

Brief on
Testing and Certification procedures in
Military Aviation Sector



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New Delhi

A Brief on Testing and Certification procedures in Military Aviation Sector

A. Introduction:

Testing and certification procedures in the aviation sector are stringent to ensure that the system is airworthy and safe to fly. While civil aviation sector is regulated by DGCA, Ministry of Civil Aviation in India under the aegis of International Civil Aviation Organisation (ICAO), military aviation sector is regulated by Ministry of Defence. Centre for Military Airworthiness and Certification (CEMILAC) Headquartered at Bangalore looks after the Airworthiness Certification requirements. The Quality Assurance aspects during development as well as production are regulated by Directorate General of Aeronautical Quality Assurance with its Headquarters in New Delhi. Both these organisations have their field offices co-located with major work centres of military aviation to guide and monitor the respective activities.

B. Testing and Certification Procedures:

The procedures for testing and certification requirements in the military aviation are given in a MoD document titled DDPMAS-2002 (Procedure for Design Development and Production of Military Aircraft and Airborne Stores). This is a document co-authored by DRDO (CEMILAC) and Department of Defence Production (DDP) having representation from all the stakeholders during preparation of the document. Hardcopy of the document can be obtained from M/s Jain Book Agency, C-9 Connaught place, New Delhi-110001. For soft copy of the document, CEMILAC (DRDO), Marathalli-P.O, Bangalore-560037 may be approached. Section IV of the DDPMAS-2002 deals with Indigenous Development and Production of Airborne Equipment, Raw Materials and AGS (Aircraft General Standards) parts.

The large business houses in JVs with the global majors in military aviation will act as Main contractors (integrators) of major platforms. MSME sector would be part of the supply chain as Tier-I, II & III suppliers and hence would actively participate in the development/ production of Airborne Equipment, Raw Materials and AGS (Aircraft General Standards) parts. Therefore information on the testing and certification requirements stipulated in Section IV of DDPMAS-2002 would be relevant to the MSME sector. Subsequent paragraphs explain these requirements for the benefit of MSME sector.

C. Indigenisation Procedures:

1. Initiation:

Project for development of Airborne Equipments, Raw materials etc could be initiated on specific requirements by the user services; Design authority (like DRDO etc) on their own can also initiate depending upon the applicability of the same to the users.

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2. Qualitative Requirement:

QR is a document stating the minimum performance requirement of the equipment including working environment and impact on other systems.

3. Major and Minor Items :

Defined by the Main contractor in consultation with Regional centre of Military Airworthiness (RCMA), a field office of CEMILAC, generally co-located with the main contractor. Minor items are those which do not affect the safety and interchangeability. Major items have larger effect on the system e.g. Electrical Black Boxes, Electro-mechanical, Hydraulic, Pneumatic Components, Brake Pads etc.

4. Classification of Components:

- i. Flight Safety Critical: The failure of such components Endanger the safety of aircraft or aircrew.
- ii. Mission Critical: Failure results in aborting the aircraft Mission.
- iii. Non-critical: Failure does not endanger the safety of aircraft, crew nor does it result in aborting the mission.

Note :- Approach to certification and type approval including the extent of testing would depend upon the criticality of component.

5. Categories of items (for indigenous development)

*Minor items are those which do not affect the safety and interchangeability.

*Major items have larger effect on the system e.g. Electrical Black Boxes, Electro-mechanical, Hydraulic, Pneumatic components, Brake Pads etc.

(a) Items for which a licence exists for indigenous manufacturing

Main contractor QCD to ensure the following before accepting the items:

- i) Manufacturing as per specified material/ consumables/ processes.
- ii) Validate w.r.t. Test Schedule/specification of the Licensor.
- iii) The list of such items so indigenized shall be intimated to RCMA and DGAQA.

(b) Items for which Technology, Specification, Qualification Test Procedure (QTP) and Production Acceptance Test (PAT) requirements are available:

- Main contractor may take up for development after consultation with RCMA.
- Test results to be compiled as Type Record.
- Provisional Clearance/ Type Approval(PC/TA).
- Batch acceptance as per PAT.
- Materials thus indigenized permitted for fabrication of all types of components whenever called for in the original specification/drawings.

(c) Items for which only Technical Specification is available:

(i) Raw Materials:

- Metallic, Non-metallic (Rubber compound PTFE etc)
- Specification/end use details available
- Main Contractor prepares type test schedule in consultation with RCMA
- QA coverage during testing by DGAQA
- Test result to be compiled as Type Record
- Provisional clearance/Type Approval
- Batch acceptance test schedule in co-ordination with DGAQA
- Release Note by DGAQA/ Signatory authorized by DGAQA

(ii) Standard Parts:

- Information on Material, component drawing, process etc. available.
- Main contractor may develop in-house
- May sub-contract to private vendor by supplying the approved raw materials
- Design Department and QCD of main contractor to carry out tests indicated in the drawing/standard and/or end use functional checks.
- Issue Indigenization clearance and notify to RCMA and RDAQA

(iii) Information on Material/Component drawing not available

- By the main contractor/approved Design Agency
- To be generated by carrying out detailed load analysis, strength test etc.
- Material specification after testing a sample
- Alternate substitute material by Design Department in consultation with RCMA

- Drawing to be coordinated by concerned RCMA (if considered necessary)
- Test requirement defined by Design agency/main contractor in consultation with RCMA and DGAQA
- Approval by RCMA/CEMILAC

(iv) Consumables:

- For non-airborne applications and process chemicals exactly as per the OEM specification: Main Contractor responsibility.
- To be tested as per OEM specification and notify to RCMA/DGAQA.
- Direct/Indirect airborne applications (Welding filler rods, special coatings, adhesives, sealants etc.)
- LTCC: for non-critical.
- PC/TA: for critical

(d) Items for which no tech. specification available:

- Need major effort.
- Classify as Major, Minor, Critical, Non-critical.
- Classification to be decided by LTCC.

6. Procedure for Indigenisation under LTCC (Local Type Certification Committee).

Objective of LTCC (Local Type Certification Committee)

- To reduce amount of documentation and development time frame.
- For non-critical items
- Permit usage after satisfactory performance evaluation
- Monitor the progress/approval of critical items

7. Formation of LTCC.

CHAIRMAN	:	RD of RCMA
MEMBERS	:	Head of Indigenisation (Contractor)
	:	Rep of Design deptt (Contractor)
	:	Head of QCD (Contractor)
	:	Head of Laboratory (Contractor)
	:	RDAQA
	:	User Representative (AFLE for IAF)

8. Terms & Reference of LTCC :

- To assess and categorize the criticality of the item.
- To refer the flight safety critical and mission critical items to RCMA for approval and to progress/monitor the approval of such items through RCMA.
- To approve the usage of non-critical items.

9. Approval of Non-Critical Items:

LTCC will ensure the following:

- Non-critical items are end specific and not generic in nature.
- Advise the main contractor additional test requirements if any.
- Discuss test results and evaluate the product.
- Accept usage if satisfied.
- Main contractor to maintain data base.

10. Test Schedule (TS) and Tests.

- To be prepared by Main contractor/Design agency.
- In accordance with tech. specification of the equipment.
- Copy of Draft TS forwarded to RCMA/DGAQA for comments.
- RCMA approves the finalised TS.
- Tests to be carried at Test House/Approved Laboratory.
- RCMA/DGAQA would advise if witnessing by their reps required.

11. Test schedule.

The test schedule should include the following information:

- Details of the items to be tested.
- Standard Of Preparation(SOP) and drawing applicability list.
- Objective and aim of the test.
- Test procedures/Specification.
- Measurements to be taken and instrumentation required.
- Pass/fail criterion
- No. of samples to be tested/sequence of tests.
- Environmental conditions.

12. Association for QA activities.

DGAQA shall be associated throughout the process of development of every store/equipment in connection with witnessing/carrying out test and assessing the capacity of prospective production agencies for undertaking bulk production.

Observations of User Evaluation Agency

In regard to certain items/equipment, it may be necessary to carry out flight tests/obtain views of the users through IAF/ IN/ ARMY before formal type approval is given.

13. Indigenisation procedure for Flight safety & Mission Critical Items

- Availability of specification: OEM supplied/international standards.
- Otherwise main contractor/design agency to prepare in consultation with RCMA.
- Identification of prospective firm/vendor by main contractor. Design Assessment of the firm by RCMA/CEMILAC. Quality Control assessment by main contractor.
- Vendor to be supplied with the specification including brief write-up.
- Vendor or main contractor shall prepare necessary drawings (to be approved by RCMA) after satisfactory completion of all type test requirements
- Preparation of type test schedule based on the tech specification by Main contractor/vendor in consultation with RCMA.
- Vendor shall use approved materials / components / fasteners etc. and maintain traceability.
- Prototype as per the type test schedule.
- Inspection by QCD (main contractor) and DGAQA for conformity to the drawings.
- If satisfactory, formal clearance for type tests by RCMA.
- Main contractor/vendor shall provide program of type tests/test centre to RCMA/DGAQA.
- Witnessing of tests by main contractor's design and QC reps.
- RCMA may witness if desired.
- Type tests would be witnessed and test reports coordinated by DGAQA.
- Whenever the tests are carried out at approved labs of DRDO, ETDC, HAL etc., If DGAQA rep is unable to provide full coverage owing to any constraints, alternate coverage plans based on past experience on similar items, significance/criticality of test etc. may be resorted to by DGAQA rep
- Test to be carried out in the same sequence as per type test schedule. Deviation (if any) may be discussed in a common forum like LTCC.
- In case of failure of the items during type test, the same is to be analyzed in coordination with RCMA/DGAQA. Remedial measures shall be implemented after the concurrence of RCMA and the drawings duly amended.
- Tests may resume after inspection by QC and DGAQA.

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- On completion of type tests, items shall be flight evaluated if called for in the TTS. Flight test schedule shall be drawn by the Design and Flight Test section Of main contractor in coordination with RCMA.
- The TA shall be renewed on expiry by CEMILAC after ascertaining the in-service performance of the item from the main contractor, DGAQA and user services.
- Whenever, considered necessary, re-qualification of the product may become essential by carrying out the type approval tests.
- PAT schedule to be prepared by QCD of the main contractor in coordination with DGAQA. Type test schedule shall be the basis.
- QCD of main contractor to carryout capacity assessment of their sub-contractors before placement of any supply orders. Report of the same if requested for by DGAQA to be provided.
- Quality audit by DGAQA if required.
- A copy of PAT shall be forwarded by DGAQA to RCMA.
- Concurrently with the issue of TA, CEMILAC shall seal the drawings, processes and specification.
- After issue of TA, the same shall be promulgated by CEMILAC for information to all agencies.
- CEMILAC shall forward to DGAQA a set of approved drawings along with complete type record for clearance of bulk production.
- If for any reason, the approving authority is not satisfied about the performance of the equipment/item, based on the feed backs after due investigation and consultation with main-contractor, the user agencies would be informed about such withdrawals.

14. Proprietary Material & Processes:

- The manufacturer of the proprietary material/ process intended for use in the manufacture, operation or repair of aircraft, aero-engine, equipment shall apply to CEMILAC through concerned RCMA giving information on application for Type Approval.
- Details of tests to demonstrate the particular use of the material/process shall be forwarded.
- Approval of CEMILAC is contingent upon satisfactory results being obtained from tests on sample submitted for approval.

D. QA Aspects during Bulk production :

After the products are certified by CEMILAC, the Quality aspects during bulk production are defined by DGAQA. A Quality Management System (QMS) audit is carried out by DGAQA in the premises of the firm. If the QMS is found satisfactory, Bulk Production Clearance (BPC) is accorded by DGAQA. Subsequently Quality Assurance Plan (QAP) document is prepared by the firm and approved by DGAQA to ensure & assure that during the bulk production, the specified technical requirements are complied with and associated records are maintained as per specified procedures.

The QAP document shall include the Production Acceptance Test (PAT) and also Periodical Quality Test (PQT). While PAT is for ensuring quality during regular production, PQT is complied with periodically to ensure consistency in the quality standards over a longer horizon.

E. Conclusion:

The above information is compiled by DGAQA for the benefit of prospective enterprises from MSME sector with the objective of enhancing their active participation in the military aviation sector. Additionally the list of Test Facilities held by DGAQA is available on website: www.dgaeroqa.gov.in. The test facilities may be utilised by paying nominal charges as per the procedures specified therein. As regards to the test facilities supported by other govt organisations/ DPSUs, the same may be accessed from the portal 'Make In India' through link page of Test facilities.