



Technical Standard Order

PROPOSED

Subject: TSO-C158, AERONAUTICAL MOBILE HIGH FREQUENCY DATA LINK (HFDL) EQUIPMENT

1. **PURPOSE.** This Technical Standard Order (TSO) is for manufacturers applying for a TSO authorization or letter of design approval. In it, we tell you what minimum performance standards (MPS) your Aeronautical Mobile High Frequency Data Link (HFDL) communications equipment must first meet for approval and identification with the applicable TSO marking. Title 14 of the Code of Federal Regulations (14 CFR) part 21, Subpart O, prescribes the requirements and rules governing TSO Authorizations.

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

3. **REQUIREMENTS.** New models of HFDL systems and equipment that are to be so identified and that are manufactured on or after the effective date of this TSO must meet the Minimum Performance Standards (MPS) set forth in RTCA document No. (RTCA/DO)-265, "Minimum Operational Performance Standards For Aeronautical Mobile High frequency Data Link (HFDL)", Section 2, dated December 14, 2000.

a. **Functionality.** The standards of this TSO apply to equipment intended to provide worldwide data communications directly between aircraft sub networks and ground sub networks via High Frequency (HF) radio and HF ground stations. HFDL equipment will support data communication between aircraft users and ground-based users, such as Air Route Traffic Control Centers (ARTCCs) and aircraft operators. HFDL communication services include three categories: Air Traffic Services (ATS), Aircraft Operational Control (AOC), and Aeronautical Administrative Communications (AAC).

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

c. **Functional Qualification.** The required performance shall be demonstrated under the test conditions set forth in RTCA/DO-265 "Minimum Operational Performance Standards For Aeronautical Mobile High frequency Data Link (HFDL)", Section 2, dated December 14, 2000.

d. **Environmental Qualification.** Test the equipment according to RTCA/DO-160D, "Environmental Conditions and Test Procedures for Airborne Equipment," dated July 29, 1997,

including Change 1, dated Dec 14, 2000, Change 2, dated June 12, 2001 and Change 3, dated December 5, 2002. The applicable environmental performance requirements used during the environmental test procedures are in RTCA/DO-265, Section 2.3.

e. Software Qualification. If the article includes a digital computer, develop the software according to RTCA/DO-178B, “Software Considerations in Airborne Systems and Equipment Certification,” dated December 1, 1992.

f. Deviations. We have provisions for using alternative 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.

3. MARKING. In accordance with 14 CFR § 21.607(d), articles manufactured under this TSO must be marked as follows:

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

(1) 14 CFR § 21.607(d)(2): where you must use the name, type and part number. Do not use the optional model number; and

(2) 14 CFR § 21.607(d)(3): Where you must use the date of manufacture instead of the optional serial numbers. Use this when that information is critical for maintenance or inspections, or both.

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

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

(2) Each interchangeable element; and

(3) Each 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 to show 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 that 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 Aircraft Certification Office (ACO) manager responsible for your manufacturer's 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 HFDL communication 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 required for TSO approval of this article are minimum performance standards. Those installing this article, on or in 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. If the appliance is an incomplete or multi-use system. Describe the functions that the appliance is intended to provide.

d. The hardware and software design assurance requirements may vary, depending on equipment installation guidelines. The equipment manufacturer should identify the hardware and software design assurance for qualified equipment in the Installation Manual (IM) or Component Maintenance Manual (CMM), or both.

e. Schematic drawings as applicable to the installation procedures.

f. Wiring diagrams as applicable to the installation procedures.

g. Equipment specifications.

h. List of components, by part number, that makes up the HFDL communications equipment that complies with the standards in this TSO. Manufacturers should include vendor part number cross-references, when applicable.

i. A CMM, covering periodic maintenance, calibration and repair, for the continued airworthiness of installed equipment. Instructions should include recommended inspection intervals and service life. Details of deviations and limitations, as noted in paragraph **5a** and **5b** of this TSO, may also be described in the CMM, IM or both.

j. The quality control system description required by 14 CFR §§ 21.605(a)(3) and 21.143(a), including functional test specifications. This system tests each production article to ensure compliance with this TSO.

- k.** Manufacturer's TSO qualification test report.
 - l.** Nameplate drawing with the information required by paragraph **4** of this TSO.
 - m.** 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 the revisions to the drawing list available upon request.
 - n.** An environmental qualifications form as described in RTCA/DO-160D, Change 2, for each component of the system.
 - o.** 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 to quickly resolve issues, such as partitioning and determination of software levels.
- 6. MANUFACTURER DATA REQUIREMENTS.** Besides the data given directly to the FAA, each 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.** The results of the environmental qualification tests conducted per RTCA/DO-160D.
 - g.** If the article includes a digital computer, the appropriate documentation defined in RTCA/DO-178B, including all data supporting the applicable objectives in Annex A of RTCA/DO-178B, Process Objectives and Outputs by Software Level.

7. FURNISHED DATA REQUIREMENTS.

- a.** One copy of the technical data and information specified in paragraphs **5a** through **5o** of this TSO. Add any other data necessary for the proper installation, certification and use, or for continued airworthiness, or both of the Aeronautical Mobile High Frequency Data Link (HF DL) equipment.
- b.** If the appliance accomplishes any additional functions beyond that described in paragraphs **3** and **3a** of this TSO, then a copy of the data and information specified in paragraphs

5a through 5o must also go to each person receiving for use one or more articles manufactured under this TSO.

8. AVAILABILITY OF REFERENCED DOCUMENTS.

a. You can buy copies of RTCA/DO-160D (including Changes 1, 2 and 3), RTCA/DO-178B, DO-224A (including Changes 1 and 2) and RTCA/DO-271B, from RTCA, Inc., 1828 L Street NW, Suite 805, Washington, DC 20036-4001. You can also get copies through the RTCA Internet website at: www.rtca.org.

b. You can buy copies of Federal Aviation Regulations 14 CFR Part 21, Subpart O, from the Superintendent of Documents, Government Printing Office, Washington, DC 20402-9325. You can also get copies from the Government Printing Office (GPO), electronic CFR Internet website at: www.access.gpo.gov/ecfr/.

c. You can get Advisory Circular (AC) 20-110L (or current revision), "Index of Aviation Technical Standard Orders", and AC 20-115B (or current revision), "RTCA, Inc., Document RTCA/DO-178B", from the U.S. Department of Transportation, Subsequent Distribution Office, Ardmore East Business Center, 3341 Q 75th Avenue, Landover, MD 20785, Telephone (301) 322-4477 or FAX (301) 386-5394.

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