



GOVERNMENT OF INDIA

**OFFICE OF THE DIRECTOR GENERAL OF CIVIL AVIATION**  
TECHNICAL CENTRE, OPP SAFDURJUNG AIRPORT, NEW DELHI

**CIVIL AVIATION REQUIREMENTS**

**SECTION 2 - AIRWORTHINESS**

**SERIES 'O' PART XIII**

**18<sup>TH</sup> JANUARY 2001**

**EFFECTIVE: FORTHWITH**

**Subject: Requirements for Evaluation, Certification and Maintenance of Aircraft Flight Simulators and Synthetic Flight Training Devices.**

**1. INTRODUCTION**

The availability of advanced technology has permitted greater use of flight simulators and Synthetic Flight Training Devices for training and checking of flight crew. The complexity, cost and operating environment of modern aircraft also have warranted broad use of advanced simulation. With the application of modern technology, simulators can provide more in-depth training that can be accomplished in an aeroplane and provide a very high transfer of learning and behavior from the simulator to aeroplane. The use of simulator for training, in lieu of an aircraft, offers safer flight training, fuel conservation, elimination of aircraft for training, reduction in adverse environmental effects, and reduced cost of training to the operators.

DGCA permits usage of aircraft flight simulators for various training purposes of flight crew such as initial, refresher, recurrent, transition, up-grade and others, which may be given credit towards the flight training requirements for issue and renewal of flight crew licenses, endorsements and ratings and also for the training of check pilots, instructors and examiners. It is, therefore, necessary that performance of the simulators be evaluated prior to the approval for use. Also it is essential that the Simulators and Synthetic Flight Training Devices be maintained to the performance level for which they have been certified.

This CAR lays down the requirements and procedures to be followed for evaluation, certification and maintenance and operation of flight simulators and Synthetic Flight Training Devices. This CAR is issued under the provisions of Rule 133A of the Aircraft Rules, 1937.

**2. APPLICABILITY**

**No person or operator or organization shall use aircraft flight simulator and Synthetic Flight Training Devices for imparting training to flight crew for aircraft whose maximum take off weight is more than 5700 kg unless it has been evaluated and approved by DGCA for the specific purpose of training.**

### 3. DEFINITIONS

For the purpose of this CAR, abbreviations and definitions mentioned below shall be followed: -

- a. **Flight simulation training device:** Any one of the following three types of apparatus in which flight conditions are simulated on the ground:
  - i. *A flight simulator*, which provides an accurate representation of the flight deck of a particular aircraft type to the extent that the mechanical, electrical, electronic, etc. aircraft systems control functions, the normal environment of flight crew members, and the performance and flight characteristics of that type of aircraft are realistically simulated;
  - ii. *A flight procedures trainer*, which provides a realistic flight deck environment, and which simulates instrument responses, simple control functions of mechanical, electrical, electronic, etc. aircraft systems, and the performance and flight characteristics of aircraft of a particular class;
  - iii. *A basic instrument flight trainer*, which is equipped with appropriate instruments, and which simulates the flight deck environment of an aircraft in flight in instrument flight conditions.
- b. **Flight Simulator Data:** The various types of data used to design, manufacture, test and maintain the flight simulator.
- c. **Flight Simulator Evaluation:** A detailed appraisal of a flight simulator by the DGCA to ascertain whether or not the standard required for a specified qualification level is met.
- d. **Initial Training:** The training required for flight crew who have qualified and served in the same capacity on an aircraft.
- e. **Latency:** Additional time beyond that of the basic aeroplane perceivable response time due to the response time of the simulator. This includes the update rate of the computer system combined with the respective time delays of the motion system, visual system or instruments.
- f. **Manual Testing:** Simulator testing wherein the pilot conducts the test without computer inputs except for initial setup.
- g. **Objective Testing:** A quantitative assessment of the simulator functions based on comparison with data.
- h. **Qualification Test Guide (QTG) / Approval Test Guide (ATG):** A document designed to demonstrate that the performance and handling qualities of a Synthetic Training Device (FLIGHT SIMULATOR) agree within prescribed limits with those of the aeroplane and that all applicable regulatory requirements have been met. The QTG/ATG includes both the aeroplane and FLIGHT SIMULATOR data used to support the validation.

- i. **Recurrent Training:** The training for flight crew to remain adequately and currently proficient for each aircraft crew member position and type of operation the flight crew serves.
- j. **Statement of Compliance (SOC):** It is a certification from the operator in regard to evaluation of Flight Simulator that specific requirements have been met. It must provide references to needed sources of information for showing compliance, rationale to explain how the referenced material is used, mathematical equations and parameter values used and conclusion reached.
- k. **Subjective Testing:** A qualitative assessment of the simulator function based on established standards as interpreted by a suitably qualified person.
- l. **Transition Training:** The training required for flight crew who have qualified and served in the same capacity on another aircraft.
- m. **Upgrade Training:** The training for the flight crew who have qualified and served as Co-pilot on a particular type to acquire pilot in command rating on that aircraft.
- n. **Validation Data:** Data used to prove that the simulator performance corresponds to that of the aeroplane.
- o. **Validation Flight Test Data:** Performance, stability & control, and other necessary test parameters electrically or electronically recorded in an aeroplane using a calibrated data acquisition system of sufficient resolution and verified as accurate by the organisation performing the test to establish a reference set of relevant parameters to which like simulator parameters can be compared.
- p. **Visual System Response Time:** The interval from an abrupt control input to the completion of the visual display scan of the first video field containing the resulting different information

#### 4. LEVELS OF FLIGHT SIMULATORS

There are four levels of simulators for qualification

**Level A,**  
**Level B,**  
**Level C,**  
**Level D.**

Level A simulator has the lowest level of technical complexity. Progressive increase of complexity and training capability are achieved as the level increases from A to D. The Appendix "A" describes the minimum requirement for qualifying simulators to Level A, B, C or D.

**The qualification levels are classified based on:**

- a. Simulator Technology (Computer, motion, visual).
- b. Closeness to the airplane simulated.
- c. Objective tools to assess the quality of the simulation.
- d. Operational capabilities.

## **5. FOREIGN DIRECT INVESTMENT FOR SIMULATOR:**

Aircraft Flight Simulators serve the same purpose as aircraft in flying training institutes for training of pilots. The permissible Foreign Direct Investment for institutes providing training using flight simulators shall be the same as is applicable to flying training institutes.

## **6. EVALUATION OF FLIGHT SIMULATOR**

A simulator shall be evaluated by a DGCA nominated evaluation team in association with the operators nominated representatives. On successful evaluation, the DGCA may grant certificate of approval certifying that the simulator meets the criteria of a specific level of qualification. After certification, approval for use of the simulator in a particular training program of an operator will be determined by the Flight Inspection Directorate of DGCA responsible for oversight of the training organization of the operators.

### **6.1 SIMULATOR QUALIFICATION REQUIREMENTS AND TESTS**

An operator shall follow standards specified either in JAR STD-1A or FAA AC120-40B/C for evaluation of the simulators operated by him. A simulator will be evaluated in those areas of performance, which are essential to complete the flight crew training and checking process. This includes the simulator's longitudinal, lateral & directional responses, performance in take off, climb, cruise, descent, approach and landing phases; control checks; pilot, co-pilot, flight engineer, and instructor station functional checks, and certain additional requirements depending upon the complexity or qualification level of the simulator. The motion system and visual system will be evaluated to ensure their proper operation.

As far as possible, the flight simulator should be subjected to objective evaluation. However, pilot acceptance is also an important consideration. Therefore, the flight simulator will be subjected to validation, functions and subjective tests. The validation tests are used to compare flight simulator data with the aeroplane data objectively, to ensure that the tolerances are within specified limits. Functions and subjective tests provide a basis for evaluating flight simulator capability to perform over a period and to verify correct operation of the flight simulator.

## **6.2 COMPOSITION OF EVALUATION TEAM**

The simulator shall be evaluated in accordance with QTG/MQTG for obtaining/maintaining a qualification level. These tests are to be conducted by a group of specialists which will be appointed by the DGCA and consist of at least representatives from Flight Inspection Directorate and Airworthiness Directorate of DGCA.

At the time of evaluation by the DGCA team, the following persons of operator should be present.

- (i) A pilot holding PIC rating on the type of aircraft from the operator or main simulator users.
- (ii) Simulator Evaluation Specialist who has carried out the QTG/ATG tests and the support staff to assist with the running of tests & operation of the instructor's station

## **6.3 INITIAL EVALUATION**

**6.3.1** Initial evaluation of the simulator is intended to assess the functions and test areas necessary for specific training and checking of aircrew. Such areas include simulator's directional responses, performance in take off, climb, cruise, descent, approach and landing, control checks, cockpit, flight engineer and instructor station functions, and other additional requirements, such as motion and visual system checks, depending upon the complexity and category of the simulator.

**6.3.2** An operator seeking approval for simulator initial evaluation, must submit the request on a prescribed application form CA2002, given at Appendix B attached furnishing all the information specified in the application to DGCA through local Airworthiness Office. This request should contain a compliance statement certifying that simulator meets: -

- (a) all of the provisions of JAA/FAA standards (Ref. JAR STD-1A or FAA AC 120-40B/C),
- (b) that the cockpit configuration conforms to that of the aeroplane for which the simulator is being used.
- (c) that specific hardware and software configuration control procedures have been established,
- (d) and that the pilot(s) designated by the operator confirms that it is representative of the aeroplane in all function test area.

The completed QTG/ATG and the operator's compliance statement accompanied with a request for the evaluation should be submitted to local Airworthiness Office at least 60 days in advance. The local Airworthiness

Office will then forward the total package with his comments to DGCA for scheduling an evaluation of the simulator.

The operator may opt for QTG/ATG validation tests to be conducted while the simulator is at the manufacturer's facility. Tests at the manufacturer's facility should be accomplished at the latest practical time prior to disassembly and shipment. In this case the operator must then validate simulator performance at the final location by repeating at least one-third of the validation tests with

QTG/ATG and submit results of tests to DGCA. After review of these tests, DGCA will schedule an initial evaluation. The QTG/ATG must be clearly annotated to indicate when and where each test was accomplished.

The QTG/ATG will be approved after the completion of the initial or upgrade evaluation and all discrepancies in the QTG/ATG have been corrected. This document, after inclusion of the DGCA witnessed test results, becomes the Master QTG (MQTG). The MQTG will then be used as a guide for future recurrent evaluations.

The operators seeking initial or upgrade evaluation of a flight simulator for older aeroplane should be aware that performance and handling data for older aeroplanes may not be of sufficient quality to meet some of the test standards. Operator may be required to acquire additional flight test data.

During flight simulator evaluation, if a problem is encountered with a particular validation test, the test may be repeated to ascertain, whether the error is due to operator or test equipment. If the problem persists, the operator should be prepared to offer alternate test results, relating to the test in question.

Validation tests that do not meet the test criteria should be addressed and reasons explained to the satisfaction of the DGCA

#### **6.4 MAJOR CHANGES / MODIFICATIONS TO FLIGHT SIMULATOR**

A flight simulator should always, represent the aeroplane in ground, flight and environmental condition. Any major changes/ modifications that are carried out on the aeroplane and the aircraft systems influencing the above should be incorporated in the simulator, at the earliest. Decision for incorporating modifications on the simulator will be made by the Chief of Training and in case of ambiguity the same may be referred to the DGCA Headquarters, Flight Inspection Directorate New Delhi for clarification. Up-gradation to the hardware and software that affect flight or ground dynamics should be incorporated on the simulator to improve the performance of the simulator by reducing the latency. These up-gradations are to be notified to the local Airworthiness Office, in writing, by the Manager (QS). The operator should maintain a configuration control system to ensure the continued integrity of the simulator and to account for changes incorporated. The DGCA representative during routine inspection may examine the configuration control system. Modifications, which affect flight or ground dynamics, system function and significant QTG revisions may require a DGCA inspector

evaluation of the simulator. If necessary, the operator shall prepare amendments to any affected validation tests and they should test the simulator to the new criteria. DGCA shall be informed in advance of any major changes to determine if the tests carried out by the operator are satisfactory. A special evaluation of the simulator may be necessary by DGCA prior to returning it to training following the modifications

### **6.5 UPGRADE OF FLIGHT SIMULATOR TO A HIGHER LEVEL**

An operator seeking approval for simulator upgrade evaluation must submit the request on a prescribed application form as per para 5.3. A flight simulator may be upgraded to a higher qualification level. In this case a special evaluation as followed for initial evaluation as per para 5.3 shall be carried out before the award of a higher level of qualification.

If an upgrade is proposed, the operator shall give full details of the modifications carried out on the simulator to DGCA. If the upgrade takes place within the existing approval validity period, a special evaluation is required to permit the simulator to continue to operate even at the previous qualification level. Once the flight simulator is upgraded, the previous validation test results shall not be used to validate simulator performance.

### **6.6 RECURRENT EVALUATION**

For a simulator to retain its qualification, it will be evaluated at regular intervals using the approved MQTG. Unless otherwise determined by DGCA, recurrent evaluations will be accomplished annually, by a Simulator Evaluation Specialist (a suitably trained person in Simulator testing). DGCA team may carry out recurrent evaluation on sample basis, for renewal of the approval. However, operators may carry out the tests every 4 months taking one third of the MQTG at a time. The recurrent evaluation tests shall be conducted within 30 days of its due date and documents submitted to DGCA

### **6.7 SPECIAL EVALUATION**

During recurrent evaluations, if deficiencies are observed or it becomes apparent that the simulator is not being maintained to initial qualification standards, a special evaluation of the simulator may be conducted by the DGCA to verify its status. The simulator will lose its qualification if the simulator does not maintain the original simulator validation criteria during the special evaluation. The DGCA will advise the operator for resolving the deficiencies in an effective manner, if a deficiency is jeopardizing training requirements.

## **6.8 RELOCATION OF A FLIGHT SIMULATOR**

In the event an operator shifts the simulator to a new location and its level of qualification is not changed, the following procedures shall be adopted.

- a) Inform the local Airworthiness Office & DGCA Headquarters (FID) of the proposed shifting of the simulator.
- b) Prior to use of the simulator at the new location, the operator should perform a typical recurrent validation and functions test. The results of such tests will be retained by the operator and be available for inspection by the DGCA team at the next evaluation or as requested.
- c) Any performance deviation observed during the recurrent validation test shall be intimated to DGCA (FID) through local Airworthiness Office. The DGCA may schedule an evaluation prior to return to service.

At the discretion of DGCA the simulator be subjected to evaluation in accordance with the original certification criteria.

## **6.9 CHANGE OF OPERATOR**

The new operator must accomplish all required administrative procedures including the submission of the currently approved MQTG through the local Airworthiness Office to the DGCA (FID). The simulator may, at the discretion of the DGCA, be subjected to an evaluation in accordance with the original qualification criteria. Its original qualification level will be restored only when the flight simulator performs to its original standard.

## **6.10 DEACTIVATION OF A CURRENTLY QUALIFIED SIMULATOR**

- a) In the event an operator plans to deactivate a simulator for a prolonged period, local Airworthiness Office and DGCA (FID) shall be informed and suitable controls established for the period the simulator is inactive.
- b) The operator will establish an appropriate procedure to ensure that the flight simulator can be restored to active status at its original qualification level.

## **7. CERTIFICATION OF FLIGHT SIMULATOR**

On completion of evaluation, the Flight Inspector or DGCA nominated officers will debrief the operator on the results of the tests. A report along with recommendations shall be submitted to DGCA.

A Certificate of approval will be issued by the DGCA Flight Inspection Directorate after successful completion of evaluation tests conducted by DGCA provided all tests and documents prove adherence to requirements.

A Flight simulator qualification (Certificate of Approval) is valid for 2 years unless otherwise specified by the DGCA.

Qualification test for revalidation may take place at any time within 60 days prior to the expiry date of the validity. The new period of validity shall continue from the expiry date of the previous qualification document.

In case qualification tests for revalidation is carried out after the expiry of the validity period, the approval may be revalidated for a further period of twelve months from the date of evaluation.

DGCA may refuse, revoke, suspend or vary a flight simulator qualification, if the provisions of this CAR are not satisfied.

## **8. REQUIREMENTS FOR SIMULATOR INSTALLATION**

Flight Simulator operators shall have suitable premises and install the simulator, which support safe and reliable operation.

The operator shall ensure that the simulator and its installation comply with the local Municipal authority regulations on health and safety. However, following minimum requirements shall be complied with.

Operator shall prepare a circular on the following aspects, which shall be circulated to simulator occupants and maintenance personnel on simulator safety to, ensure that they are aware of

- a. Safety equipment
- b. Arrangement in the simulator in case of emergency.
- c. Adequate fire/smoke detection, warning and suppression, arrangement to ensure the safe passage of personnel from the simulator.
- d. Adequate protections against electrical, mechanical, hydraulic and pneumatic hazard including those arising from the control loading & motion systems.
- e. Other items as given below:
  - i. Two-way communication system, which remains operational in the event of total power failure.
  - ii. Emergency lighting.
  - iii. Escape exits & facilities.
  - iv. Occupant restraints (seats, seat belts etc.)
  - v. External warning of motion and access ramp or stairs activity.
  - vi. Danger area markings.
  - vii. Guard rails and gates.
  - viii. Motion & control loading, emergency stop controls accessible from either pilot and instructor seats;
  - ix. A manually or automatically operated electrical power isolation switch, and
  - x. Motion system and access ramp should be able to be operated from outside by maintenance personnel in emergency.

- f. The simulator safety features such as emergency stops and emergency lighting shall be checked regularly by the flight simulator operator at least once a year and the results are to be recorded.

## 9. RECATEGORISATION OF FLIGHT SIMULATORS

9.1 Flight simulators that are approved prior to issue of this CAR requires to be recategorised after evaluating them against JAR STD-1A/ FAA AC -120-40B & C or equivalent criteria for qualifications level A, B, C or D.

9.2 Flight simulators that can not be recategorised against JAR STD-1A / FAA but that have a primary reference document used for their testing, may be qualified by DGCA to an **equivalent** JAR STD -1A /FAA qualification level i.e OA, OB, OC or OD (the prefix O-stands for '**old**'). These qualification levels refer to similar credits achieved by JAR STD 1A /FAA levels of A, B, C & D.

- a) To gain and maintain an equivalent qualification level, these flight simulators shall be assessed in those areas which are essential to completing the flight crewmember training and checking process; which includes.
- (i) Longitudinal, lateral and directional handling qualities.
  - (ii) Performance on the ground and in the air
  - (iii) Specific operations where applicable in flight deck configuration.
  - (iv) Functioning during normal, abnormal, emergency and wherever abnormal operations are applicable.
  - (v) Instructor station function and simulator control; and
  - (vi) Additional requirements depending on the qualification level and the installed equipment.
- b) The flight simulator shall be subjected to:
- (i) Validation tests and
  - (ii) Functions and subjective tests.

9.3 Flight simulator that cannot be recategorised and that do not have a primary reference document used for their testing shall be qualified by special arrangement. Such simulator will be issued with special categories and shall be subjected to functions and subjective tests. In addition to the above, any previously recognized.

**Note:** Flight simulators that have not been approved earlier will be evaluated in accordance with any one of the provisions described above as applicable. Operators shall make all efforts to get the simulator evaluated for approval at the earliest possible time but not later than six months from the effective date of this CAR.

## 10. QUALITY SYSTEM

In order to comply with DGCA requirements on qualification and maintenance of the required level, the flight simulator operator should establish a Quality System to the satisfaction of DGCA. Necessary guidelines for establishing such

quality system are given in JAR -STD-1A. DGCA on being satisfied that the operator has a satisfactory quality system for carrying out qualification test and maintenance of each type of simulator may grant approval to the organization.

### **10.1 MANAGER (QUALITY SYSTEM)**

A suitable qualified person shall be nominated to act as Manager (Quality System). He will be responsible for management of Quality System, monitoring function, and taking corrective action. He will have put up sufficient experience in carrying out qualification tests and flight simulator maintenance and will be approved by DGCA.

### **10.2 QUALITY SYSTEM POLICY**

Manager (Quality System) shall prepare a Quality Manual detailing the organization structure, duties and responsibilities of the persons shown in the organization structure, policies, procedures and practices consistent with DGCA requirements and the broad aims the Quality System is intended to achieve. The quality policy should reflect the achievement and continued compliance with DGCA requirements together with any additional standards specified by the operator. This Quality Manual requires to be approved by DGCA as a prerequisite for grant of approval.

Suitably qualified engineers will assist the Manager (Quality System) in maintaining the simulator to the appropriate standard.

Manager (Quality System) will be fully responsible for proper functioning of the Quality System including the frequency, format and structure of the internal management evaluation activities as enunciated in the approved Quality Manual. The manual may be prepared in accordance with the guidelines given in JAR – STD 1A (Section 2).

## **11. SIMULATOR MAINTENANCE PROGRAMME**

The simulator operators should evolve a maintenance program based on the recommendations of the simulator manufacturer and using their own operational experience and documented in the Quality Manual. The maintenance program should consist of:

- a. Periodic checks at regular intervals as specified by the manufacturer.
- b. Establishing procedures for reporting of defects/ defect rectification, analysis and taking preventive maintenance.
- c. Preparation of “Allowable Deficiency List” (ADL), similar to aircraft MEL, for better utilization of the simulator.
- d. Making timely replacement action of major components, as recommended by the manufacturer, to reduce down time of simulator.
- e. Incorporating modification on the simulator to reflect the changes in the aircraft which are essential for training and checking. Incorporating modifications of hardware & software, as an upgrade, which may affect flight,

ground handling and performance or any major modifications of the motion or visual system.

### **11.1 PERIODIC INSPECTION**

Comprehensive schedules for inspection of simulator should be prepared by Manager (QS). The schedules should be prepared on the basis of

- (a) the manufacturer's maintenance manual
- (b) service bulletins
- (c) service letters,
- (d) alert bulletins etc and may comprise of daily, weekly, monthly, six monthly inspections etc

These inspections are to be carried out by suitably qualified and trained persons and shall be certified by them. The Manager (QS) should ensure that an appropriately qualified person has carried out inspections and appended his signature with date at the end of the schedule.

### **11.2 DEFECT RECTIFICATION AND ANALYSIS:-**

All defects observed during operation /maintenance / QTG tests shall be rectified and recorded in a separate register maintained for this purpose. The register should be submitted to the Manager (Quality System) for his scrutiny and further necessary action.

The defects observed should be rectified by duly qualified / trained/ experienced engineers.

A “Daily Shift Register (Maint.)” shall be maintained by the operator so that any action taken on rectification of defect/general maintenance carried out by the previous shift engineer will be known to the engineer who is on duty.

The defects and rectification action taken are required to be intimated to the local Airworthiness Office in the form of ‘Daily Serviceability Report’. Defects of repetitive nature should be given utmost importance and should be investigated thoroughly with the help of manufacturer. Action taken on such defects should be intimated to local Airworthiness Office for information and record.

### **11.3 PREVENTIVE MAINTENANCE**

The Manager (Quality System) shall prepare a list of all major components, which require bench check/ calibration / overhaul at stipulated intervals. He shall ensure that these components are replaced within the stipulated intervals as per the list. Copies of this list should be available to the simulator maintenance engineers for appropriate action during simulator maintenance. The Manager (Quality System) may reduce component life if number of

premature removals is experienced. Sufficient float level of spares should be kept available for maintenance of the simulator.

#### **11.4 ALLOWABLE DEFICIENCY LIST (ADL)**

Allowable Deficiency List (ADL) which is similar to aircraft MEL (Minimum Equipment List) should be prepared by Manager (QS) based on manufacturer's ADL in consultation with the pilot instructors. The list will contain 'GO'/'NO GO' items, Air Transport Association (ATA) chapter wise, along with explanation for operation of simulator with 'GO' items. The ADL will provide to the simulator instructor the services that are available for training, with restrictions/limitations, if any, on the operational aspects, against the inoperative item. The ADL may be equal to or more stringent than the manufacturer's ADL.

A copy of the ADL should be submitted to the local Airworthiness Office for approval in consultation with FID. A copy of ADL should be kept in the simulator for reference of the crew.

While invoking the provisions of ADL the simulator operator establish procedure and should follow the guidelines given below for proper conduct of simulator training.

- a) The simulator engineer should notify the simulator instructor/scheduling office of the inoperative component/item, and if possible, provide an estimated time for replacement.
  
- b) The simulator engineer should notify the simulator instructor, the restrictions/limitations imposed on the training, due to failure of the item.
  
- c) The simulator instructor should exercise his judgement and decide about the type of training that he can under take, based on whether the inoperative item is required to meet training objectives
  - (i) for a particular crew position
  - Or
  - (ii) for a particular phase of training.

The simulator instructor will reject the training if either condition of the above applies.

In such occasions, simulator instructor may choose the type of training, which does not involve the failed item(s). If the simulator instructor accepts the simulator for Training, under ADL he shall specify the restrictions that apply, such as 'training in specific maneuvers', in the snag registers.

#### **12. GENERAL CONDITIONS:**

- 12.1** Periodical evaluation checks of the simulators shall be carried out by the DGCA approved pilot instructors/ examiners who are qualified on the type and DGCA

nominated officers, to confirm objectively that the simulator performance is within the specified tolerance limits for their revalidation, and that it has been maintained as required.

- 12.2** If the evaluation for certification or renewal reveals any significant deficiency in the performance of the simulator, the evaluation process may be repeated. In case the deficiency persists and the simulator does not meet the required criteria but can perform satisfactorily to lower criteria, the simulator may be certified by the DGCA for that lower criteria performance.
- 12.3** Any time an approved simulator is reinstalled at the new location/ site it requires a certification to the standard of initial approval.
- 12.4** The operator shall ensure the serviceability of the simulator must conform to the standard for which it qualifies as a substitute for flight check/ flying experience. Failure to comply with this will render the approval of simulator and the checks/ flying done on such simulator, invalid.
- 13.** This CAR cancels CAR Section 7 Series 'M' Part III dated 31<sup>st</sup> July 1997.



(R. P. Sahi)

Joint Director General of Civil Aviation  
for Director General of Civil Aviation

**Minimum Simulator Requirements for qualifying DGCA  
Level A, B, C & D Simulators**

Qualification Level	Technical Capabilities	Training Capabilities
<p><b>Level A</b></p>	<p>The lowest level of simulator technical complexity. An enclosed full scale replica of the aeroplane cockpit/light deck including simulation of all systems, instruments, navigational equipment, communications and caution and warning systems. An instructor's station with seat (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 specific data tailored to the specific aeroplane type with fidelity sufficient to meet the objective tests. Functions and subjective tests are allowed. Genetic Ground Effect and ground handling models are permitted. Motion, visual and sound systems sufficient to support the training, testing and checking credits sought are required. The visual system (shall) provide at least 45 degrees horizontal and 30 degrees vertical field of view per pilot. A night scene is acceptable. The response to control inputs shall not be greater than 300 milliseconds more than that experienced on the aircraft. Wind shear need not be simulated.</p>	<p>Suitable for:</p> <ul style="list-style-type: none"> <li><input type="checkbox"/> Crew procedure training.</li> <li><input type="checkbox"/> Instrument Flight training.</li> <li><input type="checkbox"/> Transition/Conversion training, testing and checking except for take off and landing maneuvers.</li> </ul> <p>Recurrent training, checking and testing (Type and instrument rating renewal/revalidation).</p>
<p><b>Level B</b></p>	<p>As for Level A plus: 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"> <li><input type="checkbox"/> Recency of experiences (three take off and landings in 90 days).</li> <li><input type="checkbox"/> Transition/Conversion training for take off and landing maneuvers.</li> <li><input type="checkbox"/> Transition/Conversion testing and checking except for take off and landings.</li> </ul>

APPENDIX 'A' (contd.)

Qualification Level	Technical Capabilities	Training Capabilities
<p><b>Level C</b></p>	<p>The second highest level of simulator performance. As for Level B plus: A Dusk/ Night Visual system is required with an instantaneous horizontal field of view of not less than 75 degrees per pilot. A six-axis motion system shall be provided. The sound simulation (shall) include the sounds of precipitation and other significant (aeroplane) noises to the pilot and (shall) be able to reproduce the sounds of a crash landing. The response to control inputs shall not be greater than 150 milliseconds more than that experienced on the aircraft. Wind shear simulation (shall) be provided.</p>	<p>As for Level B plus:  <input type="checkbox"/> Transition/ Conversion testing and checking of take off and landings for crewmembers whose minimum experience level is defined by the Authority.</p>
<p><b>Level D</b></p>	<p>The highest level of simulator performance. As for Level C plus: A full Daylight/Dusk/Night visual system is required and there (shall) be complete fidelity of sounds and motion buffets.</p>	<p>As for Level C plus: <input type="checkbox"/> Transition/Conversion testing and checking of take off and landings for crews, who may be required to meet a minimum experience level defined by the Authority.</p>



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## **1. INTRODUCTION**

The availability of advanced technology has permitted greater use of flight simulators for training and checking of flight crew. The complexity, cost and operating environment of modern aircraft also have warranted broad use of advanced simulation. With the application of modern technology, simulators can provide more in-depth training that can be accomplished in an aeroplane and provide a very high transfer of learning and behavior from the simulator to aeroplane. The use of simulator for training, in lieu of an aeroplane, offers safer flight training, fuel conservation, elimination of aeroplane for training, reduction in adverse environmental effects, and reduced cost of training to the operators.

DGCA permits usage of aeroplane flight simulators for various training purposes of flight crew such as initial, refresher, recurrent, transition, up-grade and others, which may be given credit towards the flight training requirements for issue and renewal of flight crew licences, endorsements and ratings and also for the training of check pilots, instructors and examiners. It is, therefore, necessary that performance of the simulators be evaluated prior to the approval for use. Also it is essential that the flight simulators be maintained to the performance level for which they have been certified.

This CAR lays down the requirements and procedures to be followed for evaluation, certification and maintenance of Flight Simulators and is issued under the provisions of Rule 133A of the Aircraft Rules, 1937.

## **2. APPLICABILITY**

**No person or operator or organization shall use aeroplane flight simulator for imparting training to flight crew for aeroplane whose maximum take off weight is more than 5700 kg unless it has been evaluated and approved by DGCA for the specific purpose of training.**

### 3. DEFINITIONS

For the purpose of this CAR, abbreviations and definitions mentioned below shall be followed: -

- a. **Aeroplane Flight Simulator:** A full size replica of a specified type or make, model and series aeroplane cockpit, including the assemblage of equipment and software necessary to represent the aeroplane on ground, flight operation and out of the cockpit view and a force cueing system; and is in compliance with the minimum standards for flight simulator qualification.
- b. **Flight Simulator Data:** The various types of data used to design, manufacture, test and maintain the flight simulator.
- c. **Flight Simulator Evaluation:** A detailed appraisal of a flight simulator by the DGCA to ascertain whether or not the standard required for a specified qualification level is met.
- d. **Latency :** Additional time beyond that of the basic aeroplane perceivable response time due to the response time of the simulator. This includes the update rate of the computer system combined with the respective time delays of the motion system, visual system or instruments.
- e. **Manual Testing:** Simulator testing wherein the pilot conducts the test without computer inputs except for initial setup.
- f. **Objective Testing :** A quantitative assessment of the simulator functions based on comparison with data.
- g. **Qualification Test Guide (QTG) / Approval Test Guide (ATG):** A document designed to demonstrate that the performance and handling qualities of a Synthetic Training Device (FLIGHT SIMULATOR) agree within prescribed limits with those of the aeroplane and that all applicable regulatory requirements have been met. The QTG/ATG includes both the aeroplane and FLIGHT SIMULATOR data used to support the validation.
- h. **Statement of Compliance (SOC):** It is a certification from the operator in regard to evaluation of Flight Simulator that specific requirements have been met. It must provide references to needed sources of information for showing compliance, rationale to explain how the referenced material is used, mathematical equations and parameter values used and conclusion reached.
- i. **Subjective Testing:** A qualitative assessment of the simulator function based on established standards as interpreted by a suitably qualified person.
- j. **Validation Data:** Data used to prove that the simulator performance corresponds to that of the aeroplane.

- k. **Validation Flight Test Data:** Performance, stability & control, and other necessary test parameters electrically or electronically recorded in an aeroplane using a calibrated data acquisition system of sufficient resolution and verified as accurate by the organisation performing the test to establish a reference set of relevant parameters to which like simulator parameters can be compared.
- l. **Visual System Response Time:** The interval from an abrupt control input to the completion of the visual display scan of the first video field containing the resulting different information

#### 4 LEVELS OF FLIGHT SIMULATORS

There are four levels of simulators for qualification

**Level A,**  
**Level B,**  
**Level C,**  
**Level D.**

Level A simulator has the lowest level of technical complexity. Progressive increase of complexity and training capability are achieved as the level increases from A to D. The Appendix "A" describes the minimum requirement for qualifying simulators to Level A, B, C or D.

**The qualification levels are classified based on:**

- a. Simulator Technology (Computer, motion, visual).
- b. Closeness to the airplane simulated.
- c. Objective tools to assess the quality of the simulation.
- d. Operational capabilities.

#### 5 EVALUATION OF FLIGHT SIMULATOR

A simulator shall be evaluated by a DGCA nominated evaluation team. On successful evaluation, the DGCA may grant certificate of approval certifying that the simulator meets the criteria of a specific level of qualification. After certification, approval for use of the simulator in a particular training program of an operator will be determined by the Flight Inspection Directorate of DGCA responsible for oversight of the training organization of the operators.

##### 5.1 SIMULATOR QUALIFICATION REQUIREMENTS AND TESTS

An operator shall follow standards specified either in JAR STD-1A or FAA AC 120-40B/C for evaluation of the simulators operated by him. A simulator will be evaluated in those areas of performance, which are essential to complete the flight crew training and checking process. This includes the simulator's longitudinal, lateral & directional responses, performance in take off, climb, cruise, descent, approach and landing phases; control checks; pilot, co-pilot,

flight engineer, and instructor station functional checks, and certain additional requirements depending upon the complexity or qualification level of the simulator. The motion system and visual system will be evaluated to ensure their proper operation.

As far as possible, the flight simulator should be subjected to **objective** evaluation. However, pilot acceptance is also an important consideration. Therefore, the flight simulator will be subjected to validation, functions and subjective tests. The validation tests are used to compare flight simulator data with the aeroplane data objectively, to ensure that the tolerances are within specified limits. Functions and subjective tests provide a basis for evaluating flight simulator capability to perform over a period and to verify correct operation of the flight simulator.

## 5.2 COMPOSITION OF EVALUATION TEAM

The simulator shall be evaluated in accordance with QTG/MQTG for obtaining/maintaining a qualification level. These tests are to be conducted by a group of specialists which will be appointed by the DGCA and consist of at least representatives from Flight Inspection Directorate and Airworthiness Directorate of DGCA.

At the time of evaluation by the DGCA team, the following persons of operator should be present.

- (i) A pilot holding PIC rating on the type of aircraft from the operator or main simulator users.
- (ii) Simulator Evaluation Specialist who has carried out the QTG/ATG tests and the support staff to assist with the running of tests & operation of the instructor's station

## 5.3 INITIAL EVALUATION

An operator seeking approval for simulator initial evaluation, must submit the request on a prescribed application form CA2002, given at Appendix B attached furnishing all the information specified in the application to DGCA through local Airworthiness Office. This request should contain a compliance statement certifying that simulator meets: -

- (a) all of the provisions of JAA/FAA standards (Ref. JAR STD-1A or FAA AC 120-40B/C),
- (b) that the cockpit configuration conforms to that of the aeroplane for which the simulator is being used.
- (c) that specific hardware and software configuration control procedures have been established,

- (d) and that the pilot(s) designated by the operator confirms that it is representative of the aeroplane in all function test area.

The completed QTG/ATG and the operator's compliance statement accompanied with a request for the evaluation should be submitted to local Airworthiness Office at least 60 days in advance. The local Airworthiness Office will then forward the total package with his comments to DGCA for scheduling an evaluation of the simulator.

The operator may opt for QTG/ATG validation tests to be conducted while the simulator is at the manufacturer's facility. Tests at the manufacturer's facility should be accomplished at the latest practical time prior to disassembly and shipment. In this case the operator must then validate simulator performance at the final location by repeating at least one-third of the validation tests with QTG/ATG and submit results of tests to DGCA. After review of these tests, DGCA will schedule an initial evaluation. The QTG/ATG must be clearly annotated to indicate when and where each test was accomplished.

The QTG/ATG will be approved after the completion of the initial or upgrade evaluation and all discrepancies in the QTG/ATG have been corrected. This document, after inclusion of the DGCA witnessed test results, becomes the Master QTG (MQTG). The MQTG will then be used as a guide for future recurrent evaluations.

The operators seeking initial or upgrade evaluation of a flight simulator for older aeroplane should be aware that performance and handling data for older aeroplanes may not be of sufficient quality to meet some of the test standards. Operator may be required to acquire additional flight test data.

During flight simulator evaluation, if a problem is encountered with a particular validation test, the test may be repeated to ascertain, whether the error is due to operator or test equipment. If the problem persists, the operator should be prepared to offer alternate test results, relating to the test in question.

Validation tests that do not meet the test criteria should be addressed and reasons explained to the satisfaction of the DGCA

#### **5.4 MAJOR CHANGES / MODIFICATIONS TO FLIGHT SIMULATOR**

A flight simulator should always, represent the aeroplane in ground, flight and environmental condition. Any major changes/ modifications that are carried out on the aeroplane and the aircraft systems influencing the above should be incorporated in the simulator, at the earliest. Decision for incorporating modifications on the simulator will be made by the Chief of Training and in case of ambiguity the same may be referred to the DGCA Headquarters, Flight Inspection Directorate New Delhi for clarification. Up-gradation to the hardware and software that affect flight or ground dynamics should be incorporated on the simulator to improve the performance of the simulator by reducing the latency.

These up-gradations are to be notified to the local Airworthiness Office, in writing, by the Manager (QS). The operator should maintain a configuration control system to ensure the continued integrity of the simulator and to account for changes incorporated. The DGCA representative during routine inspection may examine the configuration control system. Modifications, which affect flight or ground dynamics, system function and significant QTG revisions may require a DGCA inspector evaluation of the simulator. If necessary, the operator shall prepare amendments to any affected validation tests and they should test the simulator to the new criteria. DGCA shall be informed in advance of any major changes to determine if the tests carried out by the operator are satisfactory. A special evaluation of the simulator may be necessary by DGCA prior to returning it to training following the modifications

### **5.5 UPGRADE OF FLIGHT SIMULATOR TO A HIGHER LEVEL**

An operator seeking approval for simulator upgrade evaluation, must submit the request on a prescribed application form as per para 5.3. A flight simulator may be upgraded to a higher qualification level. In this case a special evaluation as followed for initial evaluation as per para 5.3 shall be carried out before the award of a higher level of qualification.

If an upgrade is proposed, the operator shall give full details of the modifications carried out on the simulator to DGCA. If the upgrade takes place within the existing approval validity period, a special evaluation is required to permit the simulator to continue to operate even at the previous qualification level. Once the flight simulator is upgraded, the previous validation test results shall not be used to validate simulator performance.

### **5.6 RECURRENT EVALUATION**

For a simulator to retain its qualification, it will be evaluated at regular intervals using the approved MQTG. Unless otherwise determined by DGCA, recurrent evaluations will be accomplished annually, by a Simulator Evaluation Specialist (a suitably trained person in Simulator testing). DGCA team may carry out recurrent evaluation on sample basis, for renewal of the approval. However, operators may carry out the tests every 4 months taking one third of the MQTG at a time. The recurrent evaluation tests shall be conducted within 30 days of its due date and documents submitted to DGCA

### **5.7 SPECIAL EVALUATION**

During recurrent evaluations, if deficiencies are observed or it becomes apparent that the simulator is not being maintained to initial qualification standards, a special evaluation of the simulator may be conducted by the DGCA to verify its status. The simulator will lose its qualification if the simulator does not maintain the original simulator validation criteria during the special evaluation. The DGCA will advise the operator for resolving the deficiencies in an effective manner, if a deficiency is jeopardizing training requirements.

## **5.8 RELOCATION OF A FLIGHT SIMULATOR**

In the event an operator shifts the simulator to a new location and its level of qualification is not changed, the following procedures shall be adopted.

- a. Inform the local Airworthiness Office & DGCA Headquarters (FID) of the proposed shifting of the simulator.
- b. Prior to use of the simulator at the new location, the operator should perform a typical recurrent validation and functions test. The results of such tests will be retained by the operator and be available for inspection by the DGCA team at the next evaluation or as requested.
- c. Any performance deviation observed during the recurrent validation test shall be intimated to DGCA (FID) through local Airworthiness Office. The DGCA may schedule an evaluation prior to return to service.

At the discretion of DGCA the simulator be subjected to evaluation in accordance with the original certification criteria.

## **5.9 CHANGE OF OPERATOR**

The new operator must accomplish all required administrative procedures including the submission of the currently approved MQTG through the local Airworthiness Office to the DGCA (FID). The simulator may, at the discretion of the DGCA, be subjected to an evaluation in accordance with the original qualification criteria. Its original qualification level will be restored only when the flight simulator performs to its original standard.

## **5.10 DEACTIVATION OF A CURRENTLY QUALIFIED SIMULATOR**

- a. In the event an operator plans to deactivate a simulator for a prolonged period, local Airworthiness Office and DGCA (FID) shall be informed and suitable controls established for the period the simulator is inactive.
- b. The operator will establish an appropriate procedure to ensure that the flight simulator can be restored to active status at its original qualification level.

## **6 CERTIFICATION OF FLIGHT SIMULATOR**

A Certificate of approval will be issued by the DGCA Flight Inspection Directorate after successful completion of evaluation tests conducted by DGCA provided all tests and documents prove adherence to requirements.

A Flight simulator qualification (Certificate of Approval) is valid for 12 months unless otherwise specified by the DGCA.

Qualification test for revalidation may take place at any time within 60 days prior to the expiry date of the validity. The new period of validity shall continue from the expiry date of the previous qualification document.

In case qualification tests for revalidation is carried out after the expiry of the validity period, the approval may be revalidated for a further period of twelve months from the date of evaluation.

DGCA may refuse, revoke, suspend or vary a flight simulator qualification, if the provisions of this CAR are not satisfied.

## **7 REQUIREMENTS FOR SIMULATOR INSTALLATION**

Flight Simulator operators shall have suitable premises and install the simulator, which support safe and reliable operation.

The operator shall ensure that the simulator and its installation comply with the local Municipal authority regulations on health and safety. However, following minimum requirements shall be complied with.

Operator shall prepare a circular on the following aspects, which shall be circulated to simulator occupants and maintenance personnel on simulator safety to, ensure that they are aware of

- a. Safety equipment
- b. Arrangement in the simulator in case of emergency.
- c. Adequate fire/smoke detection, warning and suppression, arrangement to ensure the safe passage of personnel from the simulator.
- d. Adequate protections against electrical, mechanical, hydraulic and pneumatic hazard including those arising from the control loading & motion systems.
- e. Other items as given below:
  - i. Two-way communication system which remains operational in the event of total power failure.
  - ii. Emergency lighting.
  - iii. Escape exits & facilities.
  - iv. Occupant restraints (seats, seat belts etc.)
  - v. External warning of motion and access ramp or stairs activity.
  - vi. Danger area markings.
  - vii. Guard rails and gates.
  - viii. Motion & control loading, emergency stop controls accessible from either pilot and instructor seats;
  - ix. A manually or automatically operated electrical power isolation switch, and
  - x. Motion system and access ramp should be able to be operated from outside by maintenance personnel in emergency.
- f. The simulator safety features such as emergency stops and emergency lighting shall be checked regularly by the flight simulator operator at least once a year and the results are to be recorded.

## 8 RECATEGORISATION OF FLIGHT SIMULATORS

8.1 Flight simulators that are approved prior to issue of this CAR requires to be recategorised after evaluating them against JAR STD-1A /FAA AC -120-40B& C or equivalent criteria for qualifications level A, B, C or D.

8.2 Flight simulators that can not be recategorised against JAR STD-1A / FAA but that have a primary reference document used for their testing, may be qualified by DGCA to an **equivalent** JAR STD -1A /FAA qualification level i.e OA, OB, OC or OD (the prefix O-stands for 'old'). These qualification levels refer to similar credits achieved by JAR STD 1A /FAA levels of A, B, C & D.

a) To gain and maintain an equivalent qualification level, these flight simulators shall be assessed in those areas which are essential to completing the flight crewmember training and checking process; which includes.

- (i) Longitudinal, lateral and directional handling qualities.
- (ii) Performance on the ground and in the air
- (iii) Specific operations where applicable in flight deck configuration.
- (iv) Functioning during normal, abnormal, emergency and wherever abnormal operations are applicable.
- (v) Instructor station function and simulator control; and
- (vi) Additional requirements depending on the qualification level and the installed equipment.

b) The flight simulator shall be subjected to:

- (i) Validation tests and
- (ii) Functions and subjective tests.

8.3 Flight simulator that cannot be recategorised and that do not have a primary reference document used for their testing shall be qualified by special arrangement. Such simulator will be issued with special categories and shall be subjected to functions and subjective tests. In addition to the above, any previously recognized validation test shall be used.

**Note:** Flight simulators that have not been approved earlier will be evaluated in accordance with any one of the provisions described above as applicable. Operators shall make all efforts to get the simulator evaluated for approval at the earliest possible time but not later than six months from the effective date of this CAR.

## 9 QUALITY SYSTEM

In order to comply with DGCA requirements on qualification and maintenance of the required level, the flight simulator operator should establish a Quality System to the satisfaction of DGCA. Necessary guidelines for establishing such quality system are

given in JAR -STD-1A. DGCA on being satisfied that the operator has a satisfactory quality system for carrying out qualification test and maintenance of each type of simulator may grant approval to the organization.

### **9.1 MANAGER (QUALITY SYSTEM)**

A suitable qualified person shall be nominated to act as Manger (Quality System). He will be responsible for management of Quality System, monitoring function, and taking corrective action. He will have put up sufficient experience in carrying out qualification tests and flight simulator maintenance and will be approved by DGCA.

### **9.2 QUALITY SYSTEM POLICY**

Manager (Quality System) shall prepare a Quality Manual detailing the organization structure, duties and responsibilities of the persons shown in the organization structure, policies, procedures and practices consistent with DGCA requirements and the broad aims the Quality System is intended to achieve. The quality policy should reflect the achievement and continued compliance with DGCA requirements together with any additional standards specified by the operator. This Quality Manual requires to be approved by DGCA as a prerequisite for grant of approval.

Suitably qualified engineers will assist the Manager (Quality System) in maintaining the simulator to the appropriate standard.

Manager (Quality System) will be fully responsible for proper functioning of the Quality System including the frequency, format and structure of the internal management evaluation activities as enunciated in the approved Quality Manual. The manual may be prepared in accordance with the guidelines given in JAR – STD 1A (Section 2).

## **10. SIMULATOR MAINTENANCE PROGRAMME**

The simulator operators should evolve a maintenance program based on the recommendations of the simulator manufacturer and using their own operational experience and documented in the Quality Manual. The maintenance program should consist of :

- a. Periodic checks at regular intervals as specified by the manufacturer.
- b. Establishing procedures for reporting of defects/ defect rectification, analysis and taking preventive maintenance.
- c. Preparation of “Allowable Deficiency List” (ADL), similar to aircraft MEL, for better utilization of the simulator.
- d. Making timely replacement action of major components, as recommended by the manufacturer, to reduce down time of simulator.
- e. Incorporating modification on the simulator to reflect the changes in the aircraft which are essential for training and checking. Incorporating modifications of hardware & software, as an upgrade, which may affect flight, ground handling and performance or any major modifications of the motion or visual system.

### **10.1 PERIODIC INSPECTION**

Comprehensive schedules for inspection of simulator should be prepared by Manager (QS). The schedules should be prepared on the basis of

- (a) the manufacturer's maintenance manual
- (b) service bulletins
- (c) service letters,
- (d) alert bulletins etc and may comprise of daily, weekly, monthly, six monthly inspections etc

These inspections are to be carried out by suitably qualified and trained persons and shall be certified by them. The Manager (QS) should ensure that an appropriately qualified person has carried out inspections and appended his signature with date at the end of the schedule.

### **10.2 DEFECT RECTIFICATION AND ANALYSIS:-**

All defects observed during operation /maintenance / QTG tests shall be rectified and recorded in a separate register maintained for this purpose. The register should be submitted to the Manager (Quality System) for his scrutiny and further necessary action.

The defects observed should be rectified by duly qualified / trained/ experienced engineers.

A "Daily Shift Register (Maint.);" shall be maintained by the operator so that any action taken on rectification of defect/general maintenance carried out by the previous shift engineer will be known to the engineer who is on duty.

The defects and rectification action taken are required to be intimated to the local Airworthiness Office in the form of 'Daily Serviceability Report'. Defects of repetitive nature should be given utmost importance and should be investigated thoroughly with the help of manufacturer. Action taken on such defects should be intimated to local Airworthiness Office for information and record.

### **10.3 PREVENTIVE MAINTENANCE**

The Manager (Quality System) shall prepare a list of all major components, which require bench check/ calibration / overhaul at stipulated intervals. He shall ensure that these components are replaced within the stipulated intervals as per the list. Copies of this list should be available to the simulator maintenance engineers for appropriate action during simulator maintenance. The Manager (Quality System) may reduce component life if number of premature removals is experienced.

Sufficient float level of spares should be kept available for maintenance of the simulator.

#### 10.4 ALLOWABLE DEFICIENCY LIST (ADL)

Allowable Deficiency List (ADL) which is similar to aircraft MEL (Minimum Equipment List) should be prepared by Manager (QS) based on manufacturer's ADL in consultation with the pilot instructors. The list will contain 'GO'/'NO GO' items, Air Transport Association (ATA) chapter wise, along with explanation for operation of simulator with 'GO' items. The ADL will provide to the simulator instructor the services that are available for training, with restrictions/limitations, if any, on the operational aspects, against the inoperative item. The ADL may be equal to or more stringent than the manufacturer's ADL.

A copy of the ADL should be submitted to the local Airworthiness Office for approval in consultation with FID. A copy of ADL should be kept in the simulator for reference of the crew.

While invoking the provisions of ADL the simulator operator establish procedure and should follow the guidelines given below for proper conduct of simulator training.

- a) The simulator engineer should notify the simulator instructor/scheduling office of the inoperative component/item, and if possible, provide an estimated time for replacement.
- b) The simulator engineer should notify the simulator instructor, the restrictions/limitations imposed on the training, due to failure of the item.
- c) The simulator instructor should exercise his judgement and decide about the type of training that he can under take, based on whether the inoperative item is required to meet training objectives
  - (i) for a particular crew position
  - Or
  - (ii) for a particular phase of training.

The simulator instructor will reject the training if either condition of the above applies. In such occasions, simulator instructor may choose the type of training, which does not involve the failed item(s). If the simulator instructor accepts the simulator for training, under ADL he shall specify the restrictions that apply, such as 'training in specific maneuvers', in the snag registers.

Sd/-  
**(N Ramesh)**  
Deputy Director General of Civil Aviation  
for Director General of Civil Aviation

**APPENDIX 'A'**


**Minimum Simulator Requirements for qualifying DGCA  
Level A, B, C & D Simulators**

<b>Qualification Level</b>	<b>Technical Capabilities</b>	<b>Training Capabilities</b>
<b><u>Level A</u></b>	<p>The lowest level of simulator technical complexity. An enclosed full scale replica of the aeroplane cockpit/light deck including simulation of all systems, instruments, navigational equipment, communications and caution and warning systems. An instructor's station with seat (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 specific data tailored to the specific aeroplane type with fidelity sufficient to meet the objective tests. Functions and subjective tests are allowed. Genetic 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.</p> <p>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"> <li>• Crew procedure training.</li> <li>• Instrument Flight training.</li> <li>• Transition/Conversion training, testing and checking except for take off and landing maneuvers.</li> </ul> <p>Recurrent training, checking and testing (Type and instrument rating renewal/revalidation).</p>
<b><u>Level B</u></b>	<p>As for Level A plus: 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"> <li>• Recency of experiences (three take off and landings in 90 days.</li> <li>• Transition/Conversion training for take off and landing maneuvers.</li> <li>• Transition/Conversion testing and checking except for take off and landings.</li> </ul>

**APPENDIX 'A' (contd.)**

<b>Qualification Level</b>	<b>Technical Capabilities</b>	<b>Training Capabilities</b>
<b><u>Level C</u></b>	<p>The second highest level of simulator performance.</p> <p>As for Level B plus:                      A Dusk/Night Visual system is required with an instantaneous horizontal field of view of not less than 75 degrees per pilot.                      A six-axis motion system shall be provided.                      The sound simulation (shall) include the sounds of precipitation and other significant (aeroplane) noises to the pilot and (shall) be able to reproduce the sounds of a crash landing.                      The response to control inputs shall not be greater than 150 milliseconds more than that experienced on the aircraft.                      Wind shear simulation (shall) be provided.</p>	<p>As for Level B plus:</p> <ul style="list-style-type: none"> <li>• Transition/Conversion testing and checking of take off and landings for crewmembers whose minimum experience level is defined by the Authority.</li> </ul>
<b><u>Level D</u></b>	<p>The highest level of simulator performance.</p> <p>As for Level C plus:                      A full Daylight/Dusk/Night visual system is required and there (shall) be complete fidelity of sounds and motion buffets.</p>	<p>As for Level C plus:</p> <ul style="list-style-type: none"> <li>• Transition/Conversion testing and checking of take off and landings for crews, who may be required to meet a minimum experience level defined by the Authority.</li> </ul>

Appendix "B"  
Form CA 2002

 GOVERNMENT OF INDIA DIRECTOR GENERAL OF CIVIL AVIATION		Application for <b>Evaluation of Flight Simulator initial / upgrade</b>	
<b>(a) Name of Simulator operator</b>		<b>2) Reasons for Submission</b>	
		Y Initial	
		Y Upgrade	
<b>(b) Address</b>			
<b>(c) Location of simulator</b>			
<b>Phone:</b>	<b>Fax:</b>	<b>e-mail:</b>	
<b>2. Name of simulator manufacturer</b>			
<b>3. Type of Simulator</b>			
<b>4. Identification number of simulator</b>			
<b>5. Aeroplane being simulated</b>			
<b>(a) model</b>			
<b>(b) series</b>			
<b>Engine</b>			
<b>(a) model</b>			
<b>(b) Series</b>			
<b>(c) data revision</b>			
<b>7. Level of qualification requested</b>		A	OA
		B	OB
		C	OC
		D	OD
<b>8. Simulator Computer Identification</b>			
<b>9. Date of Simulator manufacture</b>			
<b>10. Aerodynamic data revision</b>			
<b>11. Flight control data revision</b>			
<b>12. Motion system</b>			
<b>(a) type</b>			
<b>(b) manufacturer</b>			
<b>13. Name of visual system manufacturer</b>			
<b>14. Log of revision</b>			
<b>15. List of effective pages</b>			



Appendix 'B' (contd.)

<b>16. Listing of all reference source data</b>							
<b>17. Glossary of terms and symbols used</b>							
<b>19. Statement of compliance (SOC) with certain requirements.</b>							
<b>20. List of outstanding tests, if any.</b>							
<b>21. Recording procedures and equipment required for the validation tests.</b>							
<b>22. Names &amp; qualification of simulator evaluation team</b>	<table border="1"> <tr> <td><b>Name</b></td> <td><b>Qualification</b></td> </tr> <tr> <td><b>Name</b></td> <td><b>Qualification</b></td> </tr> <tr> <td><b>Name</b></td> <td><b>Qualification</b></td> </tr> </table>	<b>Name</b>	<b>Qualification</b>	<b>Name</b>	<b>Qualification</b>	<b>Name</b>	<b>Qualification</b>
<b>Name</b>	<b>Qualification</b>						
<b>Name</b>	<b>Qualification</b>						
<b>Name</b>	<b>Qualification</b>						
<b>23. Name and Qualification of Manager (Quality System)</b>	<table border="1"> <tr> <td><b>Name</b></td> <td><b>Qualification</b></td> </tr> </table>	<b>Name</b>	<b>Qualification</b>				
<b>Name</b>	<b>Qualification</b>						
<b>24. No. of Qualified Simulator, personnel available.</b>	<table border="1"> <tr> <td><b>Name</b></td> <td><b>Qualification</b></td> </tr> <tr> <td><b>Name</b></td> <td><b>Qualification</b></td> </tr> <tr> <td><b>Name</b></td> <td><b>Qualification</b></td> </tr> </table>	<b>Name</b>	<b>Qualification</b>	<b>Name</b>	<b>Qualification</b>	<b>Name</b>	<b>Qualification</b>
<b>Name</b>	<b>Qualification</b>						
<b>Name</b>	<b>Qualification</b>						
<b>Name</b>	<b>Qualification</b>						
<b>25. Existing DGCA Authority/Approval if any.</b>							
<b>26. Approval fees remitted</b>							
<i>The simulator has been assessed by the evaluation team and certified that it conforms to the aeroplane cockpit configuration of aeroplane type _____ and that the simulated systems and sub-systems function equivalently to those in that aeroplane. The team has also assessed the performance and the flying qualities of the simulator and finds that it represents the designated aeroplane.</i>							
<b>27. Any tests outstanding:-</b>							

**Date: -**

**Name of the applicant**

**Note 1:**For initial qualification testing of flight simulators the aeroplane manufacturer Validation flight test data is preferred. Data from other sources may be used, subject to review and concurrence by the DGCA.

**Note 2:**SOCs should refer to the sources of information and show compliance to explain how the referred material is used, applicable mathematical equations, parameter values, and conclusion reached.

**Note3:** Qualification in items 22,23,and 24 imply the designation of the evaluation team personnel such as pilot examiner/instructor/ check pilot/ simulator engineer as applicable.