KEMENTERIAN PERHUBUNGAN
DIREKTORAT JENDERAL PERHUBUNGAN UDARA

PERATURAN DIREKTUR JENDERAL PERHUBUNGAN UDARA

NOMOR : KP **461**TAHUN 2013

TENTANG
PETUNJUK PELAKSANAAN PERATURAN KESELAMATAN PENERBANGAN SIPIL BAGIAN 8900-11.10 *(STAFF INSTRUCTION)* TENTANG PROSEDUR EVALUASI PERALATAN PELATIHAN DAN PENDIDIKAN SINTETIS
(SYNTHETIC TRAINING DEVICES EVALUATIONS)

DENGAN RAHMAT TUHAN YANG MAHA ESA

DIREKTUR JENDERAL PERHUBUNGAN UDARA,

Menimbang : a. Bahwa dalam Keputusan Menteri Perhubungan Nomor KM 56 Tahun 2010 tentang Peraturan Keselamatan Penerbangan Sipil Bagian 121 tentang Peraturan Keselamatan Penerbangan Sipil Bagian 60 *(Civil Aviation Safety Regulation Part 60)* tentang Persyaratan Alat Bantu Pelatihan Sintetis *(Synthetic Training Devices)* telah diatur mengenai penggunaan alat bantu pelatihan dan pendidikan sintesis;

b. bahwa untuk melaksanakan hal sebagaimana dimaksud pada huruf a, perlu ditetapkan Petunjuk Pelaksanaan Peraturan Keselamatan Penerbangan Sipil Bagian 8900-11.10 *(Staff Instruction)* tentang Prosedur Evaluasi Peralatan Pelatihan dan Pendidikan Sintetis dengan Peraturan Direktur Jenderal Perhubungan Udara;

Mengingat : 1. Undang-Undang Republik Indonesia Nomor 1 Tahun 2009 tentang Penerbangan (Lembaran Negara Republik Indonesia Tahun 2009 Nomor 1, Tambahan Lembaran Negara Republik Indonesia Nomor 4956);

2. Peraturan Pemerintah Nomor 3 Tahun 2001 tentang Keamanan dan Keselamatan Penerbangan (Lembaran Negara Republik Indonesia Tahun 2001 Nomor 9, Tambahan Lembaran Negara Republik Indonesia Nomor 4075);

3. Peraturan Presiden Nomor 47 Tahun 2009 tentang Kedudukan, Tugas, Fungsi, Kewenangan, Susunan Organisasi Dan Tata Kerja Kementerian Negara RI sebagaimana telah diubah dengan Peraturan Presiden Nomor 91 Tahun 2011;

4. Peraturan Presiden Nomor 24 Tahun 2010 tentang Kedudukan, Tugas, dan Fungsi Kementerian Negara serta Susunan Organisasi, Tugas, dan Fungsi Eselon I Kementerian Negara sebagaimana telah diubah dengan Peraturan Presiden Nomor 38 Tahun 2013;

5. Peraturan Menteri Perhubungan Nomor KM 56 Tahun 2010 tentang Peraturan Keselamatan Penerbangan Sipil Bagian 60 (Civil Aviation Safety Regulation Part 60) tentang Persyaratan Alat Bantu Pelatihan Sintetis *(Synthetic Training Devices)*;

6. Peraturan Menteri Perhubungan Nomor KM 60 Tahun 2010 tentang Organisasi dan Tata Kerja Kementerian Perhubungan;

MEMUTUSKAN :

Menetapkan : PETUNJUK PELAKSANAAN PERATURAN KESELAMATAN PENERBANGAN SIPIL BAGIAN 8900-11.10 *(STAFF INSTRUCTION)* TENTANG PROSEDUR EVALUASI PERALATAN PELATIHAN DAN PENDIDIKAN SINTETIS *(SYNTHETIC TRAINING DEVICES EVALUATIONS)*

Pasal 1

Petunjuk Pelaksanaan Peraturan Keselamatan Penerbangan Sipil Bagian 8900-11.10 tentang Prosedur Evaluasi Peralatan Pelatihan dan Pendidikan Sintetis *(Synthetic Training Devices Evaluations)* sebagaimana tercantum dalam Lampiran Peraturan ini.

Pasal 2

Direktur Kelaikan Udara dan Pengoperasian Pesawat Udara, mengawasi pelaksanaan peraturan ini.

Pasal 3

Peraturan ini mulai berlaku pada tanggal ditetapkan

Ditetapkan di : JAKARTA
pada tanggal : 17 Oktober 2013

DIREKTUR JENDERAL PERHUBUNGAN UDARA

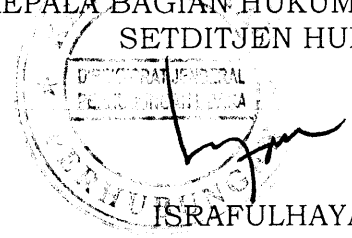
ttd

HERRY BAKTI

SALINAN Peraturan ini disampaikan kepada :

1. Sekretaris Jenderal, Kementerian Perhubungan;
2. Inspektur Jenderal, Kementerian Perhubungan;
3. Sekretaris Direktorat Jenderal Perhubungan Udara;
4. Para Direktur di Lingkungan Ditjen Perhubungan Udara;

SALINAN dibuat sesuai dengan aslinya
KEPALA BAGIAN HUKUM DAN HUMAS
SETDITJEN HUBUD



ISRAFULHAYAT

LAMPIRAN KEPUTUSAN DIREKTUR JENDERAL PERHUBUNGAN UDARA
NOMOR KP 461 TAHUN 2013
TANGGAL 17 Oktober 2013

Staff Instruction

SI 8900 - 11.10
Synthetic Training Devices Evaluations

Revision :
Date : 2013

REPUBLIC OF INDONESIA – MINISTRY OF TRANSPORTATION
DIRECTORATE GENERAL OF CIVIL AVIATION
JAKARTA – INDONESIA

AMENDMENT RECORD LIST

Amendment No.	Issue Date	Inserted By	Insertion Date
Original issue			

SUMMARY OF AMENDMENTS

Amendment No.	Source/s	Subject/s	Approved
Original			

FOREWORD

1. PURPOSE

This Staff Instruction has been prepared to guide and assist all Directorate of Airworthiness and Aircraft Operation Personnel, especially those in charge with flight simulator and flight training devices evaluation in properly discharging their responsibilities and efficiently accomplishing their assigned tasks.

This Staff Instruction may be made available to the public so that they may better understand the authority and responsibility of the DGCA.

2. REFERENCES

This Staff Instruction should be used in accordance with the applicable regulations, which is CASR 60 Synthetic Training Device.

3. REVISION

Revision of this Staff Instruction will be approved by the Director General of Civil Aviation.

DIRECTOR GENERAL OF CIVIL AVIATION,

ttd

HERRY BAKTI

SALINAN dibuat sesuai dengan aslinya
KEPALA BAGIAN HUKUM DAN HUMAS
SETDITJEN HUBUD

ISRAFULHAYAT

TABLE OF CONTENTS

CHAPTER 1

FLIGHT SIMULATOR EVALUATIONS

1. PURPOSE

CASR Part 60 requires that flight simulators undergo initial, recurrent and special evaluations. The purpose of this Staff Instruction is to provide Evaluation Teams with guidance on the content, process and proformas relevant to these evaluations. It also provides guidance on the application method and information required for Evaluation Team Leader appointment.

2. INTRODUCTION

2.1 Flight Simulators may be subject to:
(a) Operator Testing;
(b) Initial Evaluation;
(c) Recurrent Evaluation; and
(d) Special Evaluation.

2.2 Operator Testing is conducted by the Flight Simulator Operator to ensure that the flight simulator complies with their specifications etc. Operator Testing normally involves conducting tests in the Acceptance Test Manual (ATM) and the Qualification Test Guide (QTG). The Flight Simulator Operator conducts this testing to ensure that the flight simulator meets the required standard, specific training requirements, and is ready for evaluation by DGCA.

2.3 An **Initial Evaluation** is conducted by DGCA to qualify the flight simulator for use. This evaluation consists of a technical review of the QTG and a subsequent on-site evaluation of the flight simulator.

2.4 Recurrent Evaluations are conducted annually to ensure that the flight simulator continues to meet its qualified level.

2.5 Special Evaluations are conducted as a result of major modifications, requests for upgrade, or the flight simulator failing to maintain its qualification level. The content of the Special Evaluation depends on the circumstances, and should be determined by DGCA.

2.6 Non-DGCA team Member is a personnel involved in flight simulator evaluation being part of the team but not from DGCA organization Example for this personnel may come from aircraft or simulator manufacturer

3. INITIAL EVALUATION

3.1 Qualification Test Guide (QTG)

3.1.1 Flight Simulator Operators are encouraged to submit an advance copy of the QTG to DGCA, at the earliest opportunity, to ensure that the proposed tests and validation data are suitable.

3.1.2 The substantially complete QTG should be submitted to DGCA not less than 15 working days prior to the proposed date of commencement of the on-site evaluation. All Validation, and Functions and Subjective Test results contained in the QTG should have been conducted on-site within the last 90 days. A letter of application should be submitted before commencement of the on-site evaluation confirming that Operator Testing is complete, listing all outstanding discrepancies and providing QTG updates (as necessary).

A template for the letter is enclosed at Application For Initial Qualification Flight Simulator.

3.1.3 DGCA should advise the Flight Simulator Operator of the outcome of their technical review of the QTG. Any significant discrepancies should be addressed before commencement of the on-site evaluation.

3.2 Composition of Evaluation Team

3.2.1 DGCA should appoint the Evaluation Team Leader. The Evaluation Team Leader should have completed an approved Flight Simulator Evaluation Course.

3.2.2 The Evaluation Team Leader is responsible for the conduct of the on-site evaluation and for certifying the results achieved.

3.2.3 The Evaluation Team may be made up of a combination of both DGCA and non-DGCA staff (eg. representatives from aircraft or simulator manufacturer). For the duration of the evaluation, any non-DGCA Evaluation Team members should be considered as acting on behalf of DGCA. It is strongly recommended that individual team members should have completed an approved Flight Simulator Evaluation Course.

3.2.4 The Evaluation Team should consist of at least the following members:

(a) a flight simulation specialist who is familiar with the scope and content of Qualification Test Guides; and

(b) a check pilot who is type rated and aircraft current on the aircraft type; and

(c) a training pilot or suitably qualified person who is familiar with the operation of the flight simulator as a training device, particularly with regard to the Instructor Station.

Note: Non-DGCA staff should participate in appropriate team member roles.

3.3 Content of On-site Evaluation. The on-site evaluation should consist of an evaluation of the following:

(a) Validation Tests;
(b) Functions and Subjective Tests; and
(c) The proper functioning of the instructor station, seating, lighting, radio communications, navigation aids, and intercom facilities.

3.4. Validation Tests.

The on-site evaluation should re-run a representative sample of the Validation Tests in the QTG. This sample size should be approximately 33%. A selection of Validation Tests should also be run manually to verify the integrity of the automatic test procedures.

3.5 Functions and Subjective Tests

3.5.1 The on-site evaluation should evaluate a representative sample of Functions and Subjective Tests.

3.5.2 The Functions and Subjective Testing should be structured into several flights, with the purpose being to evaluate the flight simulator's reliability and usability as a training device. The overall fidelity including the integration of the visual and motion systems should be evaluated. Any user specific training manoeuvres or scenarios should be incorporated into the flight profiles. This evaluation should cover those areas essential for flight crew member training, testing and include:

(a) flight deck configuration (physical layout, placards, engine, autopilot, flight management system. etc.);
(b) handling qualities;
(c) performance; and
(d) systems functionality during normal and non-normal operations.

3.5.3 During Functions and Subjective Testing, the normal aircraft crew complement should occupy the operating flight crew seats. At least one pilot should be current on the aircraft type and model. That pilot should be competent to assess the flight simulator's performance both as a representation of the particular aircraft and as a training/testing/checking device.

3.6 Instructor Station and Supporting Facilities. Evaluation of the instructor station, together with the seating, lighting, radio communications, navigation aids and intercom facilities, should be conducted on an ongoing basis throughout the on-site evaluation. Additionally, the Instructor Station should be assessed to ensure that its operation does not present an unnecessary distraction from observing the activities of the flight crew whilst providing adequate facilities for the tasks.

3.7 Qualification

3.7.1 At the conclusion of the on-site evaluation, where major discrepancies remain unresolved, the Evaluation Team Leader may at his or her discretion decline to qualify the flight simulator.

3.7.2 Where minor discrepancies remain unresolved, a process and timescale for rectification of all discrepancies outstanding at the conclusion of the on-site evaluation should be agreed to between the Flight Simulator Operator and the Evaluation Team Leader.

3.7.3 The Evaluation Team Leader should certify in the QTG that all tests except those recorded as outstanding have been completed to the standard required for the appropriate Qualification Level. An Evaluation Report detailing the findings of the evaluation should be produced.

A template for the Evaluation Report is enclosed at Flight Simulator Evaluation Report.

3.7.4 All outstanding discrepancies arising from the on-site evaluation together with the outstanding discrepancies from operator testing should be entered into the flight simulator's maintenance management system.

3.7.5 Upon satisfactory completion of the on-site evaluation, DGCA should issue a Qualification Certificate.

A template for the Qualification Certificate is enclosed at Flight Simulator Qualification Certificate.

DGCA should review the flight simulator's reliability in-service and the progress in correcting outstanding discrepancies after the flight simulator has been qualified for 60 days.

3.8 Support Staff. The Flight Simulator Operator should provide sufficient support staff to assist the Evaluation Team with the conduct of the on-site evaluation.

4. RECURRENT EVALUATIONS

4.1 Request for Recurrent Evaluation

4.1.1 The certificate holder of a qualified flight simulator or qualified flight training device shall submit in advance a written request to DGCA for recurrent evaluation.

4.1.2 Such request shall be submitted at least 60 days before the expiry of the flight simulator qualification or flight training device qualification.

4.2 Composition of Evaluation Team

4.2.1 DGCA should appoint the Evaluation Team Leader. The Evaluation Team Leader should have completed an approved Flight Simulator Evaluation Course.

4.2.2 The Evaluation Team Leader is responsible for the conduct of the Recurrent Evaluation and for certifying the results achieved.

4.2.3 The Evaluation Team may be made up of a combination of both DGCA and non-DGCA staff. For the duration of the evaluation, any non-DGCA Evaluation Team members should be considered as acting on behalf of DGCA. It is strongly recommended that individual team members should have completed an approved Flight Simulator Evaluation Course.

4.2.4 The Evaluation Team should consist of at least the following members:

(a) a flight simulation specialist who is familiar with the scope and content of Qualification Test Guides;

(b) a check pilot who is type rated and aircraft current on the aircraft type;

(c) a training pilot or suitably qualified person who is familiar with the operation of the flight simulator as a training device, particularly with regard to the Instructor Station.

Note: Non-DGCA staff may participate in any arranged Recurrent Evaluation in an appropriate team member role.

4.2.5 The check pilot (referred to at 4.2.4 (b)) should be selected from not more than two or three suitably qualified pilots who are identified in the Flight Simulator Operator's Quality System.

4.3 Content of Recurrent Evaluation. The Recurrent Evaluation should consist of an evaluation of the following:

(a) Flight Simulator Operator's Quality System;
(b) overall flight simulator reliability and serviceability;
(c) current unserviceabilities and defects;
(d) modification status;
(e) Validation Tests;
(f) Functions and Subjective Tests;
(g) the proper functioning of the instructor station, seating, lighting, radio communications, navigation aids, and intercom facilities.

4.4 Quality System

4.4.1 The Evaluation Team should review the effectiveness of the Flight Simulator Operator's Quality System, with regard to the specific flight simulator, including:

(a) quality policy;
(b) management responsibility;
(c) document control;
(d) resource allocation;
(e) quality procedures;
(f) internal audit;
(g) reports, findings and follow up actions; and
(h) corrective and preventative measures.

Note: The Operator's Quality System should be subject to an annual audit by DGCA. This audit may normally be conducted independently from any Recurrent Evaluation.

4.5 Overall flight simulator reliability and serviceability.

4.5.1 The Flight Simulator Operator should provide metrics describing the flight simulator's performance since the previous Recurrent Evaluation. Further guidance may be found in Aeronautical Radio Inc (ARINC) Report 433 Standard Measurements for Flight Simulator Quality.

4.5.2 The Flight Simulator Operator should provide a summary of all significant flight simulator defects that have occurred since the previous Recurrent Evaluation.

4.5.3 The Evaluation Team should review the defect history, the reported overall performance and consider their effects on the future Qualification Level.

4.6 Current Unserviceabilities and Defects

4.6.1 The Evaluation Team should assess whether any current unserviceability or defect affects the Qualification Level of the flight simulator.

4.7 Modifications

4.7.1 The Flight Simulator Operator should provide a summary of all flight simulator modifications which have occurred since the previous Recurrent Evaluation.

4.7.2 The Evaluation Team should confirm that the Master QTG Validation Tests, if applicable, have been updated to reflect the incorporation of the flight simulator modifications.

4.7.3 The Evaluation Team should assess whether any modifications affect the Qualification Level of the flight simulator.

4.8 Validation Tests. The Recurrent Evaluation should re-run a representative sample of the Validation Tests in the QTG. This sample size should be approximately 10 - 15%.

4.9 Functions and Subjective Tests.

4.9.1 The Recurrent Evaluation should assess a representative sample of Functions and Subjective Tests. The Functions and Subjective Testing should be structured into one or more flights, with the purpose being to evaluate the flight simulator's reliability and usability as a training device. The continuing overall fidelity including the integration of the visual and motion systems should be evaluated. A sample of specific training manoeuvres or scenarios should be incorporated into the flight profiles. This evaluation should include a selection of those areas essential for flight crew member training, testing and checking including:
(a) flight deck configuration;
(b) handling qualities;
(c) performance; and
(d) systems functionality during normal and non-normal operations.

4.9.2 During Functions and Subjective Testing, the normal aircraft crew complement should occupy the operating flight crew seats. At least one pilot should be

current on the aircraft type and model. That pilot should be competent to assess the flight simulator's performance both as a representation of the particular aircraft and as a training/testing/checking device.

4.10 Instructor Station and Supporting Facilities. Evaluation of the Instructor Station, together with the seating, lighting, radio communications, navigation aids and intercom facilities, should be conducted on an ongoing basis throughout the Recurrent Evaluation.

4.11 Continuing Qualification

4.11.1 At the completion of the Recurrent Evaluation, where major discrepancies remain unresolved that are likely to have a significant impact on the continuing use of the flight simulator, the Evaluation Team Leader may at his or her discretion decline to requalify the flight simulator.

4.11.2 A process and timescale for rectification of all discrepancies outstanding at the conclusion of the Recurrent Evaluation should be agreed to by the Flight Simulator Operator and the Evaluation Team Leader.

4.11.3 An Evaluation Report detailing the findings of the evaluation should be produced. A template for the Evaluation Report is enclosed at Flight Simulator Evaluation Report.

4.11.4 All outstanding discrepancies arising from the Recurrent Evaluation should be entered into the flight simulator's maintenance management system.

4.12 Support Staff The Flight Simulator Operator should provide sufficient support staff to assist the Evaluation Team with the conduct of the tests and operation of the Instructors' Station.

5. EVALUATION TEAM LEADER APPROVAL

The Evaluation Team Leader should have:

(a) completed an approved Flight Simulator Evaluation Course;

(b) previously participated in several Recurrent Evaluations;

(c) an acceptable record of performance in Recurrent Evaluations; and

(d) have demonstrated to DGCA within the last twelve months, the successful completion of a Flight Simulator Recurrent Evaluation under supervision.

CHAPTER 2

FLIGHT SIMULATOR APPROVALS

1. PURPOSE

CASR Part 121 or 135 requires that persons proposing to use a qualified flight simulator in a training, testing or checking program must apply to DGCA for approval to use the flight simulator. In considering such an application, DGCA is required by the regulations to consider the differences between the aircraft and flight simulator, and the person's operating and training competencies.

The purpose of this Staff Instruction is to provide flight simulator users who are seeking approval with guidance on the type and quality of information to be included in the application to DGCA. It also provides advice on the application method and information requirements for foreign flight simulator approval.

2. APPLICATION.

Applicants for Flight Simulator Approvals should apply to the DGCA, Directorate of Airworthiness and Aircraft Operations in writing, providing the following:

(a) Flight Simulator User Details;
(b) Flight Simulator Approvals sought;
(c) a copy of the Training and Checking Organization approval (if relevant);
(d) a copy of the Training Syllabus which specifies the flight simulator-based training sequences (if relevant);
(e) a list of all configuration differences existing between the flight simulator and the applicant's aircraft;
(f) proposals for differences training (if relevant);
(g) Flight Simulator Operator;
(h) Flight Simulator Identification details;
(i) Flight Simulator Qualification Level;
(j) a copy of the Flight Simulator Qualification Certificate.

Notes:

1. *The Application may reference material previously supplied to, or issued by, DGCA during the process of Training and Checking Organization approval, Training Syllabus approval, Flight Simulator Qualification, and/or Operator approval.*
2. *Flight Simulator Users, who are also Flight Simulator Operators, may submit a combined application for qualification and approval of a Flight Simulator.*

The applicant should also state that the flight simulator is suitable for use in its training program, and has been assessed for:

(a) Available visual and navigational databases; and
(b) Instructor training requirements for use of the flight simulator's Instructor's Station.

Approval. DGCA Flight Operation Inspector should be consulted prior to the approval of foreign flight simulators.

3. RECOGNITION OF FOREIGN FLIGHT SIMULATORS

The International Civil Aviation Organization (ICAO) Manual of Criteria for the Qualification of Flight Simulators (MCQFS) Document 9625-AN/938 establishes an international standard for aeroplane flight simulators. MCQFS was intended to provide the means for the National Aviation Authorities of other States to accept the qualifications granted by the State which conducted the initial and recurrent evaluation of an aeroplane flight simulator, without repetitive evaluations, when considering approval for the use of that aeroplane flight simulator by applicants from their own State.

Indonesia's aeroplane flight simulator standards (detailed in CASR Part 60) are consistent with MCQFS. DGCA should recognise aeroplane and helicopter flight simulator qualifications granted by other States where their:
(a) Flight Simulator Standards are consistent with CASR Part 60, and
(b) National Aviation Authority has an acceptable level of oversight of the operation of the flight simulator.

DGCA currently recognizes Qualification Certificates issued by the National Aviation Authorities of the following States:
(a) Australia;
(b) Canada;
(c) Hong Kong (Special Administrative Region of China);
(d) Malaysia
(e) New Zealand;
(f) People's Republic of China
(g) South Africa
(h) South Korea
(i) Singapore
(j) Thailand
(k) United Arab Emirates
(l) United States of America;
(m) the following European Aviation Safety Agency (EASA) member States:
    (i) Belgium;
    (ii) Denmark;
    (iii) France;
    (iv) Germany;
    (v) Italy;
    (vi) Netherlands;
    (vii) Spain;
    (viii) Switzerland;
    (ix) United Kingdom;

If an applicant wishes to use a flight simulator that is not qualified by one of the above listed States, then DGCA may require initial and recurrent evaluations of that flight simulator.

Applicants for Approval to use a Foreign Flight Simulator should apply to the Directorate of Airworthiness and Aircraft Operations in writing as specified in Section 2.

CHAPTER 3

VALIDATION TESTS — GUIDANCE MATERIAL

1. PURPOSE

CASR Part 60 requires an application for a flight simulator qualification to include a Qualification Test Guide (QTG). The QTG contains aircraft data and validation test results. The purpose of this AC is to provide flight simulator operators with guidance on aircraft data requirements and applicable tolerances.

2. INTRODUCTION

2.1. This SI provides guidance for the following subjects:

- New Aeroplane Flight Simulator Qualification. An acceptable interim validation method for new aeroplane programmes.
- Engineering Simulation Validation Data. The use of engineering simulator data as an alternative source of validation data.
- Validation Test Tolerances. Likely sources of variation when using engineering simulator data for validation.
- Validation Data Roadmap. Applies configuration management to the validation data.
- Data Requirements for Alternate Engines. The issues arising when generating a Qualification Test Guide (QTG) for a flight simulator representing more than one engine type or thrust rating.
- Data Requirements for Alternate Avionics. The issues arising when generating a QTG as the simulated aeroplane(s)' avionics are progressively updated during the life on the represented in-service aeroplane(s).
- Transport Delay Testing Method. The issues arising when measuring transport delay for conventional aeroplanes, CCA using aeroplane hardware, CCA using software emulation, and when using simulated displays.
- Recurrent Evaluations – Validation Test Data Presentation. An alternative means of comparing simulator test results during Recurrent Evaluations.

3. NEW AEROPLANE FLIGHT SIMULATOR QUALIFICATION

3.1 It is usual that aeroplane manufacturers' approved final data for performance, handling qualities, systems or avionics will not be available until well after a new or derivative aeroplane has entered service. It is often necessary to begin flight crew training and certification several months prior to the entry of the first aeroplane into service and consequently it may be necessary to use aeroplane manufacturer-provided preliminary data for interim qualification of flight simulators.

3.2 In recognition of the sequence of events that should occur and the time required for final data to become available, DGCA may accept certain partially validated preliminary aeroplane and systems data, and early release ('red label') avionics in order to permit the necessary programme schedule for training, certification and service introduction.

3.3 Operators seeking qualification based on preliminary data should, however, consult DGCA as soon as it is known that special arrangements will be necessary or as soon as it is clear that the preliminary data will need to be used for flight simulator qualification. Aeroplane and flight simulator manufacturers should also be made aware of the needs and be an agreed party to the data plan and flight simulator qualification plan.

The plan should include periodic meetings to keep the interested parties informed of project status.

3.4 The precise procedure followed to gain authority acceptance of preliminary data will vary from case to case and between aeroplane manufacturers. Each aeroplane manufacturer's new aeroplane development and test programme is designed to suit the needs of the particular project and may not contain the same events or sequence of events as another manufacturer's programme or even the same manufacturer's programme for a different aeroplane. Hence, there cannot be a prescribed invariable procedure for acceptance of preliminary data, but instead a statement of needs with the final sequence of events, data sources, and validation procedures agreed by the flight simulator operator, the aeroplane manufacturer, the flight simulator manufacturer, and DGCA.

Note: A description of aeroplane manufacturer-provided data needed for flight simulator modelling and validation is to be found in the IATA document 'Flight Simulator Design and Performance Data Requirements' (Edition 6, 2000 or as amended).

3.5 There should be assurance that the preliminary data is the manufacturer's best representation of the aeroplane and reasonable certainty that final data will not deviate to a large degree from these preliminary, but refined, estimates. Data derived from these predictive or preliminary techniques should be validated by available sources including, at least, the following:

(a) Manufacturer's engineering report. Such a report will explain the predictive method used and illustrate past success of the method on similar projects. For example, the manufacturer could show the application of the method to an earlier aeroplane model or predict the characteristics of an earlier model and compare the results to final data for that model.

(b) Early flight test results. Such data will often be derived from aeroplane certification tests, and should be used to maximum advantage for early flight simulator qualification. Certain critical tests, which would normally be done early in the aeroplane certification programme, should be included to validate essential pilot training and certification maneuvers. These include cases in which a pilot is expected to cope with an aeroplane failure mode including engine failures. The early data available, however, will depend on the aeroplane manufacturer's flight test programme design and may not be the same in each case. However it is expected that the aeroplane manufacturer's flight test programme include provisions for generation of very early flight tests results for flight simulator qualification.

3.6 The use of preliminary data is not indefinite. The aeroplane manufacturer's final data should be available within six months after aeroplane first 'service entry' or as agreed by DGCA, the flight simulator operator and the aeroplane manufacturer, but usually not later than one year. In applying for an interim qualification, using preliminary data, the flight simulator operator and DGCA should agree upon the update programme. This will normally specify that the final data update will be installed in the flight simulator within a period of six months following the final data release unless special conditions exist and a different schedule is agreed. The flight simulator performance and handling validation would then be based on data derived from flight test. Initial aeroplane systems data should be updated after engineering tests. Final aeroplane systems data should also be used for flight simulator programming and validation.

3.7 Flight simulator avionics should stay essentially in step with aeroplane avionics (hardware and software) updates. The permitted time lapse between aeroplane and flight simulator updates is not a fixed time but should be minimal. It may depend on the magnitude of the update and whether the QTG and pilot training and checking are affected.
Permitted differences in aeroplane and flight simulator avionics versions and the resulting effects on flight simulator qualification should be agreed between the operator and DGCA. Consultation with the flight simulator manufacturer is desirable throughout the agreement of the qualification process.

3.8 The following provides an example of the design data and sources which might be used in the development of an interim qualification plan.

3.8.1 The plan should consist of the development of a QTG based upon a mix of flight test and engineering simulation data. For data collected from specific aeroplane flight tests or other flights the required design model/data changes, necessary to support an acceptable Proof of Match (POM), should be generated by the aeroplane manufacturer.

3.8.2 In order to ensure that the two sets of data are properly validated, the aeroplane manufacturers should compare their simulation model responses against the flight-test data, when driven by the same control inputs and subjected to the same atmospheric conditions as recorded in the flight test. The model responses should result from a simulation where the following systems are run in an integrated fashion and are consistent with the design data released to the flight simulator manufacturer:
(a) propulsion;
(b) aerodynamics;
(c) mass properties;
(d) flight controls;
(e) stability augmentation;
(f) brakes/landing gear.

3.9 For the qualification of flight simulators of new aeroplane types, it may be beneficial that the services of a suitably qualified test pilot are used for the purpose of assessing handling qualities and performance evaluation.
Note: The Proof of Match should meet the relevant tolerances.

4. ENGINEERING SIMULATION VALIDATION DATA

4.1 Background

4.1.1 In the case of fully flight-test validated simulation models of a new or major derivative aeroplane, it is likely that these models will become progressively unrepresentative as the aeroplane configuration is revised.

4.1.2 Traditionally as the aeroplane configuration has been revised, the simulation models have been revised to reflect changes. In the case of aerodynamic, engine, flight control and ground handling models, this revision process normally results in the collection of additional flight-test data and the subsequent release of new models and validation data.

4.1.3 The quality of the prediction of simulation models has advanced to the point where differences between predicted and flight-test validated models are often quite small.

4.1.4 The major aeroplane manufacturers utilise the same simulation models in their engineering simulations as released to the training community. These simulations vary from physical engineering simulators with and without aeroplane hardware to non-realtime work station based simulations.

4.2 Approval Guidelines For Using Engineering Simulator Validation Data

4.2.1 The current system of requiring flight test data as a reference for validating training simulators should continue.

4.2.2 When a fully flight-test-validated simulation is modified as a result of changes to the simulated aeroplane configuration, a qualified aeroplane manufacturer may choose, with prior agreement of DGCA, to supply validation data from an engineering simulator/simulation to selectively supplement flight test data.

4.2.3 In cases where data from an engineering simulator is used, the engineering simulation process would have to be audited by the appropriate authority.

4.2.4 In all cases a data package verified to current standards against flight tests should be developed for the aeroplane ‘entry-into-service’ configuration of the baseline aeroplane.

4.2.5 Where engineering simulator data is used as part of a QTG, an essential match is expected as described in Section 5.

4.2.6 In cases where the use of engineering simulator data is envisaged, a complete proposal should be presented to the appropriate authority(ies). Such a proposal would contain evidence of the aeroplane manufacturer’s past achievements in high fidelity modelling.

4.2.7 The process will be applicable to ‘one step’ away from a fully flight validated simulation.

4.2.8 A configuration management process should be maintained, including an audit trail which clearly defines the simulation model changes step by step away from a fully flight validated simulation, so that it would be possible to remove the changes and return to the baseline (flight validated) version.

4.2.9 DGCA will conduct technical reviews of the proposed plan and the subsequent validation data to establish acceptability of the proposal.

4.2.10 The procedure will be considered complete when an approval statement is issued. This statement will identify acceptable validation data sources.

4.2.11 To be admissible as an alternative source of validation data, an engineering simulator would:

(a) have to exist as a physical entity, complete with a flight deck representative of the affected class of aeroplane, with controls sufficient for manual flight;
(b) have a visual system and preferably also a motion system;
(c) where appropriate, have actual avionics boxes interchangeable with the equivalent software simulations, to support validation of released software;
(d) have a rigorous configuration control system covering hardware and software;
(e) have been found to be a high fidelity representation of the aeroplane by the pilots of the manufacturers, operators and DGCA.

4.2.12 The precise procedure followed to gain acceptance of engineering simulator data will vary from case-to-case between aeroplane manufacturers and type of change. Irrespective of the solution proposed, engineering simulations/simulators should conform to the following criteria:

(a) the original (baseline) simulation models should have been fully flight-test validated;
(b) the models as released by the aeroplane manufacturer to the industry for use in training flight simulators should be essentially identical to those used by the aeroplane manufacturer in their engineering simulations/simulators;
(c) these engineering simulations/simulators will have been used as part of the aeroplane design, development and certification process.

4.2.13 Training flight simulators utilising these baseline simulation models should be currently qualified to at least internationally recognised standards such as those in CASR Part 60.

4.2.14 The type of modifications covered by this alternative procedure will be restricted to those with ‘well understood effects’:

(a) software (e.g., flight control computer, autopilot, etc.);
(b) simple (in aerodynamic terms) geometric revisions (e.g., body length);
(c) engines, limited to non-propeller-driven aeroplanes;
(d) control system gearing/rigging/deflection limits;
(e) brake, tyre and steering revisions.

4.2.15 The manufacturer, who wishes to take advantage of this alternative procedure, is expected to demonstrate a sound engineering basis for his proposed approach. Such analysis would show that the predicted effects of the change(s) were incremental in nature and both easily understood and well defined, confirming that additional flight test data was not required. In the event that the predicted effects were not deemed to be sufficiently accurate, it might be necessary to collect a limited set of flight test data to validate the predicted increments.

4.2.16 DGCA will review any applications for this procedure.

5. VALIDATION TEST TOLERANCES

5.1 Background

5.1.1 The tolerances listed in CASR Part 60 are designed to be a measure of goodness of match using flight-test data as a reference.

5.1.2 There are many reasons, however, why a particular test may not fully comply with the prescribed tolerances:

(a) flight-test is subject to many sources of potential error, e.g. instrumentation errors and atmospheric disturbance during data collection;
(b) data that exhibit rapid variation or noise may also be difficult to match;
(c) engineering simulator data and other calculated data may exhibit errors due to a variety of potential differences discussed below.

5.1.3 When applying tolerances to any test, good engineering judgement should be applied. Where a test clearly falls outside the prescribed tolerance(s) for no apparent reasons, then it should be judged to have failed.

5.1.4 The use of non-flight-test data as reference data was in the past quite small, and thus these tolerances were used for all tests. The inclusion of engineering simulator data as a validation source has rapidly expanded, and will probably continue to expand.

5.1.5 When engineering simulator data is used, the basis for their use is that the reference data is produced using the same simulation models as used in the equivalent flight training simulator; i.e. the two sets of results should be ‘essentially’ similar. The use of flight-test based tolerances may undermine the basis for using engineering simulator data, because an essential match is needed to demonstrate proper implementation of the data package.

5.1.6 There are, of course, reasons why the results from the two sources can be expected to differ:

(a) hardware (avionics units and flight controls);
(b) iteration rates;
(c) execution order;
(d) integration methods;
(e) processor architecture;
(f) digital drift:

(i) interpolation methods;
(ii) data handling differences;
(iii) auto-test trim tolerances, etc.

5.1.7 Any differences should, however, be small and the reasons for any differences, other than those listed above, should be clearly explained.

5.1.8 Historically, engineering simulation data were used only to demonstrate compliance with certain extra modelling features:
(a) flight test data could not reasonably be made available;
(b) data from engineering simulations made up only a small portion of the verall validation data set;
(c) key areas were validated against flight-test data.

5.1.9 The current rapid increase in the use and projected use of engineering simulation data is an important issue because:
(a) flight-test data are often not available due to sound technical reasons;
(b) alternative technical solutions are being advanced;
(c) cost is an ever-present issue.

5.1.10 Guidelines are therefore provided below for the application of tolerances to engineering-simulator-generated validation data.

5.2 Non-Flight Test Tolerances

5.2.1 Where engineering simulator data or other non-flight-test data is used as an allowable form of validation data for the objective tests listed in CASR Part 60, the match obtained between the reference data and the flight simulator results should be very close.

It is not possible to define a precise set of tolerances as the reasons for other than an exact match will vary depending upon a number of factors discussed in Section 5.1.

5.2.2 As a guide, unless a rationale justifies a significant variation between the reference data and the flight simulator results, 20% of the corresponding ‘flight-test’ tolerances would be appropriate.

5.2.3 For this guideline (20% of flight-test tolerances) to be applicable, the data provider should supply a well-documented mathematical model and testing procedure that enables an exact replication of their engineering simulation results.

6. VALIDATION DATA ROADMAP

6.1 General

6.1.1 Aeroplane manufacturers or other sources of data should supply a validation data roadmap (VDR) document as part of the data package. A VDR document contains guidance material from the aeroplane validation data supplier recommending the best possible sources of data to be used as validation data in the QTG.

A VDR is of special value in the cases of requests for 'interim' qualification, requests for qualification of simulations of aeroplanes certificated prior to 1992, and for qualification of alternate engine or avionics fits (see Sections 9 and 10). A VDR should be submitted to DGCA as early as possible in the planning stages for any flight simulator planned for qualification to the standards contained in CASR Part 60.

DGCA is the final authority to approve the data to be used as validation material for the QTG. The United States Federal Aviation Administration's National Simulator Program Manager and the Joint Aviation Authorities' Synthetic Training Devices Advisory Board are committed to maintain a list of agreed VDR's.

6.1.2 The validation data roadmap should clearly identify (in matrix format) sources of data for all required tests. It should also provide guidance regarding the validity of these data for a specific engine type and thrust rating configuration and the revision levels of all avionics affecting aeroplane handling qualities and performance.

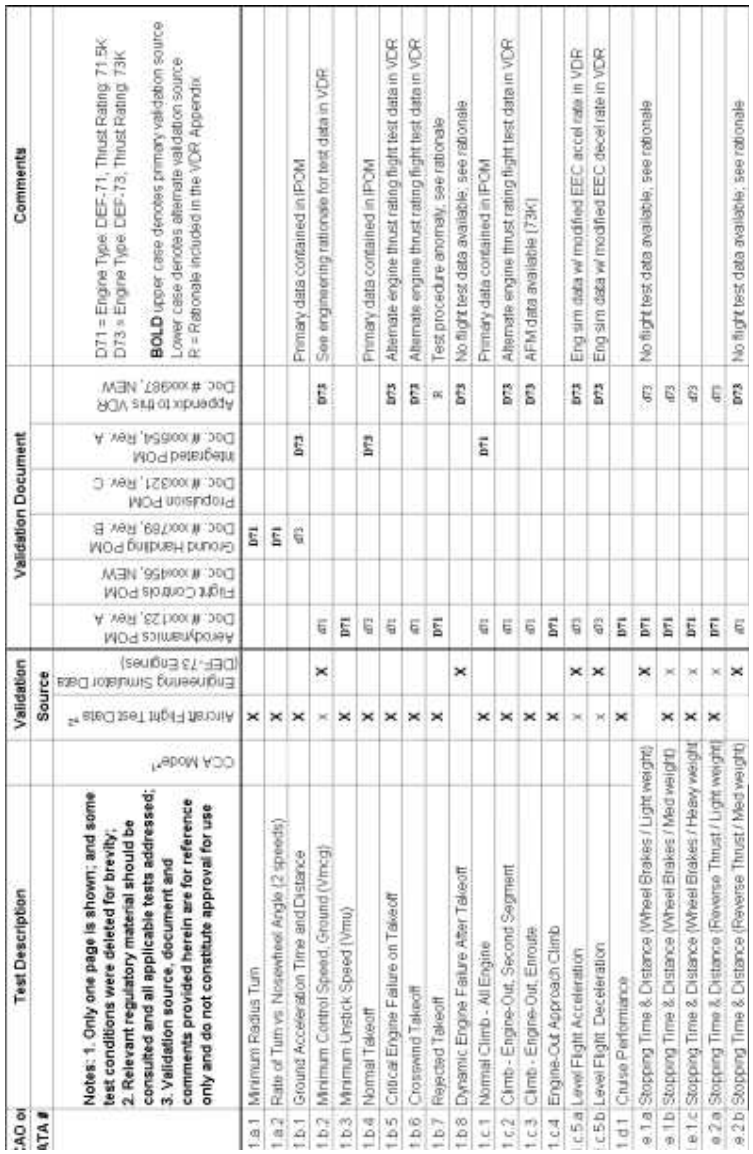
The document should include rationale or an explanation in cases where data or parameters are missing, engineering simulation data are to be used, flight test methods require explanation, etc., together with a brief narrative describing the cause/effect of any deviation from data requirements.

Additionally, the document should make reference to other appropriate sources of validation data (e.g., sound and vibration data documents).

6.1.3 Table 1 depicts a generic roadmap matrix identifying sources of validation data an abbreviated list of tests. A complete matrix should address all test conditions.

6.1.4 Additionally, two examples of 'rationale pages' are presented in Appendix F of the IATA Flight Simulator Design & Performance Data Requirements document.

These illustrate the type of aeroplane and avionics configuration information and descriptive engineering rationale used to describe data anomalies, provide alternative data, or provide an acceptable basis to DGCA for obtaining deviations from QTG validation requirements.



CAO or ATA #	Test Description	CCA Mode[1]	Validation Source		Validation Document								Comments
			Aircraft Flight Test Data [2]	Engineering Simulator Data (DEF-73 Engines)	Aerodynamics POM Doc. # xxx123, Rev. A	Flight Controls POM Doc. # xxx456, NEW	Ground Handling POM Doc. # xxx789, Rev. B	Propulsion POM Doc. # xxx321, Rev. C	Integrated POM Doc. # xxx654, Rev. A	Appendix to this VDR Doc. # xxx987, NEW			D71 = Engine Type: DEF-71; Thrust Rating: 71.5K D73 = Engine Type: DEF-73; Thrust Rating: 73K **BOLD** upper case denotes primary validation source Lower case denotes alternate validation source R = Rationale included in the VDR Appendix
	Notes: 1. Only one page is shown; and some test conditions were deleted for brevity; 2. Relevant regulatory material should be consulted and all applicable tests addressed; 3. Validation source, document and comments provided herein are for reference only and do not constitute approval for use												
1.a.1	Minimum Radius Turn		X				D71						
1.a.2	Rate of Turn vs. Nosewheel Angle (2 speeds)		X				D71						Primary data contained in IPOM
1.b.1	Ground Acceleration Time and Distance		X				d73		D73				Primary data contained in IPOM
1.b.2	Minimum Control Speed, Ground (Vmcg)		x	X	d71					D73			See engineering rationale for test data in VDR
1.b.3	Minimum Unstick Speed (Vmu)		X		D71								
1.b.4	Normal Takeoff		X		d73				D73				Primary data contained in IPOM
1.b.5	Critical Engine Failure on Takeoff		X		d71					D73			Alternate engine thrust rating flight test data in VDR
1.b.6	Crosswind Takeoff		X		d71					D73			Alternate engine thrust rating flight test data in VDR
1.b.7	Rejected Takeoff		X		D71					R			Test procedure anomaly; see rationale
1.b.8	Dynamic Engine Failure After Takeoff			X						D73			No flight test data available; see rationale
1.c.1	Normal Climb - All Engine		X		d71				D71				Primary data contained in IPOM
1.c.2	Climb - Engine-Out, Second Segment		X		d71					D73			Alternate engine thrust rating flight test data in VDR
1.c.3	Climb - Engine-Out, Enroute		X		d71					D73			AFM data available (73K)
1.c.4	Engine-Out Approach Climb		X		D71								
1.c.5.a	Level Flight Acceleration		x	X	d73					D73			Eng sim data w/ modified EEC; accel rate in VDR
1.c.5.b	Level Flight Deceleration		x	X	d73					D73			Eng sim data w/ modified EEC; decel rate in VDR
1.d.1	Cruise Performance		X		D71								
e.1.a	Stopping Time & Distance (Wheel Brakes / Light weight)			X	D71					d73			No flight test data available; see rationale
e.1.b	Stopping Time & Distance (Wheel Brakes / Med weight)		X	x	D71					d73			
e.1.c	Stopping Time & Distance (Wheel Brakes / Heavy weight)		X	x	D71					d73			
e.2.a	Stopping Time & Distance (Reverse Thrust / Light weight)		X	x	D71					d73			
e.2.b	Stopping Time & Distance (Reverse Thrust / Med weight)			X	d71					D73			No flight test data available; see rationale

*1 CCA mode shall be described for each test condition.
*2 If more than one aircraft type (e.g., derivative and baseline) are used as validation data more columns may be necessary

Table 1: Validation Data Roadmap

7. DATA REQUIREMENTS FOR ALTERNATIVE ENGINES – APPROVAL GUIDELINES

7.1 Background

7.1.1 For a new aeroplane type, the majority of flight validation data is collected on the first aeroplane configuration with a 'baseline' engine type. These data are then used to validate all flight simulators representing that aeroplane type.

7.1.2 In the case of flight simulators representing an aeroplane with engines of a different type than the baseline, or a different thrust rating than that of previously validated configurations, additional flight test validation data may be needed.

7.1.3 When a flight simulator with additional and/or alternate engine fits is to be qualified, the QTG should contain tests against flight test validation data for selected cases where engine differences are expected to be significant.

7.2 Approval Guidelines For Validating Alternative Engine Fits

7.2.1 The following guidelines apply to flight simulators representing aeroplanes with an alternate engine fit or with more than one engine type or thrust rating.

7.2.2 Validation tests can be segmented into those that are dependent on engine type or thrust rating and those which are not.

7.2.3 For tests which are independent of engine type or thrust rating, the QTG can be based on validation data from any engine fit. Tests in this category should be clearly identified.

7.2.4 For tests which are affected by engine type, the QTG should contain selected engine-specific flight test data sufficient to validate that particular aeroplane-engine configuration.

These effects may be due to engine dynamic characteristics, thrust levels and/or engine-related aeroplane configuration changes. This category is primarily characterised by differences between different engine manufacturers' products, but also includes differences due to significant engine design changes from a previously flight validated configuration within a single engine type. See Table 2 below for a list of acceptable tests.

7.2.5 For those cases where the engine type is the same, but the thrust rating exceeds that of a previously flight-validated configuration by five percent (5%) or more, or is significantly less than the lowest previously validated rating (a decrease of fifteen percent (15%) or more), the QTG should contain selected engine-specific flight test data sufficient to validate the alternate thrust level. See Table 2 below for a list of acceptable tests.

However, if an aeroplane manufacturer, qualified as a validation data supplier under the guidelines of Section 6, shows that a thrust increase greater than 5% will not significantly change the aeroplane's flight characteristics, then flight validation data are not needed.

7.2.6 No additional flight test data is required for thrust ratings which are not significantly different from that of the baseline or other applicable flight-validated engine airframe configuration (i.e., less than 5% above or 15% below), except as noted in paragraphs 7.2.7 and 7.2.8, below. As an example, for a configuration validated with 50,000 pound-thrust-rated engines, no additional flight validation data is required for ratings between 42,500 and 52,500 lbs. If multiple engine ratings are tested concurrently, only test data for the highest rating is needed.

7.2.7 Throttle calibration data (i.e., commanded power setting parameter versus throttle position) should be provided to validate all alternate engine types, and engine thrust ratings which are higher or lower than a previously validated engine. Data from a test aeroplane or engineering test bench are acceptable, provided the correct engine controller (both hardware and software) is used.

The following flight test conditions (one per test number) are appropriate and should be sufficient to validate implementation of alternate engine fits in a flight simulator.

TEST NUMBER	TEST DESCRIPTION		ALTERNATE ENGINE TYPE	ALTERNATE THRUST RATING [2]
1.b.1, 4	Normal take-off/ground acceleration time & distance		X	X
1.b.2	V_{mcg} if performed for aeroplane certification		X	X
1.b.5	Engine-out take-off	Either test	X	
1.b.8	Dynamic engine failure after take-off	may be performed		
1.b.7	Rejected take-off if performed for aeroplane certification		X	
1.d.1	Cruise performance		X	
1.f.1, 2	Engine acceleration and deceleration		X	X
2.a.7	Throttle calibration [1]		X	X
2.c.1	Power change dynamics (acceleration)		X	X
2.d.1	V_{mca} if performed for aeroplane certification		X	X
2.d.5	Engine inoperative trim		X	X
2.e.1	Normal landing		X	

Table 2: Alternate Engine Validation Flight Tests

7.2.8 The validation data described in paragraphs 7.2.4 through 7.2.7 should be based on flight test data, except as noted in those paragraphs, or where other data is specifically allowed within Section 4.

However, if certification of the flight characteristics of the aeroplane with a new thrust rating (regardless of percentage change) does require certification flight testing with a comprehensive stability and control flight instrumentation package, then the conditions in Table 2 should be obtained from flight testing and presented in the QTG.

Conversely, flight test data other than throttle calibration as described is not required if the new thrust rating is certified on the aeroplane without need for a comprehensive stability and control flight instrumentation package.

7.2.9 As a supplement to the engine-specific flight tests of Table 2 and baseline engine independent tests, additional engine-specific engineering validation data should be provided in the QTG, as appropriate, to facilitate running the entire QTG with the alternate engine configuration. The specific validation tests to be supported by engineering simulation data should be agreed to by DGCA well in advance of flight simulator evaluation.

7.2.10 A matrix or 'roadmap' should be provided with the QTG indicating the appropriate validation data source for each test (see Section 5).

8. DATA REQUIREMENTS FOR ALTERNATIVE AVIONICS (FLIGHTRELATED COMPUTERS & CONTROLLERS) — APPROVAL GUIDELINES

8.1 Background

8.1.1 For a new aeroplane type, the majority of flight validation data is collected on the first aeroplane configuration with a 'baseline' flight-related avionics ship-set (see paragraph 18.2.2). This data is then used to validate all flight simulators representing that aeroplane type.

8.1.2 In the case of flight simulators representing an aeroplane with avionics of a different hardware design than the baseline, or a different software revision than that of previously validated configurations, additional validation data may be required.

8.1.3 When a flight simulator with additional and/or alternate avionic configurations are to be qualified, the QTG should contain tests against validation data for selected cases where avionic differences are expected to be significant.

8.2 Approval Guidelines For Validating Alternative Avionics

8.2.1 The following guidelines apply to flight simulators representing aeroplanes with a revised, or more than one, avionics configuration.

8.2.2 The aeroplane avionics can be segmented into those systems or components which can significantly affect the QTG results and those which cannot. The following avionics are examples of those for which hardware design changes or software revision updates may lead to significant differences relative to the baseline avionics configuration:

Flight control computers, controllers for engines, autopilot, braking system, nose wheel steering system, high lift system, and landing gear system. Related avionics such as stall warning and augmentation systems should also be considered. The aeroplane manufacturer should identify, for each validation test, which avionics systems, if changed, could affect test results.

8.2.3 The baseline validation data should be based on flight test data, except where other data is specifically allowed (see Section 4).

8.2.4 For changes to an avionics system or component that cannot affect QTG validation test results, the QTG test can be based on validation data from the previously validated avionics configuration.

8.2.5 For changes to an avionics system or component that could affect a QTG validation test, but where that test is not affected by this particular change (e.g., the avionics change is a BITE update or a modification in a different flight phase), the QTG test can be based on validation data from the previously-validated avionics configuration.

The aeroplane manufacturer should clearly state that this avionics change does not affect the test.

8.2.6 For an avionics change which affects some tests in the QTG, but where no new functionality is added and the impact of the avionics change on aeroplane response is a small, well-understood effect, the QTG may be based on validation data from the previously-validated avionics configuration.

This should be supplemented with avionics specific validation data from the aeroplane manufacturer's engineering simulation, generated with the revised avionics configuration. In such cases, the aeroplane manufacturer should provide a rationale explaining the nature of the change and its effect on the aeroplane response.

8.2.7 For an avionics change which significantly affects some tests in the QTG, especially where new functionality is added, the QTG should be based on validation data from the previously-validated avionics configuration and supplemental avionics-specific flight test data sufficient to validate the alternate avionics revision.

However, additional flight validation data may not be needed if the avionics changes were certified without need for testing with a comprehensive flight instrumentation package. The aeroplane manufacturer should, in this situation, co-ordinate flight simulator data requirements, in advance, with DGCA.

8.2.8 A matrix or 'roadmap' should be provided with the QTG indicating the appropriate validation data source for each test (see Section 6).

9. TRANSPORT DELAY TESTING METHOD

9.1 General

9.1.1 The purpose of this Section is to demonstrate how to determine the introduced transport delay through the flight simulator system such that it does not exceed a specific time delay. That is, measure the transport delay from control inputs through the interface, through each of the host computer modules and back through the interface to motion, flight instrument and visual systems, and show that it is no more than the permissible delay.

9.1.2 Four specific examples of transport delay are described as follows:
(a) simulation of classic non-computer controlled aeroplanes;
(b) simulation of computer controlled aeroplanes using real aeroplane black boxes;
(c) simulation of computer controlled aeroplanes using software emulation of aeroplane boxes;
(d) simulation using software avionics or re-hosted instruments.

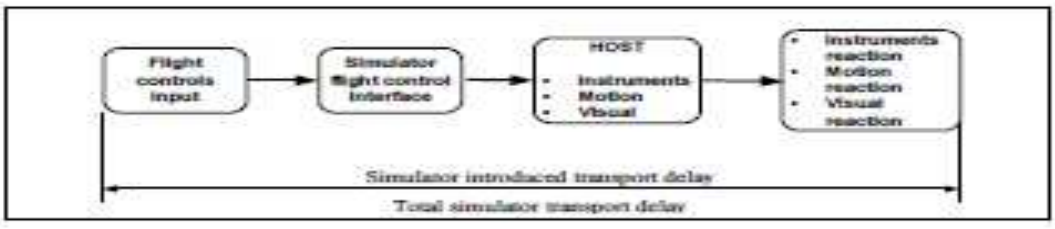


Figure 1: Transport Delay for simulation of classic non-computer controlled aeroplanes

9.1.3 Figure 1 illustrates the total transport delay for a non-computer-controlled aeroplane, or the classic transport delay test.

9.1.4 Since there are no aeroplane induced delays for this case, the total transport delay is equivalent to the introduced delay.

9.1.5 Figure 2 illustrates the transport delay testing method employed on a flight simulator that uses the real aeroplane controller system.

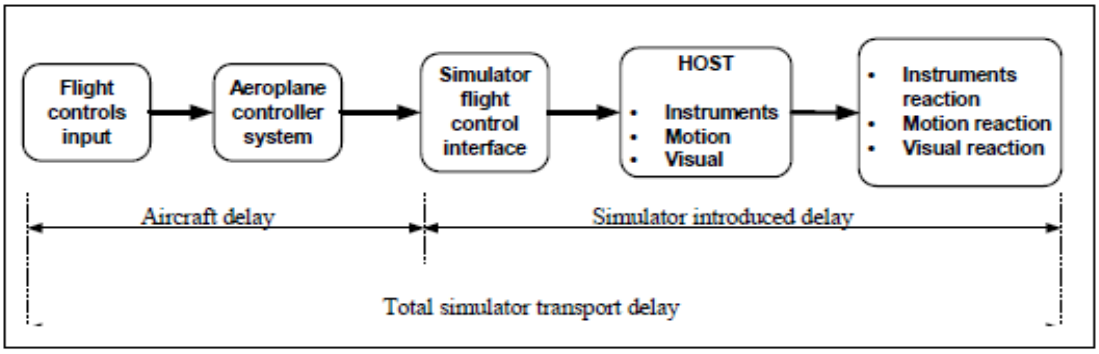


Figure 2: Transport Delay for simulation of computer controlled aeroplanes using real aircraft black boxes

9.1.6 To obtain the induced transport delay for the motion, instrument and visual signal, the delay induced by the aeroplane controller should be subtracted from the total transport delay. This difference represents the introduced delay and should not exceed the permissible delay.

9.1.7 Introduced transport delay is measured from the cockpit control input to the reaction of the instruments, and motion and visual systems (see Figure 1).

9.1.8 Alternatively, the control input may be introduced after the aeroplane controller system and the introduced transport delay measured directly from the control input to the reaction of the instruments, and simulator motion, and visual systems (see Figure 2).

9.1.9 Figure 3 illustrates the transport delay testing method employed on a flight simulator that uses a software emulated aeroplane controller system.

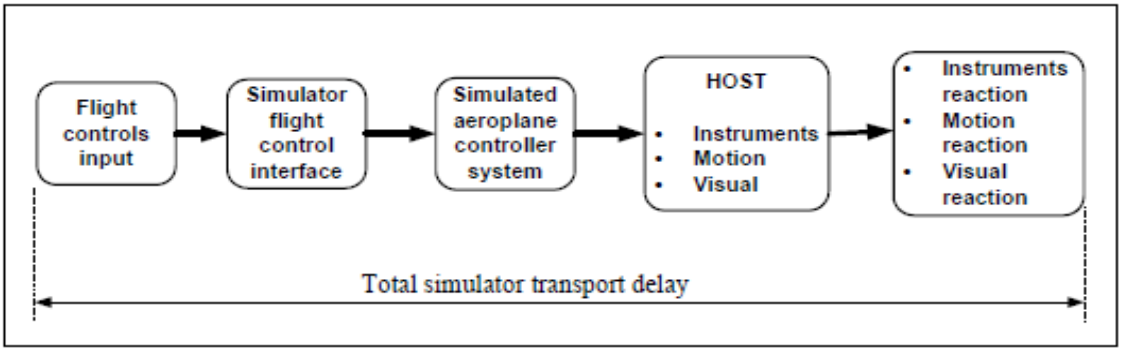


Figure 3: Transport Delay for simulation of computer controlled aeroplanes using software emulation of aeroplane boxes

9.1.10 By using the simulated aeroplane controller system architecture for the pitch and roll axes, it is not possible to measure simply the introduced transport delay. Therefore, the signal should be measured directly from the pilot controller. Since, in the real aeroplane, the controller system has an inherent delay as provided by the aeroplane manufacturer. The flight simulator manufacturer should measure the total transport delay and subtract the inherent delay of the actual aeroplane components and ensure that the introduced delay does not exceed the permissible delay.

9.1.11 Special measurements for instrument signals for flight simulators using a real aeroplane instrument display system, versus a simulated or re-hosted display. In the case of the flight instrument systems, the total transport delay should be measured, and the inherent delay of the actual aeroplane components subtracted to ensure that the introduced delay does not exceed the permissible delay.

9.1.11.1 Figure 4A illustrates the transport delay procedure without the simulation of aeroplane displays. The introduced delay consists of the delay between the control movement and the instrument change on the data bus.

9.1.11.2 Figure 4B illustrates the modified testing method required to correctly measure introduced delay due to software avionics or re-hosted instruments. The total simulated instrument transport delay is measured and the aeroplane delay should be subtracted from this total.

This difference represents the introduced delay and shall not exceed the permissible delay. The inherent delay of the aeroplane between the data bus and the displays are indicated as XX msec (see Figure 4A). This delay time shall be provided by the display manufacturer.

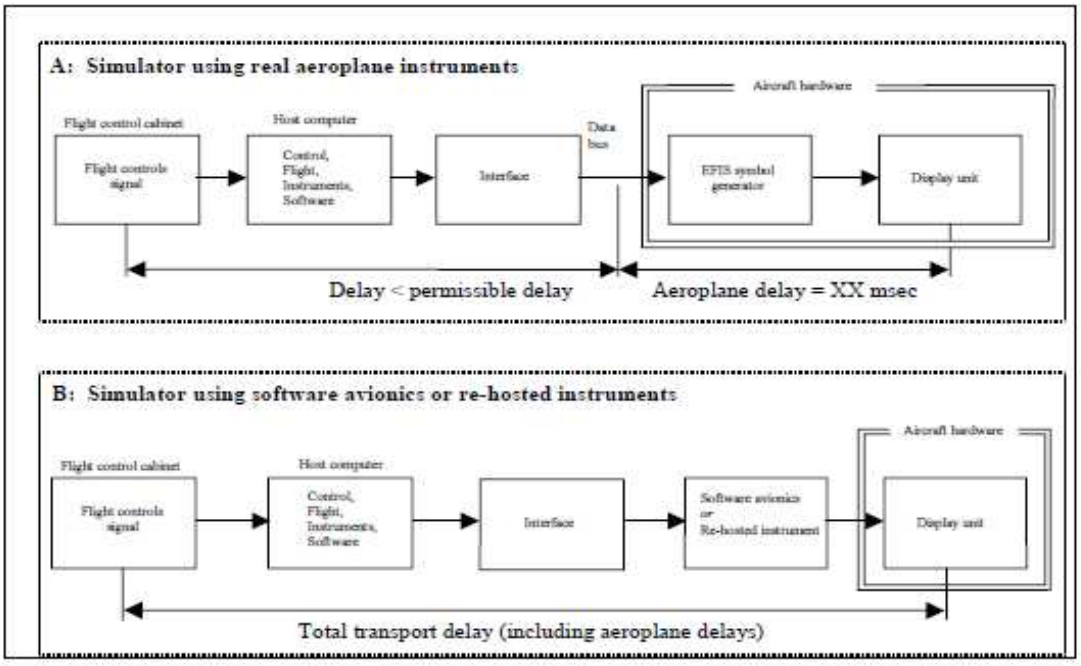


Figure 4A and 4B: Transport Delay for simulation of aeroplanes using real or re-hosted instrument drivers

9.1.12 Recorded signals. The signals recorded to conduct the transport delay calculations should be explained on a schematic block diagram. The flight simulator manufacturer should also provide an explanation of why each signal was selected and how they relate to the above descriptions.

9.1.13 Interpretation of results. It is normal that flight simulator results vary over time from test to test. This can easily be explained by a simple factor called 'sampling uncertainty.' All flight simulators run at a specific rate where all modules are executed sequentially in the host computer.

The flight controls input can occur at any time in the iteration, but this data will not be processed before the start of the new iteration. For a flight simulator running at 60 Hz, a worst case difference of 16.67 msec can be expected.

Moreover, in some conditions, the host simulator and the visual system do not run at the same iteration rate, therefore the output of the host computer to the visual will not always be synchronised.

9.1.14 The transport delay test should account for both daylight and night modes of operation of the visual system. In both cases motion response shall occur before the end of the first video scan containing new information.

10. RECURRENT EVALUATIONS — VALIDATION TEST DATA PRESENTATION

10.1 Background

10.1.1 During the initial evaluation of a flight simulator the MQTG is created. This is the master document, as amended, to which flight simulator recurrent evaluation test results are compared.

10.1.2 The currently accepted method of presenting recurrent evaluation test results is to provide flight simulator results over-plotted with reference data. Test results are carefully reviewed to determine if the test is within the specified tolerances. This can be a time consuming process, particularly when reference data exhibits rapid variations or an apparent anomaly requiring an engineering assessment in the application of the tolerances.

In these cases the solution is to compare the results to the MQTG. If the recurrent results are the same as those in the MQTG, the test is accepted. Both the flight simulator operator and DGCA are looking for any change in the flight simulator performance since initial qualification.

10.2 Recurrent Evaluation Test Results Presentation

10.2.1 To promote a more efficient recurrent evaluation, the flight simulator operators are encouraged to over-plot recurrent validation test results with MQTG flight simulator results recorded during the initial evaluation, as amended. Any change in a validation test will be readily apparent. In addition to plotting a recurrent validation test and MQTG results, operators may also elect to plot reference data.

10.2.2 There are no suggested tolerances between flight simulator recurrent and MQTG validation test results. Investigation of any discrepancy between the MQTG and recurrent flight simulator performance is left to the discretion of the flight simulator operator and DGCA.

10.2.3 Differences between the two sets of results, other than minor variations attributable to repeatability issues (see Section 5), which cannot easily be explained, may require investigation.

10.2.4 The flight simulator should still retain the capability to over-plot both automatic and manual validation test results with reference data.

CHAPTER 4

FLIGHT TRAINING DEVICES

1. PURPOSE

CASR Part 60 requires that Flight Training Devices (FTD) undergo initial, recurrent and special evaluation. Part 60 also requires that persons proposing to use a qualified FTD in a training, testing or checking program must apply to DGCA for approval to use the FTD.

The purpose of this SI is to provide guidance to the Evaluation Teams on the content, process and proformas relevant to these evaluations. The SI also provides advice on the application method and information requirements for FTD approval and guidance on the application method and information required for Evaluation Team Leader appointment.

2. INTRODUCTION

2.1 FTDs may be subject to:
(a) Operator Testing;
(b) Initial Evaluation;
(c) Recurrent Evaluation; and
(d) Special Evaluation.

2.2 Operator Testing is conducted by the FTD Operator to ensure that the FTD complies with their specifications etc. Operator Testing normally involves conducting tests in the Acceptance Test Manual (ATM) and the Qualification Test Guide (QTG).

The FTD Operator conducts the testing to ensure that the FTD meets the required standard, specific training requirements, and is ready for evaluation by DGCA.

2.3 The **Initial Evaluation** is conducted by DGCA to qualify the FTD for use. This evaluation consists of a technical review of the QTG and a subsequent on-site evaluation of the FTD.

2.4 Recurrent Evaluations are conducted periodically to ensure that the FTD continues to meet its qualified level.

2.5 Special Evaluations are conducted as a result of major modifications, requests for upgrade, or the FTD failing to maintain its qualification level. The content of the Special Evaluation depends on the circumstances, and should be determined by DGCA.

3. INITIAL EVALUATION

1.1 Qualification Test Guide (QTG)

3.1.1 FTD Operators are encouraged to submit an advance copy of the QTG to DGCA, at the earliest opportunity, to ensure that the proposed tests and validation data are suitable.

3.1.2 The substantially complete QTG should be submitted to DGCA not less than 15 working days prior to the proposed date of commencement of the on-site evaluation. All Validation, and Functions and Subjective Test results contained in the QTG should have been conducted on-site within the last 90 days.

A letter of application should be submitted before commencement of the on-site evaluation confirming that Operator Testing is complete, listing all outstanding discrepancies and providing QTG updates (as necessary).

A template for the letter is enclosed at Application For Initial Qualification Flight Training Device.

3.1.3 DGCA should advise the FTD Operator of the outcome of their technical review of the QTG. Any significant discrepancies should be addressed before commencement of the on-site evaluation.

3.2 Composition of Evaluation Team

3.2.1 DGCA should appoint the Evaluation Team Leader. The Evaluation Team Leader should have completed an approved Flight Simulator Evaluation Course.

3.2.2 The Evaluation Team Leader is responsible for the conduct of the on-site evaluation and for certifying the results achieved.

3.2.3 The Evaluation Team may be made up of a combination of both DGCA and non-DGCA staff. For the duration of the evaluation, any non-DGCA Evaluation Team members should be considered as acting on behalf of DGCA. It is strongly recommended that individual team members should have completed an approved Flight Simulator Evaluation Course.

3.2.4 The Evaluation Team should consist of at least the following members:

(a) a flight simulation specialist who is familiar with the scope and content of Qualification Test Guides;
(b) a check pilot who is type rated and current on the aircraft type;
(c) a training pilot or suitably qualified person who is familiar with the operation of the FTD as a training device, particularly with regard to the Instructor Station.

Note: Non-DGCA staff should participate in appropriate team member roles.

3.3 Content of On-site Evaluation. The on-site evaluation should consist of an evaluation of the following:

(a) Validation Tests;
(b) Functions and Subjective Tests;
(c) the proper functioning of the instructor station, seating, lighting, radio communications, navigation aids, and intercom facilities.

3.4. Validation Tests. The on-site evaluation should re-run a representative sample of the Validation Tests in the QTG. This sample size should be approximately 33%.

A selection of Validation Tests should also be run manually to verify the integrity of the automatic test procedures.

3.5 Functions and Subjective Tests

3.5.1 The on-site evaluation should evaluate a representative sample of Functions and Subjective Tests.

3.5.2 The Functions and Subjective Testing should be structured into several flights, with the purpose being to evaluate the FTD's reliability and usability as a training device. The overall fidelity including the integration of the visual and motion systems (if fitted) should be evaluated. Any user specific training manoeuvres or scenarios should be incorporated into the flight profiles.

This evaluation should cover those areas essential for flight crew member training, testing and checking including:

(a) flight deck configuration (physical layout, placards, engine, autopilot, flight management system. etc.); and
(b) systems functionality during normal and non-normal operations.

3.5.3 During Functions and Subjective Testing, the normal aircraft crew complement should occupy the operating flight crew seats. At least one pilot should be current on the aircraft type and model. That pilot should be competent to assess the FTD's performance both as a representation of the particular aircraft and as a training/testing/checking device.

3.6 Instructor Station and Supporting Facilities. Evaluation of the instructor station, together with the seating, lighting, radio communications, navigation aids and intercom facilities, should be conducted on an ongoing basis throughout the on-site evaluation.

Additionally, the Instructor Station should be assessed to ensure that its operation does not present an unnecessary distraction from observing the activities of the flight crew whilst providing adequate facilities for the tasks.

3.7 Qualification

3.7.1 At the conclusion of the on-site evaluation, where major discrepancies remain unresolved, the Evaluation Team Leader may at his or her discretion decline to qualify the FTD.

3.7.2 Where minor discrepancies remain unresolved, a process and timescale for rectification of all discrepancies outstanding at the conclusion of the on-site evaluation should be agreed to by the FTD Operator and the Evaluation Team Leader.

3.7.3 The Evaluation Team Leader should certify in the QTG that all tests, except those recorded as outstanding, have been completed to the standard required for the appropriate Qualification Level. An Evaluation Report detailing the findings of the evaluation should be produced. A template for the Evaluation Report is enclosed at Flight Training Device Evaluation Report.

3.7.4 All outstanding discrepancies arising from the on-site evaluation, together with the outstanding discrepancies from Operator Testing, should be entered into the FTD's maintenance management system.

3.7.5 Upon satisfactory completion of the on-site evaluation, DGCA should issue a Qualification certificate. A template for the Qualification Certificate is enclosed at Flight Simulator Qualification Certificate. DGCA should review the FTD's reliability in-service and the progress in correcting outstanding discrepancies after the FTD has been qualified for 60 days.

3.8 Support Staff. The FTD Operator should provide sufficient support staff to assist the Evaluation Team with the conduct of the on-site evaluation.

4. RECURRENT EVALUATIONS

4.1 Request for Recurrent Evaluation

4.1.1 The certificate holder of a qualified flight simulator or qualified flight training device shall submit in advance a written request to DGCA for recurrent evaluation.

4.1.2 Such request shall be submitted at least 60 days before the expiry of the flight simulator qualification or flight training device qualification.

4.2 Composition of Evaluation Team

4.2.1 DGCA should appoint the Evaluation Team Leader. The Evaluation Team Leader should have completed an approved Flight Simulator Evaluation course.

4.2.2 The Evaluation Team Leader is responsible for the conduct of the Recurrent Evaluation and for certifying the results achieved.

4.2.3 The Evaluation Team may be made up of a combination of both DGCA and non-DGCA staff. For the duration of the evaluation, any non-DGCA Evaluation Team members should be considered as acting on behalf of DGCA.

It is strongly recommended that individual team members should have completed an approved Flight Simulator Evaluation Course.

4.2.4 The Evaluation Team should consist of at least the following members:

(a) a flight simulation specialist who is familiar with the scope and content of Qualification Test Guides;
(b) a check pilot who is type rated and aircraft current on the aircraft type;
(c) a training pilot or suitably qualified person from one of the intended users who is familiar with the operation of the FTD as a training device, particularly with regard to the Instructor Station.

Note: Non-DGCA staff may participate in any arranged Recurrent Evaluation in an appropriate team member role.

4.2.5 The check pilot (referred to at 4.2.4 (b)) should be selected from not more than two or three suitably qualified pilots who are identified in the FTD Operator's Quality System.

4.3 Content of Recurrent Evaluation. The Recurrent Evaluation should consist of an evaluation of the following:

(a) FTD Operator's Quality System;
(b) overall FTD reliability and serviceability;
(c) current unserviceabilities and defects;
(d) modification status;
(e) Validation Tests;
(f) Functions and Subjective Tests;
(g) the proper functioning of the instructor station, seating, lighting, radio communications, navigation aids, and intercom facilities.

4.4 Quality System

4.4.1 The Evaluation Team should review the effectiveness of the FTD Operator's Quality System, with regard to the specific FTD, including:

(a) quality policy;
(b) management responsibility;
(c) document control;
(d) resource allocation;
(e) quality procedures;
(f) internal audit;
(g) reports, findings and follow up actions; and
(h) corrective and preventative measures.

Note: The Operator's Quality System should be subject to an annual audit by DGCA. This audit should normally be conducted independently from any Recurrent Evaluation.

4.5 Overall FTD reliability and serviceability.

4.5.1 The FTD Operator should provide metrics describing the FTD's performance since the previous Recurrent Evaluation. Further guidance may be found in Aeronautical Radio Inc (ARINC) *Report 433 Standard Measurements for Flight Simulator Quality*.

4.5.2 The FTD Operator should provide a summary of all significant FTD defects that have occurred since the previous Recurrent Evaluation.

4.5.3 The Evaluation Team should review the defect history and the reported overall performance and consider their effects on the future Qualification Level.

4.6 Current Unserviceabilities and Defects

4.6.1 The Evaluation Team should evaluate whether any current unserviceability or defect will affect the Qualification Level of the FTD.

4.7 Modifications

4.7.1 The FTD Operator should provide a summary of all FTD modifications which have occurred since the previous Recurrent Evaluation.

4.7.2 The Evaluation Team should confirm that the Master QTG Validation Tests, if applicable, have been updated to reflect the incorporation of the FTD modifications.

4.7.3 The Evaluation Team should evaluate whether any modifications affect the Qualification Level of the FTD.

4.8 Validation Tests. The Recurrent Evaluation should re-run a representative sample of the Validation Tests in the QTG. This sample size should be approximately 10 - 15%.

4.9 Functions and Subjective Tests.

4.9.1 The Recurrent Evaluation should assess a representative sample of Functions and Subjective Tests. The Functions and Subjective Testing should be structured into one or more flights, for the purpose of evaluating the FTD's reliability and useability as a training device. The continuing overall fidelity, including the integration of the visual and motion systems (if fitted), should be evaluated.

A sample of specific training manoeuvres or scenarios should be incorporated into the flight profiles. This evaluation should contain a selection of those areas essential for flight crew member training, testing and checking, including:
(a) flight deck configuration; and
(b) system functionality during normal and non-normal operations.

4.9.2 During Functions and Subjective Testing, the normal aircraft crew complement should occupy the operating flight crew seats. At least one pilot should be current on the aircraft type and model. That pilot should be competent to assess the FTD's performance both as a representation of the particular aircraft and as a training/testing/checking device.

4.10 Instructor Station and Supporting Facilities. Evaluation of the instructor station, together with the seating, lighting, radio communications, navigation aids and intercom facilities, should be conducted on an ongoing basis throughout the Recurrent Evaluation.

4.11 Continuing Qualification

4.11.1 At the completion of the Recurrent Evaluation, where major discrepancies remain unresolved that are likely to have a significant impact on the continuing use of the FTD, the Evaluation Team Leader may, at his or her discretion, decline to requalify the FTD.

4.11.2 A process and timescale for rectification of all discrepancies outstanding at the conclusion of the Recurrent Evaluation should be agreed between the FTD Operator and the Evaluation Team Leader.

4.11.3 An Evaluation Report detailing the findings of the evaluation should be produced. A template for the Evaluation Report is enclosed at Flight Simulator Evaluation Report.

4.11.4 All outstanding discrepancies arising from the Recurrent Evaluation should be entered into the FTD's maintenance management system.

4.12 Support Staff The FTD Operator should provide sufficient support staff to assist the Evaluation Team with the conduct of the tests and operation of the Instructors' station.

5. EVALUATION TEAM LEADER APPROVAL

The Evaluation Team Leader should have:
(a) completed an approved Flight Simulator Evaluation Course;
(b) previously participated in several Recurrent Evaluations;
(c) an acceptable record of performance in Recurrent Evaluations; and
(d) have demonstrated to DGCA within the last twelve months, the successful completion of a Flight Simulator or FTD Recurrent Evaluation under supervision.

6. FTD APPROVAL

6.1 **Application.** Applicants for FTD Approvals should apply to the DGCA, Directorate of Airworthiness and Aircraft Operation in writing, providing the following:
(a) FTD User details;
(b) FTD Approvals sought;
(c) a copy of the Training and Checking Organization approval (if relevant);
(d) a copy of the Training Syllabus which specifies the FTD-based training sequences (if relevant);
(e) a list of all configuration differences existing between the FTD and the applicant's aircraft;
(f) proposals for differences training (if relevant);
(g) FTD Operator;
(h) FTD Identification details;
(i) FTD Qualification Level; and
(j) a copy of the FTD Qualification Certificate.

Notes:
1. *The Application may reference material previously supplied to, or issued by, DGCA during the process of Training and Checking Organisation approval, Training Syllabus approval, FTD Qualification, and/or Operator approval.*
2. *FTD Users, who are also FTD Operators, may submit a combined application for qualification and approval of an FTD.*

6.2 The applicant should also state that the FTD is suitable for use in its training program, and has been assessed for:
(a) available visual and navigational databases; and
(b) instructor training requirements for use of the FTD's Instructor's Station.

6.3 Approval. The approval should be recorded on the Applicant's AOC.