



Technical Standard Order

**Subject: TSO-C110a, AIRBORNE PASSIVE THUNDERSTORM
DETECTION EQUIPMENT**

a. Applicability.

(1) Minimum Performance Standard. This technical standard order (TSO) prescribes the minimum performance standard that airborne passive thunderstorm detection equipment must meet in order to be identified with the applicable TSO marking. Models of airborne passive thunderstorm detection systems that are to be so identified and that are manufactured on or after the date of this TSO must meet the minimum performance standard of Radio Technical Commission for Aeronautics (RTCA) Document No. DO-191, "Minimum Operational Performance Standards for Airborne Thunderstorm Detection Equipment," dated May 1986.

(2) Environmental Standard. RTCA Document No. RTCA/DO-191 incorporates as a reference RTCA Document No. DO-160B, "Environmental Conditions and Test Procedures for Airborne Equipment," dated July 1984.

(3) Computer Software. If the equipment design implementation includes a digital computer, the computer software must be verified and validated in an acceptable manner. One acceptable means of compliance for the verification and validation of the computer software is outlined in RTCA Document No. DO-178A, "Software Considerations in Airborne Systems and Equipment Certification," dated March 1985. For those applicants who elect to use RTCA Document No. DO-178A to demonstrate compliance for the verification and validation of the computer software, the following requirements must be met:

(i) RTCA Document No. DO-178A defines three levels of software: Level 1, Level 2, and Level 3. The applicant must declare the level (or levels) to which the computer software has been verified and validated. This equipment may incorporate more than one software level. The software for navigation functions must be verified and validated to at least Level 2.

(ii) The applicant must submit a software verification and validation plan for review and approval.

NOTE: The Federal Aviation Administration (FAA) strongly recommends early discussion and agreement between the applicant and the FAA on the applicant's proposed software verification and validation plan, and on the applicant's proposed software level or levels.

b. Marking. In addition to the marking specified in Federal Aviation Regulations (FAR) Section 21.607(d), the following information shall be legibly and permanently marked:

(1) On the major equipment components, with regard to FAR § 21.607(d)(2), the part number is to include hardware and software identification, or a separate part number may be utilized for hardware and software. Either approach must include a means for showing the modification status.

(2) Each separate component of equipment that is manufactured under this TSO (antenna, receiver, transmitter, etc.) must be permanently and legibly marked with at least the name of the manufacturer, manufacturer's part number, and the TSO number.

(3) The level(s) to which the computer software has been verified and validated.

c. Data Requirements.

(1) In addition to the information specified in FAR § 21.605, the manufacturer must furnish the Manager, Aircraft Certification Office (ACO), Federal Aviation Administration, having purview of the manufacturer's facilities, one copy each of the following technical data:

(i) Operating instructions.

(ii) Equipment limitations.

(iii) Installation procedures and limitations

(iv) Schematic drawings as applicable to the installation procedures.

(v) Wiring diagrams as applicable to the installation procedures.

(vi) Specifications.

(vii) List of the major components (by part number) that make up the equipment system complying with the standards prescribed in this TSO.

(viii) An environmental qualification form as described in RTCA Document No. DO-160B.

(ix) Manufacturer's TSO qualification test report.

(x) Nameplate drawing.

(xi) The appropriate documentation as defined in RTCA/DO-178A, or equivalent, necessary to support the verification and validation of the computer software to Level 1, Level 2, or Level 3. If the software is verified and validated to more than one level, the appropriate documentation for all such levels must be submitted.

(2) In addition to those data requirements that are to be furnished directly to the FAA, each manufacturer must have available for review by the Manager of the ACO having purview of the manufacturer's facilities, the following technical data.

(i) A drawing list, enumerating all the drawings and processes that are necessary to define the article's design.

(ii) The functional test specification to be used to test each production article to ensure compliance with this TSO.

(iii) Equipment calibration procedures.

(iv) Corrective maintenance procedures (within 12 months after TSO authorization).

(v) Schematic drawings.

(vi) Wiring diagrams.

(vii) Documentation to support the computer software verification and validation plan for Level 1, Level 2, or Level 3 software.

(viii) The appropriate documentation as defined in RTCA/DO-178A, or equivalent, necessary to support the verification and validation of the computer software to Level 1, Level 2, or Level 3. If the software is verified and validated to more than one level, the appropriate documentation for all such levels must be available for review.

(ix) The results of the environmental qualification tests conducted in accordance with RTCA/DO-160B.

d. Data to be furnished with manufactured units. One copy of the data and information specified in paragraphs (c)(1)(i) through (viii) of this TSO, and instructions for periodic maintenance and calibration which are necessary for continued airworthiness must go to each person receiving for use one or more articles manufactured under this TSO. In addition, a note with the following statement must be included:

“The conditions and tests required for TSO approval of this article are minimum performance standards. It is the responsibility of those desiring to install this article either on or within a specific type or class of aircraft to determine that the aircraft installation conditions are within the TSO standards. If not within the TSO standards, the

article may be installed only if the applicant documents further evaluation for an acceptable installation and it is approved by the Administrator.”

e. Availability of Reference Documents.

(1) Copies of RTCA Document Nos. DO-191, DO-160B, and DO-178A may be purchased from the Radio Technical Commission for Aeronautics Secretariat, One McPherson Square, Suite 500, 1425 K Street, NW., Washington, DC 20005.

(2) Federal Aviation Regulations 21, Subpart O, and Advisory Circular 20-110D, “Index of Aviation Technical Standard Orders,” may be reviewed at the FAA Headquarters in the Office of Airworthiness, Aircraft Engineering Division (AWS-120), and at all regional ACO’s.

/S/ Thomas E. McSweeney
Acting Director, Aircraft Certification
Service