

SECTION 1 – REQUIREMENTS

1 GENERAL

1.1 This Section contains the [r]equirements for [a]eroplane [f]light [s]imulators.

2 PRESENTATION

2.1 The requirements of JAR–STD 1A are presented in two columns on loose pages, each page being identified by the date of issue and the Amendment number under which it is amended or reissued.

2.2 Sub-headings are in italic typeface.

2.3 Explanatory Notes not forming part of the requirements appear in smaller typeface.

2.4 New, amended and corrected text will be enclosed within heavy brackets until a subsequent 'Amendment' is issued.

2.5 After each paragraph, the various changes and amendments, if any since the initial issue, are indicated together with their date of issue.

INTENTIONALLY LEFT BLANK

SUBPART A – APPLICABILITY

JAR-STD 1A.001 Applicability

JAR-STD 1A [as amended] applies to those persons, organisations or enterprises ([flight simulator] operators) seeking [initial] qualification of flight [simulators].

[The version of JAR-STD 1A agreed by the Authority and used for issue of the initial qualification shall be applicable for future recurrent qualifications of the flight simulator unless recategorised.]

Flight [simulator] users also shall gain approval to use the [flight simulator] as part of their approved training programmes despite the fact that the [flight simulator] has been previously qualified. Although this document provides guidance material for [flight simulator] users, precise details of such approvals are contained in JAR-OPS, JAR-FCL and other applicable documents.

[Ch.1, 01.06.99; Amdt. 3, 01.07.03]

INTENTIONALLY LEFT BLANK

INTENTIONALLY LEFT BLANK

INTENTIONALLY LEFT BLANK

SUBPART B – GENERAL

JAR-STD 1A.005 Terminology

(See ACJ [] STD 1A.005)

Because of the technical complexity of STD [qualification], it is essential that standard terminology is used throughout. The following principal terms and abbreviations shall be used in order to comply with JAR-STD [(A)]. Further terms and abbreviations are contained in ACJ STD 1A.005.

(a) *Synthetic Training Device (STD)*. A training device which is either a Flight Simulator (FS), a Flight Training Device (FTD), a Flight & Navigation Procedures Trainer (FNPT) [, or a Basic Instrument Training Device (BITD).]

(b) *Flight Simulator (FS)*. A full size replica of a specific type or make, model and series aeroplane flight deck, including the assemblage of all equipment and computer programmes necessary to represent the aeroplane in ground and flight operations, a visual system providing an out of the flight deck view, and a force cueing motion system. It is in compliance with the minimum standards for Flight Simulator Qualification.

(c) *Flight Training Device (FTD)*. A full size replica of an aeroplane's instruments, equipment, panels and controls in an open flight deck area or an enclosed aeroplane flight deck, including the assemblage of equipment and computer software programmes necessary to represent the aeroplane in ground and flight conditions to the extent of the systems installed in the device. It does not require a force cueing motion or visual system. It is in compliance with the minimum standards for a specific FTD Level of Qualification.

(d) *Flight and Navigation Procedures Trainer [- (FNPT)]*. A training device which represents the flight deck/cockpit environment including the assemblage of equipment and computer programmes necessary to represent an aeroplane in flight operations to the extent that the systems appear to function as in an aeroplane. It is in compliance with the minimum standards for a specific FNPT Type of Qualification.]

[(e) *Basic Instrument Training Device (BITD)*. A ground based training device which represents the student pilot's station of a class of aeroplanes. It may use screen based instrument panels and springloaded flight controls, providing a training platform for at least the procedural aspects of instrument flight.

(f) *Synthetic Training Device Approval (STD Approval)*. The extent to which an STD of a specified Qualification Level may be used by persons, organisations or enterprises as approved by

JAR-STD 1A.005(f) (continued)

the Authority. It takes account of aeroplane to STD differences and the operating and training ability of the organisation.

(g) *Synthetic Training Device Operator (STD operator)*. That person, organisation or enterprise directly responsible to the Authority for requesting and maintaining the qualification of a particular STD.

(h) *Synthetic Training Device User (STD User)*. The person, organisation or enterprise requesting training, checking and testing credits through the use of an STD.

(i) *Synthetic Training Device Qualification (STD Qualification)*. The level of technical ability of an STD as defined in the compliance document.

(j) *Qualification Test Guide (QTG)*. A document designed to demonstrate that the performance and handling qualities of an STD agree within prescribed limits with those of the aeroplane and that all applicable regulatory requirements have been met. The QTG includes both the aeroplane and STD data used to support the validation.

[Ch. 1, 01.06.99; Amdt 2, 01.04.01; Amdt. 3, 01.07.03]

JAR-STD 1A.010 Implementation

JAR-STD 1A has been implemented on 1 April 1998 whereupon national arrangements, procedures and Qualification Certificates shall fully comply with JAR-STD 1A criteria.

INTENTIONALLY LEFT BLANK

INTENTIONALLY LEFT BLANK

SUBPART C – AEROPLANE FLIGHT SIMULATORS

JAR–STD 1A.015 Application for Flight Simulator Qualification

(See [ACJ No. 1 to] [JAR]-STD 1A.015)

(See [ACJ No. 2 to] [JAR]-STD 1A.015)

(a) The STD operator requiring evaluation shall apply to the Authority giving 3 months notice. [In exceptional cases this period may be reduced to one month at the discretion of the Authority.]

(b) An STD (FS) Qualification Certificate will be issued following satisfactory completion of an evaluation by the Authority.

[Ch. 1, 01.06.99; Amdt. 3, 01.07.03]

JAR–STD 1A.020 Validity of Flight Simulator Qualification
[(See ACJ STD 1A.020(a))]

(a) An STD qualification is valid for 12 months unless otherwise specified by the Authority.

(b) An STD qualification [] revalidation may take place at any time within the 60 days prior the expiry of the validity of the [qualification] document. The new period of validity shall continue from the expiry date of the previous [qualification] document.

(c) The Authority may refuse, revoke, suspend or vary an STD qualification, if the provisions of JAR–STD 1A are not satisfied.

[Ch. 1, 01.06.99; Amdt. 3, 01.07.03]

JAR–STD 1A.025 Rules governing Flight Simulator Operators

(See [ACJ JAR-]STD 1A.025)

The STD operator shall demonstrate his capability to maintain the performance, functions and other characteristics specified for the STD Qualification Level as follows:

(a) *Quality System*

(1) A Quality System shall be established and a Quality Manager designated to monitor compliance with, and the adequacy of, procedures required to ensure the maintenance of the Qualification Level of STDs. Compliance monitoring shall include a feedback system to

JAR-STD 1A.025(a)(1) (continued)

the Accountable Manager to ensure corrective action as necessary.

(2) The Quality System shall include a Quality Assurance Programme that contains procedures designed to verify that the specified performance, functions and characteristics are being conducted in accordance with all applicable requirements, standards and procedures.

(3) The Quality System and the Quality Manager shall be acceptable to the Authority.

(4) The Quality System shall be described in relevant documentation.

(b) *Updating.* Maintain a link with manufacturers to incorporate important modifications, especially:

(1) Aeroplane modifications. Aeroplane modifications, whether or not enforced by an airworthiness directive, and which are essential for training and checking, shall be introduced into all affected STDs.

(2) Modification of STDs, including motion and visual systems:

(i) Where applicable and essential for training and checking, STD operators shall update their STDs (for example in the light of data revisions). Modifications of the STD hardware and software which affect flight, ground handling and performance or any major modifications of the motion or visual system shall be evaluated to determine the impact on the original qualification criteria. If necessary, STD operators shall prepare amendments for any affected [validation tests]. The STD operator shall test the STD to the new criteria.

(ii) The Authority shall be advised in advance of any major changes to determine if the tests carried out by the STD operator are satisfactory. A special evaluation of the STD may be necessary prior to returning it to training following the modification.

(c) *Installations.* Ensure that the [flight simulator] is housed in suitable premises which support safe and reliable operation.

(1) The STD operator shall ensure that the [f]light [s]imulator and its installation comply with the local, country or state

JAR-STD 1A.025(c)(1) (continued)

regulations for [h]ealth and [s]afety. However as a minimum the following shall be addressed:

(i) Flight simulator occupants and maintenance personnel shall be briefed on [f]light [s]imulator safety to ensure that they are aware of all safety equipment and arrangement in the flight simulator in case of emergency.

(ii) Adequate fire/smoke detection, warning and suppression arrangements to ensure the safe passage of personnel from the [flight simulator].

(iii) Adequate protection against electrical, mechanical, hydraulic and pneumatic hazards – including those arising from the control loading & motion systems to ensure the maximum safety of all personnel in the vicinity of the [flight simulator].

(iv) Other items:

(A) Two way communication system which remains operational in the event of total power failure.

(B) Emergency lighting.

(C) Escape exits & facilities.

(D) Occupant restraints (seats, seat belts etc.).

(E) External warning of motion and access ramp or stairs activity.

(F) Danger area markings.

(G) Guard rails and gates.

(H) Motion & [c]ontrol [l]oading [e]mergency stop controls accessible from either pilot and instructor seats; and

(I) A manual or automatic electrical power isolation switch.

(2) The [f]light [s]imulator safety features such as emergency stops and emergency lighting shall be checked regularly by the STD operator but in any case at least annually. These tests shall be recorded.

[Ch. 1, 01.06.99, Amdt. 2, 01.04.01; Amdt. 3, 01.07.03]

JAR-STD 1A.030 Requirements for Flight Simulators [qualified] on or after 1 April 1998

(See Appendix [2] to JAR-STD 1A.030)

(See [ACJ No. 1 to JAR-] STD 1A.030)

(See [ACJ No. 2 to JAR-] STD 1A.030)

(a) Any [flight simulator] submitted for initial evaluation on or after 1 April 1998, will be evaluated against [applicable] JAR-STD 1A criteria for Qualification Levels A, B, C or D. [Recurrent evaluations of a flight simulator will be based on the same version of JAR-STD 1A, which was applicable for its initial evaluation. An upgrade will be based on the currently applicable version of JAR-STD 1A.]

(b) A [f]light [s]imulator shall be assessed in those areas which are essential to completing the flight crew member training and checking process, including:

(1) Longitudinal, lateral and directional handling qualities.

(2) Performance on the surface and in the air.

(3) Specific operations where applicable.

(4) Flight deck configuration.

(5) Functioning during normal, abnormal, emergency and, where applicable, non-normal operation.

(6) Instructor station function and simulator control; and

(7) Certain additional requirements depending on the Qualification Level and the installed equipment.

(c) The [f]light [s]imulator shall be subjected to:

(1) Validation tests (See [ACJ No. 1 to JAR-]STD 1A.030, [para 2.3, ACJ No. 1 to JAR-STD 1A.030(c)(1) and ACJ No. 2 to JAR-STD 1A.030(c)(1)]); and

(2) Functions & [s]ubjective tests [(See ACJ No. 1 to JAR-STD 1A.030, para 3).]

(d) Data which [are] used to ensure the fidelity of a [f]light [s]imulator shall be of a standard that satisfies the Authority before the [f]light [s]imulator can gain a Qualification Level.

(e) The STD operator shall submit a QTG in a form and manner acceptable to the Authority.

JAR-STD 1A.030 (continued)

(f) Upon completion of an initial or upgrade evaluation, and when all the discrepancies in the QTG have been addressed to the satisfaction of the Authority, the QTG is approved. After inclusion of the results of the tests witnessed by the Authority, the approved QTG becomes the Master QTG (MQTG), which is the basis for the [f]light [s]imulator qualification and subsequent recurrent [flight simulator] evaluations.

(g) The STD operator shall:

(1) Run the complete MQTG progressively between each annual evaluation by the Authority. Results shall be dated and retained in order to satisfy both the STD operator as well as the Authority that [f]light simulator standards are being maintained; and

(2) Establish a Configuration Control System to ensure the continued integrity of the hardware and software qualified.

[Ch. 1, 01.06.99; Amdt. 2, 01.04.01; Amdt. 3, 01.07.03]

JAR-STD 1A.035 Requirements for Flight Simulators approved or qualified before 1 April 1998

(See [ACJ JAR-]STD 1A.035)

(a) Flight [s]imulators approved or qualified in accordance with national regulations of JAA Members States before 1 April 1998 either will be recategorised or will continue to maintain their approval under the Grandfather Rights provision, in accordance with sub-paragraphs (c) and (d) below.

(b) Recategorised [f]light [s]imulators will be qualified in accordance with JAR-STD 1A.030.

(c) Flight [s]imulators that are not recategorised but that have a primary reference document used for their testing may be qualified by the Authority to an equivalent JAR-STD 1A Qualification Level, either AG, BG, CG or DG. These Qualification Levels refer to similar credits achieved by JAR-STD 1A Levels A, B, C & D. [An upgrade requires the recategorisation of the flight simulator.]

(1) To gain and maintain an equivalent Qualification Level, these [f]light [s]imulators shall be assessed in those areas which are essential to completing the flight crew member training and checking process, including:

(i) Longitudinal, lateral and directional handling qualities.

JAR-STD 1A.035(c)(1) (continued)

(ii) Performance on the [ground] and in the air.

(iii) Specific operations where applicable.

(iv) Flight deck configuration.

(v) Functioning during normal, abnormal, emergency and, where applicable non-normal operation.

(vi) Instructor station function and simulator control; and

(vii) Additional requirements depending on the Qualification Level and the installed equipment.

(2) The [f]light [s]imulators shall be subjected to:

(i) Validation [t]ests; and

(ii) Functions and [s]ubjective Tests.

(d) Flight [s]imulators that are not recategorised and that do not have a primary reference document used for their testing shall be qualified by special arrangement. Such [f]light [s]imulators will be issued with Special Categories and shall be subjected to the same [f]unctions and [s]ubjective [t]ests referred to in sub-paragraph (c)(2)(ii) above. In addition any previously recognised [v]alidation [t]est shall be used.

[Ch. 1, 01.06.99, Amdt 2, 01.04.01; Amdt. 3, 01.07.03]

JAR-STD 1A.040 Changes to qualified Flight Simulators

(a) *Requirement to notify major changes to a Flight Simulator.* The operator of a qualified STD shall inform the Authority of proposed major changes such as:

(1) Aeroplane modifications which could affect [f]light [s]imulator [q]ualification.

(2) Flight [s]imulator hardware and/or software modifications which could affect the handling qualities, performances or system representations.

(3) Relocation of the [f]light [s]imulator; and

(4) Any deactivation of the [f]light [s]imulator.

The Authority may complete a special evaluation following major changes or when a [f]light [s]imulator appears not to be performing at its initial Qualification Level.

JAR-STD 1A.040 (continued)

(b) *Upgrade of a Flight Simulator.* A [f]light [s]imulators may be upgraded to a higher Qualification Level. Special evaluation is required before the award of a higher Level of Qualification.

(1) If an [u]pgrade is proposed the STD operator shall seek the advice of the Authority and give full details of the modifications. If the upgrade evaluation does not fall upon the anniversary of the original qualification date, a special evaluation is required to permit the flight simulator to continue to qualify even at the previous [Qualification] Level.

(2) In the case of a [flight] [s]imulators [f]light [s]imulators [u]pgrade, an STD operator shall run all [v]alidation [t]ests for the requested Qualification Level. Validation [t]est results offered in a test guide for previous [i]nitial or [u]pgrade evaluation shall not be used to validate simulator performance in a test guide offered for a current [u]pgrade.

(c) *Relocation of a Flight Simulator*

(1) In instances where a [f]light [s]imulator is moved to a new location, the Authority shall be advised before the planned activity along with a schedule of events related thereto.

(2) Prior to returning the simulator to service at the new location the STD operator shall perform at least one third of the [v]alidation [t]ests (if any) and, [f]unctions and [s]ubjective [t]ests to ensure that the [flight] simulator performance meets its original qualification standard. A copy of the test documentation shall be retained with the [flight] simulator records for review by the Authority.

(3) At the discretion of the Authority, the [flight] simulator shall be subject to an evaluation in accordance with its original JAA qualification criteria.

(d) *Deactivation of a currently qualified [Flight S]imulator*

(1) In the event a STD operator plans to remove a [f]light [s]imulator from active status for prolonged periods, the Authority shall be notified and suitable controls established for the period the [f]light [s]imulator is inactive.

(2) The STD operator shall agree a procedure with the Authority to ensure that the [f]light [s]imulator can be restored to active status at its original Qualification Level.

[Ch. 1, 01.06.99, Amdt 2, 01.04.01; Amdt. 3, 01.07.03]

JAR-STD 1A.045 Interim Flight Simulator Qualification

(See [ACJ []STD 1A.045)

[]

(a) In case of new aeroplane programmes, special arrangements shall be made to enable an interim Qualification Level to be achieved.

(b) Requirements, details relating to the issue, and the period of validity of an interim Qualification Level will be decided by the Authority.

[Amdt. 3, 01.07.03]

JAR-STD 1A.050 Transferability of Flight Simulator Qualification

(a) When there is a change of STD operator, the new operator shall advise the Authority in advance in order to agree upon a plan of transfer of the [f]light [s]imulator.

(b) At the discretion of the Authority, the [f]light [s]imulator shall be subject to an evaluation in accordance with its original JAA qualification criteria.

(c) Provided that the [f]light [s]imulator performs to its original standard, its original Qualification Level shall be restored.

[Ch. 1, 01.06.99, Amdt 2, 01.04.01; Amdt. 3, 01.07.03]

INTENTIONALLY LEFT BLANK

Appendix 1 to JAR–STD 1A.030
[Minimum technical Requirements for Flight Simulator Qualification Levels]

(a) This Appendix describes the minimum technical requirements for qualifying JAA [Level A, B, C and D flight simulators.]

(1) Each of those four levels carries an appropriate technical description and maximum training, checking and testing credits.

(2) The training, checking and testing credits do not imply an automatic level of approval for any flight simulator user.

(3) Table 1 indicates in broad terms the maximum credits possible for each technical Qualification Level. Specific requirements for the use of the aeroplane or flight simulator will be determined by the Authority. Specialised training courses (e.g. ETOPS, TCAS, AWOPS, [windshear] etc.) require an adequate standard of simulation which will be evaluated by the Authority.

(b) Certain flight simulator and visual system requirements included in this Appendix shall be supported with a statement of compliance (SOC) and, in some designated cases, an objective test. Compliance statements shall describe how the requirement was met, such as gear modelling approach, coefficient of friction sources, etc.

INTENTIONALLY LEFT BLANK

[Ch. 1, 01.06.99, Amdt 2, 01.04.01; Amdt. 3, 01.07.03]

INTENTIONALLY LEFT BLANK

Appendix 1 to JAR-STD 1A.030 (continued)

Table 1 – Minimum technical requirements for qualifying JAA Level A, B, C and D Flight Simulators

| Qualification Level | General Technical Requirements | Maximum Credits |
|---------------------|--|---|
| A | <p>The lowest level of flight simulator technical complexity.</p> <p>An enclosed full scale replica of the aeroplane cockpit/flight deck including simulation of all systems, instruments, navigational equipment, communications and caution and warning systems.</p> <p>An instructor's station with seat shall be provided as shall be seats for the flight crewmembers and one seat for inspectors/observers.</p> <p>Control forces and displacement characteristics shall correspond to that of the replicated aeroplane and they shall respond in the same manner as the aeroplane under the same flight conditions.</p> <p>The use of class specific data tailored to the specific aeroplane type with fidelity sufficient to meet the objective tests, functions and subjective tests is allowed. Generic ground effect and ground handling models are permitted. Motion, visual and sound systems sufficient to support the training, testing and checking credits sought are required.</p> <p>The visual system [shall] provide at least 45 degrees horizontal and 30 degrees vertical field of view per pilot. A night scene is acceptable.</p> <p>The response to control inputs shall not be greater than 300 milliseconds more than that experienced on the aircraft.</p> <p>Wind shear need not be simulated.</p> | <p>Suitable for:</p> <ul style="list-style-type: none"> – Crew procedures training. – Instrument flight training. – Transition/conversion training, testing and checking except for take off and landing manoeuvres. – Recurrent training, checking and testing (type and instrument rating renewal/revalidation) |
| B | <p>As for Level A plus:</p> <p>Validation flight test data shall be used as the basis for flight and performance and systems characteristics. Additionally ground handling and aerodynamics programming to include ground effect reaction and handling characteristics shall be derived from validation flight test data.</p> | <p>As for Level A plus:</p> <ul style="list-style-type: none"> – Recency of experience (three take-offs and landings in 90 days). – Transition/conversion training for take-off and landing manoeuvres. – Transition/conversion testing and checking except for take-offs and landings. |
| C | <p>The second highest []level of [flight] simulator performance.</p> <p>As for Level B plus:</p> <p>A daylight/twilight/night visual system is required with [a] continuous, cross-cockpit, minimum collimated visual field of view providing each pilot with 180 degrees horizontal and 40 degrees vertical field of view.</p> <p>A six axes motion system shall be provided.</p> <p>The sound simulation shall include the sounds of precipitation and other significant aeroplane noises perceptible to the pilot and shall be able to reproduce the sounds of a crash landing.</p> <p>The response to control inputs shall not be greater than 150 milliseconds more than that experienced on the [aeroplane].</p> <p>Wind shear simulation shall be provided.</p> | <p>As for Level B plus:</p> <ul style="list-style-type: none"> – Transition/conversion testing and checking of take-offs and landings for flight crewmembers whose minimum experience level is defined by the Authority. |
| D | <p>The highest level of flight simulator performance.</p> <p>As for Level C plus:</p> <p>There shall be complete fidelity of sounds and motion buffets.</p> | <p>As for Level C plus:</p> <ul style="list-style-type: none"> – Transition/conversion testing and checking of take-off and landings for flight crews, who may be required to meet a minimum experience level defined by the Authority. |

Appendix 2 to JAR-STD 1A.030
Flight simulator standards

1 General. This appendix describes the minimum flight simulator requirements for qualifying flight simulators to the required Qualification Levels. Certain requirements included in this section shall be supported with a statement of compliance (SOC) and, in some designated cases, an objective test. The SOC will describe how the requirement was met, such as gear modelling approach, coefficient of friction sources etc. The test results shall show that the requirement has been attained. In the following tabular listing of flight simulator standards, statements of compliance are indicated in the compliance column.

| FLIGHT SIMULATOR STANDARDS | SIMULATOR LEVEL | | | | COMPLIANCE |
|--|-----------------|---|---|---|---|
| | A | B | C | D | |
| <p>a. Flight deck, a full scale replica of the aeroplane simulated. Direction of movement of controls and switches identical to that in the aeroplane.</p> <p>Equipment for operation of the cockpit windows shall be included in the flight simulator, but the actual windows need not be operable.</p> <p>The flight deck, for flight simulator purposes, consists of all that space forward of a cross section of the fuselage at the most extreme aft setting of the pilots' seats. Additional required flight crewmember duty stations and those required bulkheads aft of the pilot seats are also considered part of the flight deck and shall replicate the aeroplane.</p> | ✓ | ✓ | ✓ | ✓ | <p>Flight deck observer seats are not considered to be additional flight crewmember duty stations and may be omitted.</p> <p>Bulkheads containing items such as switches, circuit breakers, supplementary radio panels, etc. to which the flight crew may require access during any event after pre-flight cockpit preparation is complete are considered essential and may not be omitted.</p> <p>Bulkheads containing only items such as landing gear pin storage compartments, fire axes or extinguishers, spare light bulbs, aircraft document pouches etc. are not considered essential and may be omitted. Such items, or reasonable facsimile, shall still be available in the flight simulator 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.</p> |
| <p>b. Circuit breakers that affect procedures and/or result in observable cockpit indications properly located and functionally accurate.</p> | ✓ | ✓ | ✓ | ✓ | |
| <p>c. 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, thrust, drag, altitude, temperature, gross weight, moments of inertia, centre of gravity location, and configuration.</p> | ✓ | ✓ | ✓ | ✓ | <p>For level 'A' flight simulators generic ground handling, flare and touchdown effect are acceptable.</p> |

Appendix 2 to JAR-STD 1A.030 (continued)

| FLIGHT SIMULATOR STANDARDS | SIMULATOR LEVEL | | | | COMPLIANCE |
|---|-----------------|---|---|---|------------|
| | A | B | C | D | |
| d. All relevant instrument indications involved in the simulation of the applicable aeroplane shall automatically respond to control movement by a flight crewmember or induced disturbance to the simulated aeroplane; e.g., turbulence or wind shear. | ✓ | ✓ | ✓ | ✓ | |
| e. 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. | ✓ | ✓ | ✓ | ✓ | |
| f. In addition to the flight crewmember duty stations, three suitable seats for the instructor/delegated examiner and Authority inspector. The Authority will consider options to this standard based on unique cockpit configurations. These seats shall provide adequate vision to the pilot's panel and forward windows. Observer seats need not represent those found in the aeroplane but shall be adequately secured to the floor of the flight simulator, fitted with positive restraint devices and be of sufficient integrity to safely restrain the occupant during any known or predicted motion system excursion. | ✓ | ✓ | ✓ | ✓ | |
| g. Flight simulator 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. | ✓ | ✓ | ✓ | ✓ | |
| h. Instructor controls shall enable the operator to control all required system variables and insert abnormal or emergency conditions in the aeroplane systems. | ✓ | ✓ | ✓ | ✓ | |
| i. 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. | ✓ | ✓ | ✓ | ✓ | |

Appendix 2 to JAR-STD 1A.030 (continued)

| FLIGHT SIMULATOR STANDARDS | SIMULATOR LEVEL | | | | COMPLIANCE |
|--|-----------------|---|---|---|---|
| | A | B | C | D | |
| <p>j. 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’ flight simulators, generic ground handling may be represented to the extent that allows turns within the confines of the runway and adequate control on the landing and roll-out from a cross - wind landing.</p> |
| <p>k. Windshear 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>See ACJ No 1 to JAR-STD 1A.030, para 2.3, g.</p> |
| <p>l. Instructor controls for environmental effects including wind speed and direction shall be provided.</p> | ✓ | ✓ | ✓ | ✓ | |

Appendix 2 to JAR-STD 1A.030 (continued)

| FLIGHT SIMULATOR STANDARDS | SIMULATOR LEVEL | | | | COMPLIANCE |
|--|-----------------|---|---|---|---|
| | A | B | C | D | |
| <p>m. Stopping and directional control forces shall be representative for at least the following runway conditions based on aeroplane related data:</p> <p>(1) Dry (2) Wet (3) Icy (4) Patchy wet (5) Patchy icy (6) Wet on rubber residue in touchdown zone.</p> | | | ✓ | ✓ | <p>Statement of Compliance required.</p> <p>Objective Tests required for (1), (2), (3), Subjective check for (4), (5), (6).</p> |
| <p>n. Brake and tyre failure dynamics (including antiskid) and decreased brake efficiency due to brake temperatures shall be representative and based on aeroplane related data.</p> | | | ✓ | ✓ | <p>Statement of Compliance required.</p> <p>Subjective test is required for decreased braking efficiency due to brake temperature, if applicable.</p> |
| <p>o. A means for quickly and effectively conducting daily testing of flight simulator programming and hardware shall be available.</p> | | | ✓ | ✓ | <p>Statement of Compliance required.</p> |
| <p>p. Flight simulator computer capacity, accuracy, resolution, and dynamic response shall be sufficient to fully support the overall flight simulator fidelity.</p> | ✓ | ✓ | ✓ | ✓ | <p>Statement of Compliance required.</p> |

Appendix 2 to JAR-STD 1A.030 (continued)

| FLIGHT SIMULATOR STANDARDS | SIMULATOR LEVEL | | | | COMPLIANCE |
|--|-----------------|---|---|---|-----------------|
| | A | B | C | D | |
| <p>q. Control feel dynamics shall replicate the aeroplane simulated.</p> <p>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 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 flight simulators requiring static and dynamic tests at the controls, special test fixtures will not be required during initial evaluation if the STD 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> | | | ✓ | ✓ | Tests required. |

Appendix 2 to JAR-STD 1A.030 (continued)

| FLIGHT SIMULATOR STANDARDS | SIMULATOR LEVEL | | | | COMPLIANCE |
|--|-----------------|---|---|---|--|
| | A | B | C | D | |
| <p>r. Relative response of the visual system, cockpit instruments and initial motion system response shall be coupled closely to provide integrated sensory cues. Visual scene changes from steady state disturbance (i.e. the start of the scan of the first video field containing different information) shall occur within the system dynamic response limit of 150 milliseconds. Motion onset shall also occur within the system dynamic response limit of 150 milliseconds. Motion onset shall occur before the start of the scan of the first video field containing different information but shall occur before the end of the scan of the same video field. The test to determine compliance with these requirements shall include simultaneously recording the output from the pilot's pitch, roll and yaw controllers, the output from the accelerometer attached to the motion system platform located at an acceptable location near the pilot's seats, the output signal to the visual system display (including visual system analog delays), and the output signal to the pilot's attitude indicator or an equivalent test approved by the Authority.</p> <p>The following two methods are acceptable means to prove compliance with the above requirement:</p> | ✓ | ✓ | ✓ | ✓ | <p>Tests required.</p> <p>For Level 'A' & 'B' flight simulators the maximum permissible delay is 300 milliseconds.</p> |

Appendix 2 to JAR-STD 1A.030 (continued)

| FLIGHT SIMULATOR STANDARDS | SIMULATOR LEVEL | | | | COMPLIANCE |
|--|-----------------|---|---|---|--|
| | A | B | C | D | |
| <p>r. (continued)</p> <p>(1) Transport Delay: A transport delay test may be used to demonstrate that the flight simulator system response does not exceed 150 milliseconds. This test shall measure all the delay encountered by a step signal migrating from the pilot’s control through the control loading electronics and interfacing through all the simulation software modules in the correct order, using a handshaking protocol, finally through the normal output interfaces to the motion system, to the visual system and instrument displays. A recordable start time for the test shall be provided by a pilot flight control input. The test mode shall permit normal computation time to be consumed and shall not alter the flow of information through the hardware/software system.</p> <p>The transport delay of the system is then the time between control input and the individual hardware responses. It need only be measured once in each axis.</p> <p>(2) Latency: The visual system, flight deck instruments and initial motion system response shall respond to abrupt pitch, roll and yaw inputs from the pilot's position within 150 milliseconds of the time, but not before the time, when the aeroplane would respond under the same conditions. The objective of the test is to compare the recorded response of the flight simulator to that of the actual aeroplane data in the take-off, cruise and landing configuration for rapid control inputs in all three rotational axes. The intent is to verify that the flight simulator system response does not exceed 150 milliseconds (this does not include aeroplane response time as per the manufacturer’s data) and that the motion and visual cues relate to actual aeroplane responses. For aeroplane response, acceleration in the appropriate corresponding rotational axis is preferred.</p> | | | | | <p>For Level ‘A’ & ‘B’ flight simulators the maximum permissible delay is 300 milliseconds.</p> <p>For Level ‘A’ & ‘B’ flight simulators the maximum permissible delay is 300 milliseconds.</p> |

Appendix 2 to JAR-STD 1A.030 (continued)

| FLIGHT SIMULATOR STANDARDS | SIMULATOR LEVEL | | | | COMPLIANCE |
|--|-----------------|---|---|---|---|
| | A | B | C | D | |
| s. Aerodynamic modelling shall be provided. This shall include, 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. Mach effect, aeroelastic representations, and non-linearities due to sideslip are normally included in the flight simulator aerodynamic model. The Statement of Compliance shall address each of these items. Separate tests for thrust effects and a Statement of Compliance are required. |
| t. Modelling that includes the effects of airframe and engine icing. | | | ✓ | ✓ | Statement of Compliance required. SOC shall describe the effects that provide training in the specific skills required for recognition of icing phenomena and execution of recovery. |
| u. Aerodynamic and ground reaction modelling for the effects of reverse thrust on directional control shall be provided. | | ✓ | ✓ | ✓ | Statement of Compliance required. |
| v. 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. Self-testing for flight simulator hardware and programming to determine compliance with the flight simulator performance tests shall be provided. Evidence of testing shall include flight simulator number, date, time, conditions, tolerances, and the appropriate dependent variables portrayed in comparison with the aeroplane standard. | | | ✓ | ✓ | Statement of Compliance required. Tests required. |
| x. Timely and permanent update of flight simulator hardware and programming subsequent to aeroplane modification sufficient for the Qualification Level sought. | ✓ | ✓ | ✓ | ✓ | |
| y. Daily preflight documentation either in the daily log or in a location easily accessible for review is required. | ✓ | ✓ | ✓ | ✓ | |

Appendix 2 to JAR-STD 1A.030 (continued)

2 Motion system

| FLIGHT SIMULATOR STANDARDS | SIMULATOR LEVEL | | | | COMPLIANCE |
|--|-----------------|---|---|---|--|
| | A | B | C | D | |
| a. 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. | ✓ | ✓ | ✓ | ✓ | |
| b. A motion system shall: (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). (3) Produce cues at least equivalent to those of a six-degrees-of-freedom synergistic platform motion system. | ✓ | ✓ | ✓ | ✓ | Statement of Compliance required. Tests required. |
| c. A means of recording the motion response time as required. | ✓ | ✓ | ✓ | ✓ | |
| d. Motion effects programming shall include: (1) Effects of runway rumble, oleo deflections, groundspeed, uneven runway, centreline lights and taxiway characteristics. (2) Buffets on the ground due to spoiler/speedbrake extension and thrust reversal. (3) Bumps associated with the landing gear. (4) Buffet during extension and retraction of landing gear. (5) Buffet in the air due to flap and spoiler/speedbrake extension. (6) Approach to stall buffet. | ✓ | ✓ | ✓ | ✓ | For Level 'A': Effects may be of a generic nature sufficient to accomplish the required tasks. |

Appendix 2 to JAR-STD 1A.030 (continued)

| FLIGHT SIMULATOR STANDARDS | SIMULATOR LEVEL | | | | COMPLIANCE |
|--|-----------------|---|---|---|---|
| | A | B | C | D | |
| <p>d. (continued)</p> <p>(7) Touchdown cues for main and nose gear.</p> <p>(8) Nose wheel scuffing.</p> <p>(9) Thrust effect with brakes set.</p> <p>(10) Mach and manoeuvre buffet.</p> <p>(11) Tyre failure dynamics.</p> <p>(12) Engine malfunction and engine damage.</p> <p>(13) Tail and pod strike.</p> | | | | | |
| <p>e. 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 flight simulator shall be programmed and instrumented in such a manner that the characteristic vibration modes can be measured and compared with aeroplane data.</p> | | | | ✓ | Statement of Compliance required. Tests required. |

Appendix 2 to JAR-STD 1A.030 (continued)

3 Visual System

| SIMULATOR STANDARDS | SIMULATOR LEVEL | | | | COMPLIANCE |
|---|-----------------|---|---|---|---|
| | A | B | C | D | |
| a. The visual system shall meet all the standards enumerated as applicable to the level of qualification requested by the applicant. | ✓ | ✓ | ✓ | ✓ | |
| b. Continuous minimum collimated visual field-of-view of 45 degrees horizontal and 30 degrees vertical field of view simultaneously for each pilot. Continuous, cross-cockpit, minimum collimated visual field of view providing each pilot with 180 degrees horizontal and 40 degrees vertical field of view. Application of tolerances require the field of view to be not less than a total of 176 measured degrees horizontal field of view (including not less than ±88 measured degrees either side of the centre of the design eye point) and not less than a total of 36 measured degrees vertical field of view from the pilot's and co-pilot's eye points. | ✓ | ✓ | ✓ | ✓ | SOC is acceptable in place of this test. Consideration shall be given to optimising the vertical field of view for the respective aeroplane cut-off angle. |
| c. A means of recording the visual response time for visual systems. | ✓ | ✓ | ✓ | ✓ | |
| d. 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. Visual textural cues to assess sink rate and depth perception during take-off and landing shall be provided. | ✓ | ✓ | ✓ | ✓ | For Level 'A' visual cueing shall be sufficient to support changes in approach path by using runway perspective. |
| f. Horizon, and attitude shall correlate to the simulated attitude indicator. | ✓ | ✓ | ✓ | ✓ | Statement of Compliance required. |
| g. Occulting capability A minimum of ten levels of occulting shall be available. | ✓ | ✓ | ✓ | ✓ | Occulting shall be demonstrated. Statement of Compliance required. |
| h. 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. |

Appendix 2 to JAR-STD 1A.030 (continued)

| SIMULATOR STANDARDS | SIMULATOR LEVEL | | | | COMPLIANCE |
|--|-----------------|------------|---------------------|---------------------|---|
| | A | B | C | D | |
| i. 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. Highlight brightness shall be demonstrated using a raster drawn test pattern. The highlight brightness shall not be less than 20 cd/m ² (6ft-lamberts). | | | ✓ | ✓ | Test and Statement of Compliance required. Use of calligraphic lights to enhance raster brightness is acceptable. |
| k. Lightpoint 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. Lightpoint contrast ratio – not less than 10:1 Lightpoint contrast ratio – not less than 25:1. | ✓ | ✓ | ✓ | ✓ | Test and Statement of compliance required. |
| m. Daylight, twilight (and night visual capability as applicable for level of qualification sought. The visual system shall be capable of meeting, as a minimum, the system brightness and contrast ratio criteria as identified in ACJ STD 1A.030 2.3 l. 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. The system, when used in training, shall provide: (i) 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. | ✓ ✓ | ✓ ✓ | ✓ ✓ ✓ | ✓ ✓ ✓ | Statement of Compliance required for system capability. System objective and scene content tests are required. |

Appendix 2 to JAR-STD 1A.030 (continued)

| SIMULATOR STANDARDS | SIMULATOR LEVEL | | | | COMPLIANCE |
|--|-----------------|---|---|---|------------|
| | A | B | C | D | |
| (ii) 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. | | | ✓ | ✓ | |
| (iii) 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). | ✓ | ✓ | ✓ | ✓ | |

Appendix 2 to JAR-STD 1A.030 (continued)

4 Sound System

| FLIGHT SIMULATOR STANDARDS | SIMULATOR LEVEL | | | | COMPLIANCE |
|---|-----------------|---|---|---|-----------------------------------|
| | A | B | C | D | |
| a. Significant flight deck sounds which result from pilot actions corresponding to those of the aeroplane. | ✓ | ✓ | ✓ | ✓ | |
| b. 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 simulator is landed in excess of limitations. | | | ✓ | ✓ | Statement of Compliance required. |
| c. Comparable amplitude and frequency of flight deck noises, including engine and airframe sounds. The sounds shall be co-ordinated with the required weather. | | | | ✓ | Tests required. |
| d. The volume control shall have an indication of sound level setting which meets all qualification requirements. | ✓ | ✓ | ✓ | ✓ | |