Template No.
CEMILAC_SYSGP_ACP_01

AIRWORTHINESS CERTIFICATION PLAN
for <LRU/SYSTEM Name>
for
<Platform Name>

Issue/Rev No: 01/00
Date of Release: 8 Feb 2025

<DESIGN AGENCY LOGO>	**Document No.**			
	Issue No./ Rev No. :	<00X>/	**Issue Date :**	<DD/MM/YYYY>
	Copy No. :	01 of N	**No. of Pages :**	< total no .of pages >
	Document Classification :	☐ Secret ☐ Restricted		☐ Confidential ☐ Unrestricted

Title:	**Project/System :**
AIRWORTHINESS CERTIFICATION PLAN for <LRU/SYSTEM Name>for <Platform name>	< Project/System Name>
	LRU/System Part No.
	<No.>
	Critical Level
	<A/B/C/D/E>

	Name & Designation	**Signature**
Prepared By	<Design Rep Name>, < Designation> <Agency Name>	
Reviewed By	<Project Leader Name>, <Designation> <Agency Name> <AWG/QA HOD Name>, <Designation> <Agency Name>	
Approved By	<Project Leader Name>, <Designation> <Design Agency> <Officer_Name>, <Designation> RCMA <Name>	

<Design Firm Name & Address>

Disclaimer:

This document is a guidance document. Applicable section / table rows may be considered. Any additional details may be added. Any not applicable section/ table rows may be deleted. The template is very general and vary with process to process followed by Development Agency. The document may be fine-tuned with the TAA for finalization.

DOCUMENTATION PAGE
Document Type : Airworthiness plan for *LRU*
Security Classification : Restricted
TITLE : Airworthiness Certification Plan of *LRU*
Document No. and Date :
Authors :
No. of Pages : (excluding cover page and documentation page)
CEMILAC Project No. :
External Participation:
Sponsor : Sponsors Project No:
Approval :
Remarks :
Keywords : Certification, SOF, QT, IV & V
Abstract : The *LRU*s used for *System* are to be certified by CEMILAC. RCMA is the field establishment to accomplish this work. This document outlines the airworthiness certification plan for the *LRU*.

Distribution List :

Copy no. 1 : RD, RCMA

Copy no. 2 : Design Head, Design Firm

Copy no. 3 : RD, AQA

Copy no. 4 : QA, Design firm

Amendment sheet :

Sl.no.	From Issue	To Issue	Changes incorporated

TABLE OF CONTENTS

1 Introduction 7

1.1 Scope 7

1.2 Applicability 7

1.3 Applicable Documents 7

2 System Description 7

2.1 Project – Salient Details 7

2.2 Introduction & Context Diagram 7

2.3 Responsibilities of Participating Agencies 7

Note : For complex systems/ System of Systems PBS and WBS may be reproduced here. 8

2.4 Standard Compliance 8

2.5 Project Milestones 8

3 Design Certification activities 9

3.1.1 System Requirements Review 9

3.1.2 System Preliminary Design Review 10

3.1.3 System Critical Design Review 10

3.1.4 SOF readiness 11

3.1.5 SOF completion 12

3.1.6 Rig Integration checks 13

3.1.7 Trials 13

3.1.8 QT Readiness 14

3.1.9 QT Completion 14

3.1.10 Provisional Clearance 15

3.1.11 Type Approval 15

3.1.12 Service Use Clearance 16

3.1.13 Continued Airworthiness 16

4 Abbreviations 17

1 Introduction

1.1 Scope

This document gives the airworthiness certification plan for *LRU name*. The document covers the necessary aspects from certification perspective that need to be complied by all the concerned agencies for successful design evaluation and productionization of the system.

1.2 Applicability

The requirements given in this document have been tailored from DDPMAS-2002 and are applicable only to *LRU name*. The details given in the document shall be strictly adhered to and any deviation/waiver shall be documented after due concurrence from all concerned.

1.3 Applicable Documents

1. Project Proposal/ QR/ CONOPS
2. SSA/FHA

2 System Description

2.1 Project – Salient Details

1	LRU Name	
2	Part number	
3	System	
4	LRU Criticality classification	
5	Platform	
6	Design deliverables	

2.2 Introduction & Context Diagram

<Brief introduction of the system not exceeding 1 page and diagram showing all the LRUs and external systems with which it is interfaced>

2.3 Responsibilities of Participating Agencies

Sl.No.	Responsibility	Agency
1	Hardware Design & Development	
2	Software Design & Development	

3	System Integration	
4	Hardware Certification	
5	Software Certification	
6	LRU/ System Clearance	
7	Platform clearance for flight testing	
8	IV & V agency	
9	Inspection coverage during design	
10	Inspection coverage during production	
11	Production	
12	Customer	
13	User	

Note : For complex systems/ System of Systems PBS and WBS may be reproduced here.

2.4 Standard Compliance

1. Hardware design : RTCA DO-254, MIL-STD-704F
2. Software development : IEEE 12207/ DO-178C/ DGSD, DO-326
3. Environmental testing : MIL-STD-810H
4. EMI/EMC testing : MIL-STD-461G
5. System performance : *<Applicable SAE, STANAG, TSO etc>*
6. COTS screening : CEMILAC Directive No. 81/2003 Dt. 10-01-2004
7. SOF Tests : CEMILAC Directive No. 14/2015 Dt. 13-02-2015
8. Certification Regulations : Subpart C1, C6, T1, T2 of IMTAR-21 Ver 2.0

2.5 Project Milestones

A milestone marks the successful completion of a set of identified activities and indicates the readiness of the project to proceed to next stage in the lifecycle. Various milestones are identified spanning through design, development, testing and production phases of the project, as below.

1. System Requirements Review
2. System Preliminary Design Review
3. System Critical Design Review
4. SOF Readiness
5. SOF Completion
6. Rig/ aircraft Integration checks
7. Trials
8. QT Readiness
9. QT Completion
10. Provisional Clearance

11. Type Approval
12. Service Use clearance
13. Continued Airworthiness

- Software Certification will be as per the Approved Software Certification Plan. The mandatory software clearances for each phase are brought out in this document.

3 Design Certification activities

This section gives the detailed coordination of activities between design and certification at each of the milestones mentioned in section 2.5.

3.1.1 System Requirements Review

This is the first activity in the course of design evaluation. The SIPOC table for requirements review process is given below. The input documents are submitted to the review team at least 15 days in advance.

<table>
<tr><th>Supplier of inputs</th><th>Input</th><th>Process</th><th>Output</th><th>Customer for outputs</th></tr>
<tr><td>Customer</td><td>1. Operational requirements/ Concept of Utilisation</td><td rowspan="3">A review team consisting of representatives of customer, RCMA, DGAQA and system designer shall review the requirements and analyze the feasibility, expectations, implications and priority of the requirements.
The team shall ensure that functionality, performance, fault tolerance and fail-safe features, safety interlocks, BIT, orientation and other platform related constraints, which of the requirements are unchangeable and which are prone to change etc. are captured in the specification documents.</td><td>System Functional Requirements Specification/ SSS</td><td rowspan="3">LRU Designer and RCMA</td></tr>
<tr><td>System designer</td><td>2. Draft Interface control document (Buses & electrical)

3. E-Map of all applicable platforms</td><td>Interface control document approved by System designer.</td></tr>
<tr><td>LRU Designer</td><td>4. Draft Tech Spec</td><td></td></tr>
</table>

Subsequent to the Requirement Review, the approved documents are baselined and kept under configuration control. Changes to these documents shall be through change notices approved by Customer, System designer and RCMA.

3.1.2 System Preliminary Design Review

After the designer explores various options and decides on the preliminary design, it is presented to the review team for suggestions and validation. The input documents are submitted to the review team at least 15 days in advance.

Supplier of inputs	Input	Process	Output	Customer for outputs
LRU Designer	1. System Requirement Specification/ QR 2. SARAD 3. SSA/FHA	A review team consisting of System designer, RCMA and DGAQA shall review the preliminary design of hardware including the technology, architecture, tools, major components, techniques etc. Mechanical aspects such as weight bearing fixtures, guides, placement of connectors etc shall also be reviewed.	1. Action points to be implemented in the preliminary design. 2. Final SARAD absorbing the committee recommendations.	LRU Designer and RCMA

During the PDR, the action points are given an EDC. RCMA shall keep track of the action points and ensure that they are implemented before proceeding to the next stage. In case any of the points are not implemented, reason and justification shall be given by the designer. The action points are to be closed by RCMA under concurrence from the System designer.

3.1.3 System Critical Design Review

After the designer proceeds from preliminary to detailed design and a working model is ready as proof of concept, it is presented to the review team for suggestions and validation. The input documents are submitted to the review team at least 15 days in advance.

Supplier of inputs	Input	Process	Output	Customer for outputs
LRU Designer	1. Hardware Design Document	A review team consisting of RCMA, DGAQA and external experts shall review the	1. Action points to be implemented in the detailed	LRU Designer and RCMA

	2. Firmware Requirement and design Document 3.CDR document with Signal integrity, Reliability, FMECA, Structural and Thermal analysis details	detailed design of hardware and firmware including optimization, upgradability, interdependence of modules, thermal analysis, de-rating, computations to prove that the design conforms to the requirements. Testing philosophy and test rig specifications are also discussed during thereview.	design. 2. Tech Spec (and FRS, if applicable) approved by RCMA. 3. Test rig specifications approved by RCMA	

During the CDR, the action points are given an EDC. RCMA shall keep track of the action points and ensure that they are implemented before proceeding to the next stage. In case any of the points are not implemented, reason and justification shall be given by the designer. The action points are to be closed by RCMA.

3.1.4 SOF readiness

When the design of hardware and software are complete and in-house testing is satisfactory, the LRU is offered to RCMA and DGAQA for SOF1. By this stage, it is expected that the Test rig requirements are finalized and Test rig specifications are approved by RCMA. Before commencement of SOF testing, DGAQA & QC shall certify the conformance of Test rig to the specifications. Physical inspection and ESS are carried out by DGAQA. The input documents are submitted at least 15 days in advance.

Supplier of inputs	**Input**	**Process**	**Output**	**Customer for outputs**
LRU Designer	1. SOF Test Plan 2. Functional Test Procedure 3. MDI and drawings 4. BOM 5. Derating document 6. Test rig specification	The test setup and functional test procedure are demonstrated to RCMA and DGAQA. The checksum and version of the baselined software in the UUT, and test software is noted. Calibration status of the test equipment and chambers are verified by DGAQA and QC.	1. SOF test plan approved by RCMA 2. FTP approved by RCMA 3. MDI approved by RCMA 4. Test schedule 5. Baselined software 6. Test rig TVPL+TVPR 7. Test rig VDD	RCMA, DGAQA, QC

LRU Designer	Approved MDI, Drawings, BOM	DGAQA, QC carry out physical inspection, COTS screening and ESS tests on the LRU.	1. Physical inspection report 2. Test results of screening and ESS tests	1. LRU Designer 2. RCMA

Gerber checksum to be included as part of MDI. Packing box specification to be included in the MDI

After the test setup and test procedure have been accepted by RCMA and DGAQA, a test schedule is prepared by the designer outlining the dates and venues for carrying out the SOF tests and distributed to RCMA, DGAQA and QC. The approved documents are kept under configuration control.

Note: If there are programmable devices in the LRU, the firmware related requirement/testing/ simulation document also to be approved by RCMA.

3.1.5 SOF completion

When the LRU and test rig are reckoned to be ready for SOF, the actual SOF tests are started.

Supplier of inputs	Input	Process	Output	Customer for outputs
LRU Designer	1. SOF Test schedule 2. Functional Test Procedure 3. Approved Test rig & test software	SOF tests are carried out as per the schedule and test results are recorded in the format given in FTP. If there are any failures during the test, Defect investigation and repair/ modification actions are taken and test is repeated. In case of repair, DIR is prepared and in case of design modification, ECN is prepared. Test report containing test results, DIRs, ECNs is compiled at the end of the SOF testing.	1. SOF test report 2. Approved ECNs/ DIRs	RCMA, DGAQA, QC

If any discrepancies are noticed during testing, failure analysis, fault identification, corrective action and regression testing are carried out. On receipt of Application for SOF certificate, the LRU is cleared for rig/aircraft integration.

3.1.6 Rig Integration checks

The LRU shall undergo rig integration checks before fitment in the aircraft, to check the interfaces and acceptability of the outputs by the platform division.

Supplier of inputs	Input	Process	Output	Customer for outputs
System designer	1. Software & firmware Clearance for flight trials 2. ITP for rig integration approved by platform RCMA	The LRU is integrated with the rest of the system in the rig/ aircraft. The interfaces, timings, IO signal levels are checked. Full functional tests on the integrated system are carried out. Discrepancies, if any, are analyzed and corrective action taken. Modifications are noted in ECNs (for hw)/SCNs (for sw).	Integration Test Report	RCMA, DGAQA, System designer, LRU designer.

RCMA shall clear the LRU for flight trials based on the satisfactory integration tests. Hardware and software SOP are noted in the clearance.

3.1.7 Trials

The integrated System Is cleared for flight trials after satisfactory rig/ aircraft integration.

Supplier of inputs	Input	Process	Output	Customer for outputs
Customer	1. Flight Test Plan approved by Platform RCMA	The integrated system is subjected to flight trials and all the operational requirements are checked thoroughly. RCMA shall co-ordinate the preparation of flight test parameters to explore full capabilities and various conditions to be tested in detail. Discrepancies, if any, are analyzed and corrective action taken. Modifications are noted in ECNs (for hardware) / SCNs (for software).	1. Flight test report 2. Post Flight Analysis	RCMA, DGAQA, System designer, LRU designer.

The changes in hardware/ software are to be done based on the aircraft requirement, pilot inputs and QR parameters.

3.1.8 QT Readiness

After flight trials, the changes done in SOF1, SOF2 are absorbed in the QT model of the LRU. The SOP at this point is fairly stable and no major hardware or software modification is envisaged. The QT unit shall undergo physical inspection and ESS tests similar to SOF units.

Supplier of inputs	Input	Process	Output	Customer for outputs
LRU Designer	1. Qualification Test Plan. 2. Latest approved MDI, Drawings. 3. TRTM 4. TARB Committee	The process documents, maintenance manuals for system and test rig, module specifications and test procedure etc are discussed at this stage. Test Requirements Traceability Matrix will demonstrate that all requirements (functional, performance and environmental) are met by the design. The inputs required for smooth transition from design to production stage will be finalized. If TARB is constituted, the committee will review the adequacy of TRTM and recommend changes, if required.	1. QT schedule 2. QTP 3. TRTM Compliance 4. TARB recommendations	RCMA, DGAQA, LRU designer
DGAQA, QC	Physical inspection report			

A schedule for carrying out QT tests with dates and venues are prepared by the LRU designer and forwarded to RCMA, DGAQA and QC.

3.1.9 QT Completion

After the SOP of hardware, software, ATE/test rigs are frozen, qualification tests can commence.

Supplier of inputs	Input	Process	Output	Customer for outputs

LRU Designer	1. Module level specification and test procedure 2. Tuning and Testing Document	Tests as per the QTP are completed in the presence of RCMA, DGAQA and QC. During this time IV & V team shall complete all the software evaluation activities and submit a report/ recommendation to RCMA regarding adequacy/ limitations of the software.	1.Qualification Test Report 2.Compliance Matrix	RCMA, DGAQA, QC
DGAQA, QC	Physical inspection report			

The unit which undergoes QT shall be yellow-banded.

3.1.10 Provisional Clearance

On successful completion of QT and satisfactory flight trial feedback, the SOP of the LRU is cleared for production. By this time software and firmware certification as per their respective certification plans shall be completed. If Software and firmware clearance for production is not available at this time, PC cannot be issued, LoTA will be issued.

Supplier of inputs	Input	Process	Output	Customer for outputs
LRU Designer	1. Qualification Test Report 2. Compliance Matrix 3. Approved Software & Firmware 4. Flight test report	The unit will be accorded Provisional Clearance certificate which enables the designers to transfer the technology to production agency and prepare the formalities for Type Approval. The PC will be valid for one year from the date of issue.	1. Provisional Clearance/ LoTA Certificate 2. SOP document 3. ToT documents for production	LRU Designer, Production agency.

3.1.11 Type Approval

Supplier of inputs	Input	Process	Output	Customer for outputs
LRU Designer	Type Approval application and documentation as per IMTAR-21	The unit will be accorded Type Approval certificate by CEMILAC which regularizes the production for next 5 years	Type Approval Certificate	LRU Designer, Production agency.

		from the date of issue.		

3.1.12 Service Use Clearance

Supplier of inputs	Input	Process	Output	Customer for outputs
LRU Designer	1. PC or TA 2. User Trials Report	On satisfactory User Trials, the units from production will be accorded Service Use clearance where they can be incorporated in the platform delivered to the user.	Service Use Clearance by system RCMA	Production agency, User

3.1.13 Continued Airworthiness

The modifications in SOP which may arise due to requirement changes, field failures etc shall be put up to LMC for analysis and implementation methodology.

Supplier of inputs	Input	Process	Output	Customer for outputs
LRU Designer	1. Problem Report 2. AMI 3. Trial mod report	During production or field exploitation, if repeated failures occur in the airborne store, modifications may be proposed by the designer. These modifications are initially cleared in limited numbers for trials. After satisfactory trials, the mod is ratified in LMC for incorporation in production and field units.	1. Mod Leaflet 2. Modified SOP	Production agency, User

The production agency shall apply for renewal of Type Approval in the prescribed format with latest SOP.

4 Abbreviations

ATP	Acceptance Test Procedure
ATE	Automatic Test Equipment
BOM	Bill Of Material
CDR	Critical Design Review
CEMILAC	Centre for Military Airworthiness and Certification
DGAQA	Director General of Aeronautical Quality Assurance
DIR	Defect Investigation Report
ECN	Engineering Change Note
EDC	Expected Date of Completion
ESS	Environmental Stress Screening
FHA	Functional Hazard Analysis
FTP	Functional Test Procedure
HDD	Hardware Design Document
ICD	Interface Control Document
IMTAR	Indian Military Technical Airworthiness Regulations
LMC	Local Modification Committee
LRU	Line Replaceable Unit
MDI	Master Drawing Index. Same as Drawing Applicability List
PC	Provisional Clearance
PDR	Preliminary Design Review
QC	Quality Control of Design Agency
QT	Qualification Testing
QTP	Qualification Test Procedure
RCMA	Regional Centre for Military Airworthiness
SARAD	System Architecture and Requirements Allocation Description
SCN	Software Change Note
SOFT	Safety of Flight Test Procedure
SOP	Standard of Preparation
SIPOC	Supply, Input, Process, Output, Customer
SSA	System Safety Analysis
SyRS	System Requirement Specification
TA	Type Approval
TARB	Test Adequacy Review Board
TRTM	Test Requirement Traceability Matrix

Annexure -I

Documentation Summary

Sl.no.	Development Stage	Artefacts to be generated	Action by RCMA
1	System Requirement Review	• QR/ Concept of Utilisation • ICD • Functional Specifications/ SSS • E-map of platform(s)	Refer Refer Approve Refer
2	System PDR	• System Requirements • SARAD • System PDR doc • SSA/FHA	Review Refer Refer Review
3	System CDR	• Technical Specifications • Hardware Design Document • CDR Doc • Derating document • Reliability prediction • Thermal analysis • Structural analysis • Signal Integrity • EMI/EMC analysis • FMECA	Approve Refer Refer Review Review Review Review Review Review Review
4	SOFT	• SOFT Plan • Functional Test Procedure • MDI & Drawings • BOM • Test rig specifications • Test rig VDD • SOFT report	Approve Approve Approve Approve Approve Approve Refer
5	Flight Trial Clearance	• Rig/ aircraft integration test plan	Approve

		• Rig/ Aircraft integration report • Flight Test Plan • Software/ Firmware clearance	Refer Refer Refer
6	QT	• QTP • TRTM • Module level specification and test procedure • Tuning and testing document	Approve Review Approve Approve
7	PC	• Flight test report • QTR • Compliance matrix • Maintenance & Repair manuals for system • User Manual for system • Maintenance & Repair manuals for test rig • User Manual for test rig	Refer Refer Review Refer Refer Refer Refer
8	TA Service Use clearance	• Documentation as per IMTAR • User feedback	Review Refer
9	Continued airworthiness	• Problem Report • Analysis reports • Test reports • Flight trial feedback • AMI • Mod leaflet	Refer Review Review Refer Approve Approve