



Technical Standard Order

Subject: TSO-C59a, AIRBORNE SELECTIVE CALLING (SELCAL) 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 Airborne Selective Calling (SELCAL) 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 SELCAL 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 set forth in RTCA Paper No. 25-59/DO-93, "Minimum Performance Standards - Airborne Selective Calling Equipment", Section 2.0 and 3.0, dated 10 February 1959, as amended by RTCA Paper No. 140-62/EC-469, dated 13 September 1962.

a. **Functionality.** The standards of this TSO apply to equipment intended to permit selective calling of individual aircraft over approved communications channels linking the ground station with the aircraft. The system is designed to operate with existing High Frequency (HF) and Very High Frequency (VHF) ground-to-air transmitters and receivers. Each SELCAL capable aircraft is assigned a unique identifier, which allows the ground station to notify the flight crew of the need to establish communications

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

c. **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.

d. **Software Qualification.** If the article includes computer software, develop the software according to RTCA/DO-178B, "Software Considerations in Airborne Systems and Equipment Certification," dated December 1, 1992.

e. Hardware Design Assurance. If the hardware element contains electronic hardware whose functions cannot be feasibly evaluated by test and/or analysis, the electronic hardware must comply with RTCA/DO-254, "Design Assurance Guidance for Airborne Electronic Hardware," dated April 19,2000.

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.

4. MARKING. In accordance with 14 CFR § 21.607(d), mark articles manufactured under this TSO 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). Use the name, type and part number. Do not use the optional model number; and

(2) 14 CFR § 21.607(d)(3). 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 computer software, 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 SELCAL 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 SELCAL 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 computer software: 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 computer software, the appropriate documentation defined in RTCA/DO-178B, including all data supporting the applicable objectives in Annex A, "Process Objectives and Outputs by Software Level," of RTCA/DO-178B.

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 Airborne Selective Calling (SELCAL) 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, and Paper 25-59/DO-93, as amended in section 3 above 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), 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.

/s/ David W. Hempe

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