ | ✓ | ✓         | ✓ | ✓          | ✓  | ✓   | ✓    | For FTDs and FNPTs, suitable seating arrangements for the instructor and examiner or competent authority's inspector should be provided.<br>For BITDs, suitable viewing arrangements for the instructor shall be provided.                                                                                |
| g.1                                         | FSTD systems shall simulate applicable aeroplane system operation, both on the ground and in flight. Systems shall be operative to the extent that all normal, abnormal, and emergency operating procedures can be accomplished.                                                                                                                                                                                                                                                                                                                                                                                                                                                                  | ✓         | ✓ | ✓ | ✓ | ✓         | ✓ |            | ✓  | ✓   |      | For FTD level 1, applies where system is simulated. For FNPTs systems shall be operative to the extent that it shall be possible to perform all normal, abnormal and emergency operations as may be appropriate to the aeroplane or class of aeroplanes being simulated and as required for the training. |
| g.2                                         | For aeroplanes equipped with stick pusher system (e.g. longitudinal control feel system, or equivalent) control forces, displacement, and surface position of the aeroplane correspond to those of the aeroplane being simulated.                                                                                                                                                                                                                                                                                                                                                                                                                                                                 |           |   | ✓ | ✓ |           |   |            |    |     |      | A statement of compliance (SOC) is required verifying that the stick pusher system has been modelled, programmed, and validated using the aeroplane manufacturer's design data or other acceptable data source. The SOC must address, at a minimum, the stick pusher activation and                       |

| FLIGHT SIMULATION TRAINING DEVICE STANDARDS |                                                                                                                                                                                                                                                                   | FFS LEVEL |   |   |   | FTD LEVEL |   | FNPT LEVEL |    |     | BITD | COMPLIANCE                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     |
|---------------------------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-----------|---|---|---|-----------|---|------------|----|-----|------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
|                                             |                                                                                                                                                                                                                                                                   | A         | B | C | D | 1         | 2 | I          | II | MCC |      |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                |
|                                             |                                                                                                                                                                                                                                                                   |           |   |   |   |           |   |            |    |     |      | cancellation logic as well as system dynamics, control displacement and forces as a result of the stick pusher activation.<br>This requirement applies only to FSTDs that are to be qualified to conduct full stall training tasks. Test required.                                                                                                                                                                                                                                                                                                                                                                                                                             |
| h.1                                         | Instructor controls shall enable the operator to control all required system variables and insert abnormal or emergency conditions into the aeroplane systems.                                                                                                    | ✓         | ✓ | ✓ | ✓ | ✓         | ✓ | ✓          | ✓  | ✓   | ✓    | Where applicable, and as required for training, the following shall be available:<br>— position and flight freeze;<br>— a facility to enable the dynamic plotting of the flight path on approaches, commencing at the final approach fix, including the vertical profile;<br>— hard copy of map and approach plot.                                                                                                                                                                                                                                                                                                                                                             |
| h.2                                         | The FSTD must have a real-time feedback tool that provides the instructor/evaluator with visibility of whenever the FSTD training envelope or aeroplane operating limits have been exceeded. Additionally, and optionally, a recording mechanism may be utilised. |           |   | ✓ | ✓ |           |   |            |    |     |      | This feedback tool must include the following:<br>(a) FSTD validation envelope: This must be in form of an alpha/beta envelope (or equivalent method) depicting the ‘confidence level’ of the aerodynamic model. This ‘confidence level’ depends on the degree of flight validation or on the source of predictive methods. There must be a minimum of a flaps-up and flaps-down envelope available.<br>(b) Flight control inputs: These must enable the instructor/evaluator to assess the pilot’s flight control displacements and forces (including fly-by-wire, as appropriate).<br>(c) Aeroplane operational limits: This must display the aeroplane’s operational limits |

| FLIGHT SIMULATION TRAINING DEVICE STANDARDS |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        | FFS LEVEL |   |   |   | FTD LEVEL |   | FNPT LEVEL |    |     | BITD | COMPLIANCE                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  |
|---------------------------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-----------|---|---|---|-----------|---|------------|----|-----|------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
|                                             |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        | A         | B | C | D | 1         | 2 | I          | II | MCC |      |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                             |
|                                             |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        |           |   |   |   |           |   |            |    |     |      | <p>during the manoeuvre as applicable for the configuration of the aeroplane.</p> <p>An SOC is required that defines the source data used to construct the FSTD validation envelope. Please refer to AMC12 FSTD(A).300.</p>                                                                                                                                                                                                                                                                                                                                                                                                                                                 |
| h.3                                         | Upset scenarios: When equipped with instructor operating station (IOS) selectable dynamic aeroplane upsets, the IOS is to provide guidance on the method used to drive the FSTD into an upset condition, including any malfunction or degradation of the FSTD's functionality, required to initiate the upset. The unrealistic degradation of simulator functionality (such as degrading flight control effectiveness) to drive an aeroplane upset is generally not acceptable unless used purely as a tool for repositioning the FSTD with the pilot out of the loop. |           |   | ✓ | ✓ |           |   |            |    |     |      | <p>An SOC is required to confirm that each upset prevention and recovery feature programmed at the IOS and the associated training manoeuvre have been evaluated by a suitably qualified pilot. Please refer to AMC9 FSTD(A).300(a)(1).</p>                                                                                                                                                                                                                                                                                                                                                                                                                                 |
| i.1                                         | Control forces and control travel shall correspond to that of the replicated aeroplane. Control forces shall react in the same manner as in the aeroplane under the same flight conditions.                                                                                                                                                                                                                                                                                                                                                                            | ✓         | ✓ | ✓ | ✓ |           | ✓ | ✓          | ✓  | ✓   | ✓    | <p>For FTD level 2, control forces and control travel should correspond to that of the replicated aeroplane with CT&amp;M. It is not intended that the device should be flown manually other than for short periods when the autopilot is temporarily disengaged.</p> <p>For FNPT level I and BITDs, control forces and control travel shall broadly correspond to that of the replicated aeroplane or class of aeroplane. Control force changes due to an increase/decrease in aeroplane speed are not necessary.</p> <p>In addition for FNPT level II and MCC control forces and control travels shall respond in the same manner under the same flight conditions as</p> |

| FLIGHT SIMULATION TRAINING DEVICE STANDARDS |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                             | FFS LEVEL |   |   |   | FTD LEVEL |   | FNPT LEVEL |    |     | BITD | COMPLIANCE                                                                                                                                                                                                                                                                                                                                                                                                             |
|---------------------------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-----------|---|---|---|-----------|---|------------|----|-----|------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
|                                             |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                             | A         | B | C | D | 1         | 2 | I          | II | MCC |      |                                                                                                                                                                                                                                                                                                                                                                                                                        |
|                                             |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                             |           |   |   |   |           |   |            |    |     |      | in the aeroplane or class of aeroplane being simulated.                                                                                                                                                                                                                                                                                                                                                                |
| j.1                                         | <p>Ground handling and aerodynamic programming shall include:</p> <p>(1) Ground effect. For example: round-out, flare, and touchdown. This requires data on lift, drag, pitching moment, trim, and power ground effect.</p> <p>(2) Ground reaction — reaction of the aeroplane upon contact with the runway during landing to include strut deflections, tyre friction, side forces, and other appropriate data, such as weight and speed, necessary to identify the flight condition and configuration.</p> <p>(3) Ground handling characteristics — steering inputs to include crosswind, braking, thrust reversing, deceleration and turning radius.</p> | ✓         | ✓ | ✓ | ✓ |           |   |            | ✓  | ✓   |      | <p>Statement of compliance required. Tests required.</p> <p>For level A FFSs, generic ground handling to the extent that allows turns within the confines of the runway, adequate control on flare, touchdown and roll-out (including from a crosswind landing) only is acceptable.</p> <p>For FNPTs, a generic ground handling model need only be provided to enable representative flare and touch down effects.</p> |
| k.1                                         | <p>Wind shear models shall provide training in the specific skills required for recognition of wind shear phenomena and execution of recovery manoeuvres. Such models shall be representative of measured or accident derived winds, but may include simplifications which ensure repeatable encounters. For example, models may consist of independent variable winds in multiple simultaneous components. Wind models shall be available for the following critical phases of flight:</p> <p>(1) Prior to take-off rotation,</p> <p>(2) At lift-off,</p> <p>(3) During initial climb,</p> <p>(4) Short final approach.</p>                                |           |   | ✓ | ✓ |           |   |            |    |     |      | <p>Tests required.</p> <p>Please refer to AMC1 FSTD(A).300, (b)(3) 2.g.</p>                                                                                                                                                                                                                                                                                                                                            |

| FLIGHT SIMULATION TRAINING DEVICE STANDARDS |                                                                                                                                                                                                                                                                                                                                          | FFS LEVEL |   |   |   | FTD LEVEL |   | FNPT LEVEL |    |     | BITD | COMPLIANCE                                                                                                                                 |
|---------------------------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-----------|---|---|---|-----------|---|------------|----|-----|------|--------------------------------------------------------------------------------------------------------------------------------------------|
|                                             |                                                                                                                                                                                                                                                                                                                                          | A         | B | C | D | 1         | 2 | I          | II | MCC |      |                                                                                                                                            |
| l.1                                         | Instructor controls for environmental effects including wind speed and direction shall be provided.                                                                                                                                                                                                                                      | ✓         | ✓ | ✓ | ✓ | ✓         | ✓ | ✓          | ✓  | ✓   | ✓    | For FTDs environment modelling sufficient to permit accurate systems operation and indication.                                             |
| m.1                                         | Stopping and directional control forces shall be representative for at least the following runway conditions based on aeroplane related data:<br>(1) Dry<br>(2) Wet<br>(3) Icy<br>(4) Patchy wet<br>(5) Patchy icy<br>(6) Wet on rubber residue in touchdown zone.                                                                       |           |   | ✓ | ✓ |           |   |            |    |     |      | Statement of compliance required.<br><br>Objective tests required for (1), (2), (3); subjective check for (4), (5), (6).                   |
| n.1                                         | Brake and tyre failure dynamics (including antiskid) and decreased brake efficiency due to brake temperatures shall be representative and based on aeroplane related data.                                                                                                                                                               |           |   | ✓ | ✓ |           |   |            |    |     |      | Statement of compliance required.<br>Subjective test is required for decreased braking efficiency due to brake temperature, if applicable. |
| o.1                                         | A means for quickly and effectively conducting daily testing of FSTD programming and hardware shall be available.                                                                                                                                                                                                                        | ✓         | ✓ | ✓ | ✓ |           |   |            |    |     |      | Statement of compliance required.                                                                                                          |
| p.1                                         | Computer capacity, accuracy, resolution, and dynamic response shall be sufficient to fully support the overall fidelity, including its evaluation and testing.                                                                                                                                                                           | ✓         | ✓ | ✓ | ✓ | ✓         | ✓ |            |    |     |      | Statement of compliance required.                                                                                                          |
| q.1                                         | Control feel dynamics shall replicate the aeroplane simulated.<br><br>Free response of the controls shall match that of the aeroplane within the tolerances specified. Initial and upgrade evaluations will include control free response (pitch, roll and yaw controller) measurements recorded at the controls. The measured responses |           |   | ✓ | ✓ |           |   |            |    |     |      | Tests required.                                                                                                                            |

| FLIGHT SIMULATION TRAINING DEVICE STANDARDS |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         | FFS LEVEL |   |   |   | FTD LEVEL |   | FNPT LEVEL |    |     | BITD | COMPLIANCE                                                                                                                                            |
|---------------------------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-----------|---|---|---|-----------|---|------------|----|-----|------|-------------------------------------------------------------------------------------------------------------------------------------------------------|
|                                             |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         | A         | B | C | D | 1         | 2 | I          | II | MCC |      |                                                                                                                                                       |
|                                             | <p>shall correspond to those of the aeroplane in take-off, cruise, and landing configurations.</p> <p>(1) For aeroplanes with irreversible control systems, measurements may be obtained on the ground if proper pitot static inputs are provided to represent conditions typical of those encountered in flight. Engineering validation or aeroplane manufacturer rationale will be submitted as justification to ground test or omit a configuration.</p> <p>(2) For FSTDs requiring static and dynamic tests at the controls, special test fixtures shall not be required during initial evaluation if the FSTD operator's MQTG shows both text fixture results and alternate test method results such as computer data plots, which were obtained concurrently. Repetition of the alternate method during initial evaluation may then satisfy this requirement.</p> |           |   |   |   |           |   |            |    |     |      |                                                                                                                                                       |
| r.1                                         | <p>One of the following two methods is acceptable as a means to prove compliance:</p> <p>(1) Transport Delay: A transport delay test may be used to demonstrate that the FSTD system response does not exceed 150 ms. This test shall measure all the delay encountered by a step signal migrating from the pilot's control through the control loading electronics and interfacing through all the simulation software modules in the correct order, using a handshaking protocol, finally through the normal output interfaces to the motion</p>                                                                                                                                                                                                                                                                                                                      | ✓         | ✓ | ✓ | ✓ | ✓         | ✓ | ✓          | ✓  | ✓   | ✓    | <p>Tests required.</p> <p>For level 'A' &amp; 'B' FFSs, and applicable systems for FTDs, FNPTs and BITDs the maximum permissible delay is 300 ms.</p> |

| FLIGHT SIMULATION TRAINING DEVICE STANDARDS |                                                                                                                                                                                                                                                                                                                                                                                                                                       | FFS LEVEL |   |   |   | FTD LEVEL |   | FNPT LEVEL |    |     | BITD | COMPLIANCE                                                                                                                                                                                                                                                                                                     |
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|                                             |                                                                                                                                                                                                                                                                                                                                                                                                                                       | A         | B | C | D | 1         | 2 | I          | II | MCC |      |                                                                                                                                                                                                                                                                                                                |
|                                             | system, to the visual system and instrument displays.<br>(2) Latency: The visual system, flight deck instruments and initial motion system response shall respond to abrupt pitch, roll and yaw inputs from the pilot's position within 150 ms of the time, but not before the time, when the aeroplane would respond under the same conditions.                                                                                      |           |   |   |   |           |   |            |    |     |      |                                                                                                                                                                                                                                                                                                                |
| s.1                                         | Aerodynamic modelling includes, for aeroplanes issued an original type certificate after June 1980, low altitude level flight ground effect, Mach effect at high altitude, normal and reverse dynamic thrust effect on control surfaces, aeroelastic representations, and representations of non-linearities due to sideslip based on aeroplane flight test data provided by the manufacturer.                                        |           |   | ✓ | ✓ |           |   |            |    |     |      | Statement of compliance required to include:<br>— Mach effect, aeroelastic representations, ground effect and non-linearities due to sideslip;<br>— separate tests for thrust effects.<br><br>Please refer to AMC9 FSTD(A).300(a)(2).                                                                          |
| s.2                                         | The aerodynamic model has to incorporate data representing the aeroplane's characteristics covering an angle of attack and sideslip range to support the training tasks.                                                                                                                                                                                                                                                              |           |   | ✓ | ✓ |           |   |            |    |     |      | An SOC is required.<br>Please refer to AMC9 FSTD(A).300(a)(3).                                                                                                                                                                                                                                                 |
| s.3                                         | Applicable only for those FSTDs that are to be qualified for full stall training tasks.<br>The aerodynamic modelling has to support stall-recovery training tasks in the following flight conditions:<br>(a) stall entry at wing level (1g);<br>(b) stall entry into turning flight of at least 25° bank angle (accelerated stall);<br>(c) stall entry into a power-on condition (required only for propeller-driven aeroplanes); and |           |   | ✓ | ✓ |           |   |            |    |     |      | An SOC is required which describes the aerodynamic-modelling methods, validation, as well and check of the stall characteristics of the FSTD.<br>An additional SOC has also to include a verification that the FSTD has been evaluated by a subject-matter expert pilot acceptable to the competent authority. |

| FLIGHT SIMULATION TRAINING DEVICE STANDARDS |                                                                                                                                                                                                                                                 | FFS LEVEL |   |   |   | FTD LEVEL |   | FNPT LEVEL |    |     | BITD | COMPLIANCE                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        |
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|                                             |                                                                                                                                                                                                                                                 | A         | B | C | D | 1         | 2 | I          | II | MCC |      |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   |
|                                             | (d) aeroplane configurations of second-segment climb, high-altitude cruise ('near performance limited condition'), and approach or landing.                                                                                                     |           |   |   |   |           |   |            |    |     |      | <p>Please refer to AMC10 FSTD(A).300(e) for clarification on the definition of a 'subject-matter expert pilot'.</p> <p>Please refer to AMC9 FSTD(A).300(a)(4) for clarification on the stall modelling.</p> <p>Please refer to AMC1 FSTD(A).200 for clarification of the 'near performance limited condition'.</p>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                |
| t.1                                         | <p>Modelling that includes the effects of icing, where appropriate, on the airframe, aerodynamics and the engine(s).</p> <p>Icing-effects simulation models are only required for aeroplanes authorised for operations in icing conditions.</p> |           |   | ✓ | ✓ |           |   |            |    |     |      | <p>Icing models simulate the aerodynamic degradation effects of ice accretion on the aeroplane lifting surfaces, including (if present on the simulated aeroplane) 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.</p> <p>Aeroplane systems (such as the stall protection system and auto flight system) must respond properly to ice accretion, consistent with the simulated aeroplane. Aeroplane original equipment manufacturer (OEM) data or other acceptable analytical methods must be used to develop ice accretion models. Acceptable analytical methods may include wind tunnel analysis and/or engineering analysis of the aerodynamic effects of icing on the aeroplane lifting surfaces coupled with tuning and supplemental subjective assessment by a subject-matter expert pilot knowledgeable of the effect of ice accretion on the handling qualities of the simulated aeroplane.</p> |



| FLIGHT SIMULATION TRAINING DEVICE STANDARDS |                                                                                                                                                                                                                                                                                                           | FFS LEVEL |   |   |   | FTD LEVEL |   | FNPT LEVEL |    |     | BITD | COMPLIANCE                                                                                                                                                                                                                                                                                                                                                      |
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|                                             |                                                                                                                                                                                                                                                                                                           | A         | B | C | D | 1         | 2 | I          | II | MCC |      |                                                                                                                                                                                                                                                                                                                                                                 |
|                                             |                                                                                                                                                                                                                                                                                                           |           |   |   |   |           |   |            |    |     |      | An SOC is required describing the effects that provide training in the specific skills for recognition of icing phenomena and execution of recovery. The SOC must describe the source data and any analytical methods used to develop ice accretion models, including a verification that these effects have been tested.<br>Please refer to AMC13 FSTD(A).300. |
| t.2                                         | Modelling that includes the effects of icing, where appropriate, on the airframe, aerodynamics and the engine(s).<br>Icing-effects simulation models are only required for those aeroplanes authorised for operations in icing conditions.                                                                |           |   |   |   |           |   |            | ✓  | ✓   |      | An SOC is required describing the effects that provide training in the specific skills for recognition of icing phenomena and execution of recovery.                                                                                                                                                                                                            |
| u.1                                         | Aerodynamic and ground reaction modelling for the effects of reverse thrust on directional control shall be provided.                                                                                                                                                                                     |           | ✓ | ✓ | ✓ |           |   |            |    |     |      | Statement of compliance required.                                                                                                                                                                                                                                                                                                                               |
| v.1                                         | Realistic aeroplane mass properties, including mass, centre of gravity and moments of inertia as a function of payload and fuel loading shall be implemented.                                                                                                                                             | ✓         | ✓ | ✓ | ✓ |           |   |            |    |     |      | Statement of compliance required at initial evaluation. SOC shall include a range of tabulated target values to enable a demonstration of the mass properties model to be conducted from the instructor's station.                                                                                                                                              |
| w.1                                         | Self-testing for FSTD hardware and programming to determine compliance with the FSTD performance tests shall be provided. Evidence of testing shall include FSTD number, date, time, conditions, tolerances, and the appropriate dependent variables portrayed in comparison with the aeroplane standard. |           |   | ✓ | ✓ |           |   |            |    |     |      | Statement of compliance required. Tests required.                                                                                                                                                                                                                                                                                                               |

| FLIGHT SIMULATION TRAINING DEVICE STANDARDS |                                                                                                                                                           | FFS LEVEL |   |   |   | FTD LEVEL |   | FNPT LEVEL |    |     | BITD | COMPLIANCE                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 |
|---------------------------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------|-----------|---|---|---|-----------|---|------------|----|-----|------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
|                                             |                                                                                                                                                           | A         | B | C | D | 1         | 2 | I          | II | MCC |      |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            |
| x.1                                         | Timely and permanent update of hardware and programming subsequent to aeroplane modification sufficient for the qualification level sought.               | ✓         | ✓ | ✓ | ✓ | ✓         | ✓ |            |    |     |      |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            |
| y.1                                         | Daily preflight documentation either in the daily log or in a location easily accessible for review is required.                                          | ✓         | ✓ | ✓ | ✓ | ✓         | ✓ | ✓          | ✓  | ✓   | ✓    |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            |
| <b>2. Motion system</b>                     |                                                                                                                                                           |           |   |   |   |           |   |            |    |     |      |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            |
| a.1                                         | Motion cues as perceived by the pilot shall be representative of the aeroplane, e.g. touchdown cues shall be a function of the simulated rate of descent. | ✓         | ✓ | ✓ | ✓ |           |   |            |    |     |      | For FSTDs where motion systems are not specifically required, but have been added, they will be assessed to ensure that they do not adversely affect the qualification of the FSTD.<br>For level C or level D devices, special consideration is given to the motion system response during upset prevention and recovery manoeuvres. Notwithstanding the limitations of simulator motion, the operator should place specific emphasis on tuning out objectionable motion system responses, where possible. |
| b.1                                         | A motion system shall:                                                                                                                                    |           |   |   |   |           |   |            |    |     |      | Statement of compliance required.<br>Tests required.                                                                                                                                                                                                                                                                                                                                                                                                                                                       |
|                                             | (1) provide sufficient cueing, which may be of a generic nature to accomplish the required tasks;                                                         | ✓         |   |   |   |           |   |            |    |     |      |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            |
|                                             | (2) have a minimum of 3 degrees of freedom (pitch, roll & heave); and                                                                                     |           | ✓ |   |   |           |   |            |    |     |      |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            |
|                                             | (3) produce cues at least equivalent to those of a six-degrees-of-freedom synergistic platform motion system.                                             |           |   | ✓ | ✓ |           |   |            |    |     |      |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            |
| c.1                                         | A means of recording the motion response time as required.                                                                                                | ✓         | ✓ | ✓ | ✓ |           |   |            |    |     |      |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            |

| FLIGHT SIMULATION TRAINING DEVICE STANDARDS |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        | FFS LEVEL |   |   |   | FTD LEVEL |   | FNPT LEVEL |    |     | BITD | COMPLIANCE                                                                                                                                                                                                                                                                                                               |
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|                                             |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        | A         | B | C | D | 1         | 2 | I          | II | MCC |      |                                                                                                                                                                                                                                                                                                                          |
| d.1                                         | <p>Motion effects programming shall include:</p> <ul style="list-style-type: none"> <li>(1) effects of runway rumble, oleo deflections, groundspeed, uneven runway, centreline lights and taxiway characteristics;</li> <li>(2) buffets on the ground due to spoiler/speedbrake extension and thrust reversal;</li> <li>(3) bumps associated with the landing gear;</li> <li>(4) buffet during extension and retraction of landing gear;</li> <li>(5) buffet in the air due to flap and spoiler/speedbrake extension;</li> <li>(6) approach-to-stall buffet and stall buffet (where applicable);</li> <li>(7) touchdown cues for main and nose gear;</li> <li>(8) nose-wheel scuffing;</li> <li>(9) thrust effect with brakes set;</li> <li>(10) Mach and manoeuvre buffet;</li> <li>(11) tyre failure dynamics;</li> <li>(12) engine malfunction and engine damage; and</li> <li>(13) tail and pod strike.</li> </ul> | ✓         | ✓ | ✓ | ✓ |           |   |            |    |     |      | <p>For level A FFSs: effects may be of a generic nature sufficient to accomplish the required tasks.</p> <p>For level B, C and D FFSs: if there are known flight conditions where buffet is the first indication of the stall, or where no stall buffet occurs, this characteristic should be included in the model.</p> |
| e.1                                         | <p>Motion vibrations: tests with recorded results that allow the comparison of relative amplitudes versus frequency are required.</p> <p>Characteristic motion vibrations that result from operation of the aeroplane in so far as vibration marks an event or aeroplane state that can be sensed at the flight deck shall be present. The FSTD shall be programmed and instrumented in such a manner that the characteristic vibration modes can be measured and compared with aeroplane data.</p>                                                                                                                                                                                                                                                                                                                                                                                                                    |           |   |   | ✓ |           |   |            |    |     |      | <p>Statement of compliance required.</p> <p>Tests required.</p>                                                                                                                                                                                                                                                          |

| FLIGHT SIMULATION TRAINING DEVICE STANDARDS |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       | FFS LEVEL |   |   |   | FTD LEVEL |   | FNPT LEVEL |    |     | BITD | COMPLIANCE                                                                                                                                                                                                                                                                                                                                                                                                                                                       |
|---------------------------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-----------|---|---|---|-----------|---|------------|----|-----|------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
|                                             |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       | A         | B | C | D | 1         | 2 | I          | II | MCC |      |                                                                                                                                                                                                                                                                                                                                                                                                                                                                  |
|                                             | <b>3. Visual System</b>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               |           |   |   |   |           |   |            |    |     |      |                                                                                                                                                                                                                                                                                                                                                                                                                                                                  |
| a.1                                         | The visual system shall meet all the standards enumerated as applicable to the level of qualification requested by the applicant.                                                                                                                                                                                                                                                                                                                                                                                     | ✓         | ✓ | ✓ | ✓ |           |   |            | ✓  | ✓   |      | For FTDs, FNPT 1s and BITDs, when visual systems have been added by the FSTD operator even though not attracting specific credits, they will be assessed to ensure that they do not adversely affect the qualification of the FSTD.<br>For FTDs if the visual system is to be used for the training of manoeuvring by visual reference (such as route and airfield competence) then the visual system should at least comply with that required for level A FFS. |
| b.1                                         | Continuous minimum collimated visual field-of-view of 45 degrees horizontal and 30 degrees vertical field of view simultaneously for each pilot.                                                                                                                                                                                                                                                                                                                                                                      | ✓         | ✓ |   |   |           |   |            |    |     |      | SOC is acceptable in place of this test.                                                                                                                                                                                                                                                                                                                                                                                                                         |
| b.2                                         | Continuous, cross-cockpit, minimum collimated visual field of view providing each pilot with 180 degrees horizontal and 40 degrees vertical field of view. Application of tolerances require the field of view to be not less than a total of 176 measured degrees horizontal field of view (including not less than $\pm 88$ measured degrees either side of the centre of the design eye point) and not less than a total of 36 measured degrees vertical field of view from the pilot's and co-pilot's eye points. |           |   | ✓ | ✓ |           |   |            |    |     |      | Consideration shall be given to optimising the vertical field of view for the respective aeroplane cut-off angle.                                                                                                                                                                                                                                                                                                                                                |
| b.3                                         | A visual system (night/dusk or day) capable of providing a field-of-view of a minimum of 45 degrees horizontally and 30 degrees vertically, unless restricted by the type of aeroplane, simultaneously for each pilot, including adjustable cloud base and visibility.                                                                                                                                                                                                                                                |           |   |   |   |           |   |            | ✓  | ✓   |      | The visual system need not be collimated but shall be capable of meeting the standards laid down in Parts (b) and (c) (Validation, Functions and Subjective Tests - See AMC1 FSTD(A).300).<br>SOC is acceptable in place of this test.                                                                                                                                                                                                                           |

| FLIGHT SIMULATION TRAINING DEVICE STANDARDS |                                                                                                                                                                    | FFS LEVEL |   |   |   | FTD LEVEL |   | FNPT LEVEL |    |     | BITD | COMPLIANCE                                                                                                           |
|---------------------------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------|-----------|---|---|---|-----------|---|------------|----|-----|------|----------------------------------------------------------------------------------------------------------------------|
|                                             |                                                                                                                                                                    | A         | B | C | D | 1         | 2 | I          | II | MCC |      |                                                                                                                      |
| c.1                                         | A means of recording the visual response time for visual systems.                                                                                                  | ✓         | ✓ | ✓ | ✓ |           |   |            | ✓  | ✓   |      |                                                                                                                      |
| d.1                                         | System geometry. The system fitted shall be free from optical discontinuities and artefacts that create non-realistic cues.                                        | ✓         | ✓ | ✓ | ✓ |           |   |            | ✓  | ✓   |      | Test required. A statement of compliance is acceptable in place of this test.                                        |
| e.1                                         | Visual textural cues to assess sink rate and depth perception during take-off and landing shall be provided.                                                       | ✓         | ✓ | ✓ | ✓ |           |   |            |    |     |      | For level 'A' FFS visual cueing shall be sufficient to support changes in approach path by using runway perspective. |
| f.1                                         | Horizon and attitude shall correlate to the simulated attitude indicator.                                                                                          | ✓         | ✓ | ✓ | ✓ |           |   |            |    |     |      | Statement of compliance required.                                                                                    |
| g.1                                         | Occulting - a minimum of ten levels shall be available.                                                                                                            | ✓         | ✓ | ✓ | ✓ |           |   |            |    |     |      | Occulting shall be demonstrated. Statement of compliance required.                                                   |
| h.1                                         | Surface (Vernier) resolution shall occupy a visual angle of not greater than 2 arc minutes in the visual display used on a scene from the pilot's eyepoint.        |           |   | ✓ | ✓ |           |   |            |    |     |      | Test and statement of compliance required containing calculations confirming resolution.                             |
| i.1                                         | Surface contrast ratio shall be demonstrated by a raster drawn test pattern showing a contrast ratio of not less than 5:1.                                         |           |   | ✓ | ✓ |           |   |            |    |     |      | Test and statement of compliance required.                                                                           |
| j.1                                         | Highlight brightness shall be demonstrated using a raster drawn test pattern. The highlight brightness shall not be less than 20 cd/m <sup>2</sup> (6ft-lamberts). |           |   | ✓ | ✓ |           |   |            |    |     |      | Test and statement of compliance required. Use of calligraphic lights to enhance raster brightness is acceptable.    |
| k.1                                         | Light point size – not greater than 5 arc minutes.                                                                                                                 |           |   | ✓ | ✓ |           |   |            |    |     |      | Test and statement of compliance required. This is equivalent to a light point resolution of 2.5 arc minutes.        |
| l.1                                         | Light point contrast ratio – not less than 10:1.                                                                                                                   | ✓         | ✓ |   |   |           |   |            |    |     |      | Test and statement of compliance required.                                                                           |
| l.2                                         | Light point contrast ratio – not less than 25:1.                                                                                                                   |           |   | ✓ | ✓ |           |   |            |    |     |      | Test and statement of compliance required.                                                                           |
| m.1                                         | Daylight, twilight and night visual capability as applicable for level of qualification sought.                                                                    | ✓         | ✓ | ✓ | ✓ |           |   |            |    |     |      | Statement of compliance required for system capability.                                                              |

| FLIGHT SIMULATION TRAINING DEVICE STANDARDS |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              | FFS LEVEL |   |   |   | FTD LEVEL |   | FNPT LEVEL |    |     | BITD | COMPLIANCE                                             |
|---------------------------------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-----------|---|---|---|-----------|---|------------|----|-----|------|--------------------------------------------------------|
|                                             |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              | A         | B | C | D | 1         | 2 | I          | II | MCC |      |                                                        |
|                                             |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              |           |   |   |   |           |   |            |    |     |      | System objective and scene content tests are required. |
| m.2                                         | The visual system shall be capable of meeting, as a minimum, the system brightness and contrast ratio criteria as applicable for level of qualification sought.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              | ✓         | ✓ | ✓ | ✓ |           |   |            |    |     |      |                                                        |
| m.3                                         | Total scene content shall be comparable in detail to that produced by 10 000 visible textured surfaces and (in day) 6 000 visible lights or (in twilight or night) 15 000 visible lights, and sufficient system capacity to display 16 simultaneously moving objects.                                                                                                                                                                                                                                                                                                                                                                                                                        |           |   | ✓ | ✓ |           |   |            |    |     |      |                                                        |
| m.4                                         | The system, when used in training, shall provide in daylight, full colour presentations and sufficient surfaces with appropriate textural cues to conduct a visual approach, landing and airport movement (taxi). Surface shading effects shall be consistent with simulated (static) sun position.                                                                                                                                                                                                                                                                                                                                                                                          |           |   | ✓ | ✓ |           |   |            |    |     |      |                                                        |
| m.5                                         | The system, when used in training, shall provide at twilight, as a minimum, full colour presentations of reduced ambient intensity, sufficient surfaces with appropriate textural cues that include self-illuminated objects such as road networks, ramp lighting and airport signage, to conduct a visual approach, landing and airport movement (taxi). Scenes shall include a definable horizon and typical terrain characteristics such as fields, roads and bodies of water and surfaces illuminated by representative ownship lighting (e.g. landing lights). If provided, directional horizon lighting shall have correct orientation and be consistent with surface shading effects. |           |   | ✓ | ✓ |           |   |            |    |     |      |                                                        |

| FLIGHT SIMULATION TRAINING DEVICE STANDARDS |                                                                                                                                                                                                                                                                                                                               | FFS LEVEL |   |   |   | FTD LEVEL |   | FNPT LEVEL |    |     | BITD | COMPLIANCE                                                                                                                                                                                                                                           |
|---------------------------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-----------|---|---|---|-----------|---|------------|----|-----|------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
|                                             |                                                                                                                                                                                                                                                                                                                               | A         | B | C | D | 1         | 2 | I          | II | MCC |      |                                                                                                                                                                                                                                                      |
| m.6                                         | The system, when used in training, shall provide at night, as a minimum, all features applicable to the twilight scene, as defined above, with the exception of the need to portray reduced ambient intensity that removes ground cues that are not self-illuminating or illuminated by ownship lights (e.g. landing lights). | ✓         | ✓ | ✓ | ✓ |           |   |            |    |     |      |                                                                                                                                                                                                                                                      |
|                                             | <b>4. Sound System</b>                                                                                                                                                                                                                                                                                                        |           |   |   |   |           |   |            |    |     |      |                                                                                                                                                                                                                                                      |
| a.1                                         | Significant flight deck sounds which result from pilot actions corresponding to those of the aeroplane or class of aeroplane.                                                                                                                                                                                                 | ✓         | ✓ | ✓ | ✓ |           | ✓ | ✓          | ✓  | ✓   | ✓    | For FNPTs level I and BITDs engine sounds only need to be available.                                                                                                                                                                                 |
| b.1                                         | Sound of precipitation, rain removal equipment and other significant aeroplane noises perceptible to the pilot during normal and abnormal operations and the sound of a crash when the FSTD is landed in excess of limitations.                                                                                               |           |   | ✓ | ✓ |           |   |            |    |     |      | A statement of compliance is required. Sounds have to be directionally representative. For FSTDs that are to be qualified for full stall training tasks, sounds associated with stall buffet have to be replicated, if significant in the aeroplane. |
| c.1                                         | Comparable amplitude and frequency of flight deck noises, including engine and airframe sounds. The sounds shall be coordinated with the required weather.                                                                                                                                                                    |           |   |   | ✓ |           |   |            |    |     |      | Tests required.                                                                                                                                                                                                                                      |
| d.1                                         | The volume control shall have an indication of sound level setting which meets all qualification requirements.                                                                                                                                                                                                                | ✓         | ✓ | ✓ | ✓ |           |   |            |    |     |      |                                                                                                                                                                                                                                                      |

[Issue: CS-FSTD(A)/2]