



Technical Standard Order

Subject: TSO-C132, Geosynchronous Orbit Aeronautical Mobile Satellite Services Aircraft Earth Station Equipment

1. **PURPOSE.** This Technical Standard Order (TSO) is for manufacturers of geosynchronous orbit Aeronautical Mobile Satellite Services (AMSS) Aircraft Earth Station (AES) equipment applying for a TSO authorization. In it, the Federal Aviation Administration (FAA) tells you what minimum performance standards (MPS) your AMSS AES equipment must meet for approval and identification with the applicable TSO marking.

2. **APPLICABILITY.** This TSO affects new applications submitted after this TSO's effective date.

3. **REQUIREMENTS.** New models of AMSS AES equipment identified and manufactured on or after the effective date of this TSO must meet the MPS in RTCA Document No. RTCA/DO-210D, "Minimum Operational Performance Standards (MOPS) for Geosynchronous Orbit Aeronautical Mobile Satellite Services (AMSS) Avionics," Section 2.0, dated April 19, 2000, or most current revision.

a. **Functionality.** This TSO's standards apply to AMSS AES equipment that provides direct worldwide communications between aircraft subnetworks and ground subnetworks using aeronautical mobile satellites and their ground earth stations. AMSS will support both data and voice communications between aircraft users and ground-based users, such as Air Route Traffic Control Centers (ARTCCs) and aircraft operators. Communication services with AMSS functions include four categories: Air Traffic Services (ATS), Aircraft Operational Control (AOC), Aeronautical Administrative Communications (AAC), and Aeronautical Passenger Communications (APC).

NOTE: We may have more airworthiness requirements for installing AMSS AES equipment intended for ATS communications. Contact your local geographic Aircraft Certification Office (ACO) for more information.

b. **Failure Condition Classification.** Failure of the function defined in paragraphs 3 and 3a of this TSO is a minor failure condition. You must develop the system to at least the design assurance level equal to this failure condition classification.

c. **Environmental Qualification.** Test the equipment according to RTCA Document No. RTCA/DO-160D, "Environmental Conditions and Test Procedures for Airborne Equipment," dated July 29, 1997, or most current revision.

d. Software Qualification. If the article includes a digital computer, develop the software according to *what section or sections* RTCA Document No. RTCA/DO-178B, “Software Considerations in Airborne Systems and Equipment Certification,” dated December 1, 1992, or most current revision.

e. Deviations. We have provisions for using alternate or equivalent means of compliance to the criteria in the MPS of this TSO. If you invoke these provisions, you must show that your equipment maintains an equivalent level of safety. Apply for a deviation under 14 CFR § 21.609.

4. MARKING.

a. Mark at least one major component permanently and legibly with all the information in 14 CFR § 21.607(d), except for:

(1) Section 21.607(d)(2). Use the name, type, and part number instead of the optional model number, and

(2) Section 21.607(d)(3). Use the date of manufacture instead of the optional serial number.

b. In addition, mark the following permanently and legibly with at least the name of the manufacturer, manufacturer’s subassembly part number, and the TSO number:

(1) Each component that is easily removable (without hand tools),

(2) Each interchangeable element, and

(3) Each separate sub-assembly of the article that you determined may be interchangeable.

c. If the component includes a digital computer, then the part number must include hardware and software identification. Or, you can use a separate part number for hardware and software. Either way, you must include a means for showing the modification status.

NOTE: Similar software versions, approved to different software levels, must be differentiated by part number.

d. When applicable, identify the equipment as an incomplete system or that the appliance performs functions beyond those described in paragraphs **3** and **3a** of this TSO.

5. APPLICATION DATA REQUIREMENTS. Under 14 CFR § 21.605(a)(2), you, as a manufacturer-applicant, must give the FAA’s ACO manager responsible for your facilities, one copy each of the following technical data to support our design and production approval:

a. Operating instructions and equipment limitations, sufficient to describe the equipment’s operational capability.

b. Installation procedures and limitations, sufficient to ensure that the AMSS AES equipment, when installed according to the installation procedures, still meets this TSO's requirements. The limitations must identify any unique aspects of the installation. Finally, the limitations must include a note with the following statement:

The conditions and tests for TSO approval of this article are minimum performance standards. Those installing this article, on or within a specific type or class of aircraft, must determine that the aircraft installation conditions are within the TSO standards. TSO articles must have separate approval for installation in an aircraft. The article may be installed only according to 14 CFR part 43 or the applicable airworthiness requirements.

- c.** When applicable, identify the appliance as an incomplete system or a multi-use system. Describe the functions that the appliance is intended to provide.
- d.** Schematic drawings of the installation procedures.
- e.** Wiring diagrams of the installation procedures.
- f.** List of the components, by part number, that make up the AMSS AES system complying with the standards in this TSO. You should include vendor part number cross-references, when applicable.
- g.** Instructions, covering periodic maintenance, calibration, and repair, for the continued airworthiness of installed AMSS AES equipment. Instructions should include recommended inspection intervals and service life.
- h.** Material and process specifications list.
- i.** The quality control system description required by 14 CFR §§ 21.605(a)(3) and 21.143(a), including functional test specifications. These test each production article to ensure compliance with this TSO.
- j.** Manufacturer's TSO qualification test report.
- k.** Nameplate drawing with the information required by paragraph 4 of this TSO.
- l.** A list of all drawings and processes, including revision level, to define the article's design. For a minor change, you only need to make revisions to the drawing list available on request.
- m.** An environmental qualifications form as described in RTCA/DO-160D, dated July 29, 1997, or most current revision for each component of the system.
- n.** If the article includes a digital computer: a Plan for Software Aspects of Certification (PSAC); Software Configuration Index; and Software Accomplishment Summary. We recommend that you submit the PSAC early in the software development process. Early

submittal allows us quickly to resolve issues, such as partitioning and determining software levels.

6. MANUFACTURER DATA REQUIREMENTS. Besides the data to be furnished directly to the FAA, a manufacturer must have available for review (by the responsible ACO) the following technical data:

- a. The functional qualification specifications for qualifying each production article to ensure compliance with this TSO.
- b. Equipment calibration procedures.
- c. Corrective maintenance procedures within 12 months after TSO authorization.
- d. Schematic drawings.
- e. Wiring diagrams.
- f. Material and process specifications.
- g. The results of the environmental qualification tests conducted per RTCA/DO-160D.
- h. If the article includes a digital computer, the appropriate documentation defined in RTCA/DO-178B, or most current revision, including all data supporting the applicable objectives in Annex A of RTCA/DO-178B, Process Objectives and Outputs by Software Level, or most current revision.

7. FURNISHED DATA REQUIREMENTS. With each article manufactured under this TSO, provide the following:

- (1) One copy of the technical data and information specified in paragraphs **5a** through **5g** of this TSO. Add any other data or information necessary for the proper installation, certification, and use, or for continued airworthiness, or for both, of the AMSS AES equipment.
- (2) One copy of the data and information in paragraphs **5l** through **5n**, if the appliance performs functions beyond those described in paragraphs **3** and **3a** of this TSO. You must send these data to each person receiving one or more of the equipment for use.

8. HOW TO GET REFERENCED DOCUMENTS.

a. You can buy copies of RTCA Document Nos. DO-210D, DO-160D, DO-178B, and DO-229C from RTCA, Inc., 1828 L Street, NW, Suite 805, Washington, DC 20036. Telephone (202) 833-9339, fax (202) 833-9434. You can also get copies through the RTCA website @ www.rtca.org.

b. You can buy copies of 14 CFR part 21, Subpart O, from the Superintendent of Documents, Government Printing Office, Washington, DC 20402-9325. Telephone

(202) 512-1800, fax (202) 512-2250. You can also get copies from the Government Printing Office (GPO), electronic CFR Internet website @ www.access.gpo.gov/ecfr/.

c. You can get FAA Advisory Circular (AC) 20-110 or the most current revision, “Index of Aviation Technical Standard Orders,” and AC 20-115 or the most current revision, “Index of Articles Certified under the Technical Standard Order System,” from the U.S. Department of Transportation, Utilization and Storage Section, M-443.2, Washington, DC 20590. Telephone (301) 322-4477, fax (301) 386-5394. You can also get copies from the FAA’s Regulatory and Guidance Library (RGL) @ www.airweb.faa.gov/rgl. On the RGL webpage, select “Advisory Circulars.”

David W. Hempe
Manager, Aircraft Engineering Division
Aircraft Certification Service

