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सभी पत्रादि मुख्य कार्यपालक (उडन-योग्यता) को सम्बोधित किया जाए और न किसी अन्य अधिकारी के उपनाम से
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CEMILAC/5390/2/TCS

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Clearance of Bought-out Electronic Equipments (LRUs) and Subassemblies (SRUs) for Military Airborne Applications

1. Introduction

The use of electronic equipments for military airborne applications is rapidly increasing and as a result about 70% of the cost of modern A/C is that of avionics equipments. Sometimes, these avionic equipments and their associated subsystems and subassemblies are bought-out from foreign vendors as off-the-shelf items or these are developed and supplied by foreign vendors as a custom built item for our specific requirements. The avionic equipments / subsystems and subassemblies can be broadly categorized into two categories - Line Replaceable Units (LRUs) and Shop Replaceable Units (SRUs). The LRUs are the equipments of the aircraft which can be replaced quickly on the aircraft in the forward operational areas and SRUs are subassemblies of the main unit which can only be replaced in an assembly / maintenance facility. SRUs may sometimes also be referred as modules e.g. RF modules. Airworthiness of these bought-out avionic equipments and subassemblies needs to be assured so that they meet their functional requirements and are capable of working reliably in the environmental conditions in which these are required to operate. The LRUs are required to be maintained by the services and if need be, it should be possible to modify software or hardware depending on the requirements in the future. The relevant information /documents should be available for this purpose as per Annexure-V of DDPMAS-2002 as applicable. It has been observed that sometimes these LRUs / SRUs are not accompanied with the relevant documents and test records. In many cases only Certificate of Conformance (COC) is supplied and in some cases even COC is not available which makes it difficult for CEMILAC to clear these items for installation on airborne platform.

This directive provides a comprehensive approach to address these issues and act as a guideline which can be followed while procuring avionic equipments / subassemblies from abroad for military airborne applications. This was evolved after discussions with the system designers, DGAQA and users' representatives. However, this directive is for mission-critical and non-critical avionic equipments only. The flight-

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critical electronic equipments need to be comprehensively tested and evaluated for clearance as per the existing procedure.

2. Approach to Clearance

2.1 Line Replaceable Unit (LRU) Level Clearance

The LRUs can either be bought-out as off-the-shelf items meeting the design requirements or can be specifically developed to user's specifications. The clearance approach in these cases is as follows.

2.1.1 LRU Bought-Out as Off-the-Shelf Item

When LRUs are bought-out as off-the-shelf items, the system designer should ensure that the bought-out LRU meets the system specifications and platform environmental & EMI/EMC requirements. This can be verified by scrutinizing various design documents, functional test plans and results, qualification test plans and results, FMECA, reliability and thermal analysis reports, software documents etc. However, if the LRU is from the standard catalog of a reputed firm, the data sheet or the specifications of the LRU provided by the firm are acceptable. In the absence of relevant documents and test results, the bought-out LRU shall be subjected to qualification tests as per a tailored QT plan finalized in consultation with CEMILAC. The broad range of tests which shall necessarily be carried out in this case is given at **Annexure - I**. In case, if there is a problem to follow any of the above procedures for any reason, performance report of the LRU on a similar type of platform shall be obtained to verify the capability of the bought-out LRU. CEMILAC after ensuring the airworthiness of the LRU by one of the methods mentioned above would issue clearance to these LRUs for fitment on the intended military airborne platform.

2.1.2 LRU Developed to User Specifications / Requirements

In the cases where a foreign firm takes up the task of developing and supplying certain LRUs as per user's requirements / specifications, the design & development process shall be as per DDPMAS-2002 and evaluated at appropriate stages of LRU development. The requirements of carrying out the design reviews and subjecting the unit to the qualification tests should be included in the contract documents. The qualification tests to be carried out shall be as per the platform requirements. Certain critical qualification tests such as High & Low Temperature, Vibration, Humidity etc. shall be witnessed by the certification authorities. Software development process shall also have enough visibility and the software documents shall be evaluated as per the level demanded by the criticality of use in the system. The hardware and software deliverables shall be appropriately identified so that modifications and maintenance at a later date is possible. CEMILAC, after ensuring the airworthiness, would issue clearance to these LRUs for fitment on intended platform.

2.2 Shop Replaceable Unit (SRU) Level Clearance

SRUs can also be categorized into two categories: -

a) Off-the-shelf bought-out items
b) Developed to user's specifications.

The airworthiness clearance approach in these two cases shall be as follows.

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2.2.1 SRU Bought-Out as Off-the-Shelf Item

The responsibility of selection of SRUs for fitment in a LRU shall rest with the system or LRU designer. However, if the system designer desires association of certification authorities while procuring off-the-shelf SRU, certification authorities shall provide necessary inputs towards certification. The designer shall ensure that the bought-out SRU meets the system or LRU requirements including functional, interface, environmental, EMI/EMC etc. This shall be ensured by scrutinizing relevant documents. The qualification testing will be done at the LRU level with off-the-shelf bought-out SRU installed. However, the designer should define clearly the SRU in the SOP of the LRU by obtaining adequate details of the SRU. This SOP shall be approved by CEMILAC. SRUs will be treated as a part of the LRU which is subjected to the qualification testing and cleared for airborne application. In case a SRU which has been the part of the qualified LRU has to be replaced with another type of SRU for any reason, the designer should ensure that the new SRU complies with the requirements of qualification tests carried out at LRU level. The details of these qualification tests and integration tests carried out at LRU level should be provided to CEMILAC along with the amended SOP of the LRU, which shall be approved by CEMILAC.

2.2.2 SRU Developed to User Specifications / Requirements

The system / LRU designer is responsible for finalizing the SRU requirements and getting it developed to ensure that the SRU meets system and environmental requirements for airborne applications. However, if the systems designer desires to associate certification authorities during the development of the SRU, certification authorities shall provide necessary inputs towards certification. Designer shall obtain all relevant hardware and software documents by ensuring relevant clauses in the contract as these documents will also help in carrying out modifications / maintenance during the LRU life cycle. SRUs will be treated as a part of the LRU, which will be subjected to the qualification testing and cleared for airborne application. In case a SRU, which has been the part of the qualified LRU, has to be replaced with another type of SRU for any reason, the designer should ensure that the new SRU complies with the requirements of qualification tests carried out at LRU level. The details of these qualification tests and integration tests carried out at LRU level should be provided to CEMILAC along with the amended SOP of the LRU, which shall be approved by CEMILAC.

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Chief Executive (Airworthiness)

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End-(3)

Annexure-I

Tailored Qualification Tests for Bought-out off-the-shelf LRUs

1. Vibration Test - 30 min on each axis
2. High Temperature Test
3. Low Temperature Test
4. CATH Test (if CATH facility is not available, carry out Humidity & Altitude tests separately)
5. Rapid Decompression Test (if applicable)
6. EMI / EMC Tests as applicable
7. Power Supply Compatibility Tests as per MIL- Std -704 E