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GOVERNMENT OF INDIA
CIVIL AVIATION DEPARTMENT
DIRECTOR GENERAL OF CIVIL AVIATION

AIRWORTHINESS ADVISORY CIRCULAR

Subject: **Maintenance of Airborne Communication, Navigation and Radar Equipment**

1. INTRODUCTION

1.1 Sub-rule 3 of Rule 9 and Rule 57 of the Aircraft Rules, 1937 specify that every aircraft shall be fitted and equipped with radio apparatus as may be specified according to the use and circumstances under which the flight is to be conducted. The equipment to be fitted on aircraft depending on type of operation has been detailed in CAR Section 2 Series 'I' Part II and CAR Section 8 Series 'O'. Each operator / CAMO is required to get Maintenance Program in respect of aircraft operated/ managed by them, approved by the respective Regional/ Sub-regional Airworthiness Office in accordance CAR M. Based on the approved maintenance program, the operator/ CAMO is required to prepare inspection schedules/ work package for compliance by the respective maintenance organisation. These schedules/ work package should include all radio communication, navigation and radar equipment as prescribed by the manufacturers. The schedules/ work package in respect of radio communication and navigation equipment should also indicate if the equipment are required to be tested in-situ, bench checked or subjected to any other tests as specified by the manufacturer and include any special tools, spares, consumables required for these tests, specifying the tolerances/ limits etc. as laid down by the manufacturer.

1.2 This circular provides guidance to all organizations/ persons maintaining airborne communication, navigation and radar equipment including airborne radio equipment under an approved maintenance programme in order to ensure that these equipment function in a manner they have been designed for and also to ensure that the communication from the aircraft with the ground and to aircraft are maintained correctly.

1.3 It is important to note that this circular is for guidance purpose only and on its own does not change, create, amend or permit deviations from regulatory requirements, nor does it establish minimum standards.

2 CERTIFICATION OF MAINTENANCE

2.2 All defects, reported by the pilot or engineering staff which are observed during operation/ scheduled inspection on aircraft communication, navigation and radar system, must be properly attended and endorsement made in the relevant technical logbook / Off-Job Sheet / appropriate Log Book. Guidance material for the maintenance and certification of airborne communication, navigation and radar equipment is given at Appendix 'A'.

2.3 All airborne communication, navigation and radar equipment should be inspected and certified by appropriately authorised certifying staff/ licensed AME/ authorized person as per approved schedules keeping in view the specific working conditions such as environmental control required for the maintenance of such equipment.

2.4 The authorised certifying staff/ licensed AME/ authorized person after carrying out inspections, either in-situ or in the workshop, shall issue Certificate of Release to Service in accordance with CAR-145/ Subpart-F of CAR-M and also make relevant entries in the relevant log book/ component history cards as applicable.

2.5 Separate history card should be maintained for all major equipment having serial number, to indicate hours done, installation history including major modifications carried out with proper reference to manufacturer's Service Bulletins/ airworthiness directives etc.

2.6 While replacing parts it shall be ensured that approved parts bearing the correct part number as mentioned in the manufacturer's Parts Catalog are only fitted. The replaced components must have a proper approval certificate, release note or other evidence of their being airworthy and manufactured to aeronautical specifications.

Sd/-
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For Director General of Civil Aviation

Guidance Material on Maintenance and Certification of Communication, Navigation and Radar Equipment

1. The maintenance program should be based on the recommendations of the Maintenance Planning Document/ Aircraft Maintenance Manual/ MRBR/ CMM etc., and additional items of inspection based on the operating environment, type of operation and experience of the operator/ maintenance organization.

2. Regular data collection and analysis, assessment of rate of failure and introduction of suitable checks at intermediate level/ modification has to be considered to check the failures. Manufacturer's guidance in all these matters will be a prime consideration while preparing the maintenance programme.

3. Maintenance checks for communication, navigation and radar equipment can be broadly classified as:

a) In-situ check; and

b) Work shop check

3.1 In-situ Check:

The aircraft radio communication and navigation system and its individual items should be inspected and maintained at periods mentioned below and a Certificate of Release to Service (CRS) shall be issued in accordance with CAR-145 and Subpart F of CAR-M.

a) After scheduled maintenance/ inspection and operation check, as and when due, in accordance with the approved maintenance programme.

b) After rectification of the reported/ observed defect in accordance with the procedure laid down in the AMM/ TSM. In such a case, the Pilot may be required to record the range and performance of the radio equipment during the first flight after rectification of the defect.

Note: The operation check should be carried out with engine(s) running in case where it is mentioned in AMM / component maintenance manual.

3.2 Workshop Check:

Workshop checks are further classified as:

a) Bench Check – for normal testing; and
b) Flight Test Data Check (FTD) given by the manufacturer

3.2.1 Bench Check:
Bench check is required to be carried out:

a) When the performance of the radio communication and navigation equipment is required to be ascertained when it becomes due in accordance with approved maintenance programme.

b) As and when, any radio communication and navigation equipment is repaired subsequent to removal from aircraft due to reported defect.

c) After carrying out necessary repair/ modification work on the electronic circuit board inside the radio Communication and navigation equipment in accordance with manufacturer's recommendation.

d) Whenever any radio communication and navigation equipment is not operated for more than 02 (two) years or as per the manufacturer's recommendation, whichever is earlier.

Note: The bench check should be carried out on a proper test bench having adequate test equipment / test meters as specified by the manufacturer. The bench should be calibrated/ tested at regular intervals using primary standards as mentioned in the manufacturer's manuals.

3.2.2 Final Test Data (FTD) Check:

For some radio communication and navigation equipment, the manufacturer of the equipment may prescribe final test data (FTD) check at periodic intervals. This check compares the observed data of the equipment with the manufacturers test data to ensure that it is within the tolerance given by the manufacturer for ensuring serviceability of the equipment.

Final Test Data check is required to be carried out:

a) When the performance of the radio communication and navigation equipment is required to be ascertained when it becomes due in accordance with approved maintenance programme.

b) After rectification of defects, where the manufacturer has specified final test data (FTD) check on the equipment.

Note: FTD checks should be carried out in accordance with the Component Maintenance Manual (CMM)/ Avionics System Manual and may include checks for all important parameters such as sensitivity, AGC, selectivity, output power, the frequency stability, ADF bearing accuracy, modulation

and other specific checks, as recommended by the manufacturer. It may also include visual inspection of all components, assembly circuitry, P.C. board and proper bonding/ megger check and security of fitment after installation.

4. Maintenance of Emergency Locator Transmitters (ELT):

4.1 ELT shall be subjected to periodic inspections in accordance with manufacturers recommendation and approved maintenance programme.

4.2 In absence of manufacturers recommendation, all ELTs installed on the aircraft should be inspected within 12 calendar months of last inspection for:

a) Proper installation
b) Battery corrosion ,
c) Operation of the controls and crash sensor,
d) Presence of sufficient signal radiated from its antenna, and
e) Verification of the expiry date of the battery (Recharge, if the batteries are rechargeable). The battery should be replaced when 50 percent of their useful life or, for rechargeable batteries, 50 percent of their useful life of charge has crossed or when the transmitter has been in use for more than one cumulative hour (except for water activated batteries).

5. Equipment like Weather Radar, VLF, Omega NAV, GNSS, Radio Altimeter, DME, ATC, ACAS / TCAS Processor, CVR and RNAV shall be checked in-situ at intervals specified in the AMM/ CMM/ Avionics System Manual for installation, security and operational checks using simulators or ground facilities or "In test" modes.

6. After carrying out major inspection the flying pilots should file de-briefing report regarding the range and performance of these equipment for monitoring continued airworthiness. In case, the range and/ or performance has deteriorated, rectification action shall be taken by appropriately authorised certifying staff/ licensed AME/ authorized person

7. Radio communication and navigation equipment related to RNP, RVSM, ETOPS, MNPS, CAT II, CAT III and POLAR operations shall be maintained and tested at regular intervals as specified in the approved maintenance programme.

8. Special Inspection

8.1 The Communication, Navigation and Radar equipment, including their indicators and antenna should be subjected to appropriate inspection schedule whenever the aircraft is involved in heavy landing or the aircraft flies through an electrical storm or lightning strike etc. Such Special Inspection Schedules shall be prepared based on manufacturer's recommendation and approved by the Continuing Airworthiness Manager or any designated person of organization. In the absence of manufacturer's recommendations, the following guidelines may be followed for drawing the inspection schedules:

a) Heavy Landing

i) Aircraft equipment installation shall be inspected for security of attachment and bonding.
ii) All wire antenna shall be inspected for any damage to the wire, function of cable tensioners and fed/ terminated ends for any damage or distortion.
iii) All analog indicators shall be subjected to an inspection for damage or distortion to the mechanical movement and associated part.
iv) All digital and CRT indicators shall be inspected for any possible damage to display units / components.
v) All other equipment shall be inspected visually for any damage to their components and connectors.
vi) All equipment including indicators shall be subjected to operational check either on bench or on aircraft.

b) Flying Through Electrical Storm Or Lightening Strike:

The aircraft radio system shall be subjected to the following checks if the aircraft flies through an electrical storm or is struck by lightning and malfunction of a specific system is reported by the pilot or detected by the inspection personnel during ground check:

i) Insulation of RF cables is to be checked.
ii) Radio installation is to be checked for bonding.
iii) If lightening arrestors are installed in antenna circuit, these are to be checked.
iv) Loop antenna is to be demagnetized.
v) All stub-matched antenna are to be checked for continuity of matching coil.
vi) SWR checks of the transmitter.
vii) All radio equipment are to be visually inspected for any evidence of damage and a functional check, either on bench or on the aircraft, is to be carried out.
viii) Ensure before carrying out operational/ functional check of radio navigation equipment that the compass has been swung.

Note: (i) Ensure that the aircraft is not magnetized.

(ii) The radio equipment removed from a damaged aircraft shall be subjected to thorough visual inspection and FTD check before the equipment is put in service again.

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