



Technical Standard Order

Subject: EQUIPMENT THAT PREVENTS BLOCKED CHANNELS USED IN TWO-WAY RADIO COMMUNICATIONS DUE TO SIMULTANEOUS TRANSMISSIONS

1. **PURPOSE.** This technical standard order (TSO) tells manufacturers seeking a TSO authorization or letter of design approval what minimum performance standards (MPS) their equipment to prevent blocked channels must first meet to obtain approval and be identified with the applicable TSO marking. The MPS in this TSO are intended to prevent the blocking of frequencies used in air traffic control (ATC) two-way radio communication resulting from simultaneous transmissions. Title 14 of the Code of Federal Regulations (14 CFR) part 21, Subpart O, prescribes the requirements and rules governing TSO authorizations.

2. **APPLICABILITY.**

a. This TSO is effective for new applications submitted after its effective date. All prior revisions to this TSO are no longer effective and, in general, we will not accept applications after the effective date of this TSO. However, we may accept applications submitted against the previous version of this TSO up to six months after the effective date of this TSO, when we have established that the applicant was working against the earlier MPS before the new change became effective.

b. Equipment that prevents blocked channels due to simultaneous transmissions approved under a previous TSO authorization may continue to be manufactured under the provisions of their original approval, as specified in 14 CFR § 21.603(b). However, major design changes to equipment approved under previous versions of this TSO requires a new authorization under this TSO, per 14 CFR § 21.611(b).

3. **REQUIREMENTS.** New models of equipment that prevents blocked channels due to simultaneous transmissions identified and manufactured on or after the effective date of this TSO must meet the MPS in Section 2 of RTCA, Inc. document RTCA/DO-209, *Minimum Operational Performance Standards For Devices That Prevent Blocked Channels Used In Two-Way Radio Communications Due To Simultaneous Transmissions*, dated April 23, 1992.

a. **Functionality.** The standards of this TSO apply to equipment intended to prevent blocked frequencies used in air traffic control (ATC) two-way radio communication due to simultaneous transmissions by aircraft transmitters. Equipment covered by this TSO is primarily intended for aeronautical operational control (AOC) and air traffic services (ATS) safety

communications. Equipment developed under this TSO will communicate safety-related tactical and strategic information.

NOTE: We consider equipment functionality beyond the scope of paragraph 3.a of this TSO or RTCA/DO-209 as significant to the TSO authorization process, and strongly encourage you to coordinate early with your local geographic aircraft certification office (ACO). Examples of additional functionality include high frequency (HF) or very high frequency (VHF) transceiver equipment primarily intended for ATS safety communications.

b. Failure Condition Classification. You must develop the system to at least the design assurance level commensurate with a *major* failure condition classification.

NOTE: Blockage of a communication channel is a *hazardous* failure condition, whereas loss of ATS communication on an aircraft is a *major* failure condition. Guidance on design assurance levels may be found in the SAE International's Aerospace Recommended Practice (ARP) 4754, *Certification Considerations for Highly Integrated or Complex Aircraft Systems*, dated June 27, 1996, for a system. See RTCA/DO-254, *Design Assurance Guidance For Airborne Electronic Hardware*, dated April 19, 2000, for hardware. See EUROCAE/RTCA document ED-12B/DO-178B, *Software Considerations In Airborne Systems and Equipment Certification*, dated December 1, 1992, for software. You will find guidance on establishing quantitative safety objectives for different installations in the latest versions of advisory circulars (AC) 23-1309-1, *Equipment, Systems And Installations In Part 23 Airplanes*, AC 25-1309-1, *System Design And Analysis*, AC 27-1, *Certification of Normal Category Rotorcraft*, and AC 29-2, *Certification Of Transport Category Rotorcraft*, for aircraft certificated under the provisions of 14 CFR parts 23, 25, 27 or 29.

c. Functional Qualification. Demonstrate the required performance under the test conditions specified in RTCA/DO-209, Section 2.4.

d. Environmental Qualification. Defined environmental conditions and corresponding test procedures to produce these environmental conditions are specified in EUROCAE/RTCA document ED-14E/DO-160E, *Environmental Conditions and Test Procedures for Airborne Equipment*, dated December 9, 2004. Demonstrate the required equipment performance during the environmental conditions of EUROCAE/RTCA document ED-14E/DO-160E under the test conditions specified in RTCA/DO-209, Section 2.3.

e. Software Qualification. If the article includes software, develop the software in accordance with EUROCAE/RTCA document ED-12B/DO-178B.

f. Deviations. We have provisions for using alternative or equivalent means of compliance to the criteria set forth in the MPS of this TSO. Applicants invoking these provisions shall demonstrate that an equivalent level of safety is maintained and apply for a deviation under 14 CFR § 21.609.

4. MARKING. Under the provisions of 14 CFR § 21.607(d), articles manufactured under this TSO must be marked as follows:

a. At least one major component must be permanently and legibly marked with all the information listed in 14 CFR § 21.607(d), except for the following: the option in 14 CFR § 21.607(d)(2), where the name, type and part number must be used instead of the optional model number; and the option in 14 CFR § 21.607(d)(3), where the date of manufacture must be used instead of the optional serial number when that information is critical for maintenance and/or inspections.

b. In addition to the requirements of 14 CFR § 21.607(d), each separate component that is easily removable (without hand tools), each interchangeable element, and each separate sub-assembly of the article that the manufacturer determines may be interchangeable must be permanently and legibly marked with at least the name of the manufacturer, manufacturer's subassembly part number, and the TSO number.

c. If the component includes a digital computer, the part number must 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. Note that 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 accomplishes additional functions beyond that described in paragraphs **3** and **3.a** of this TSO.

e. If any deviations have been granted, consider placing the additional permanent marking, "(Dev)," after the TSO number.

5. APPLICATION DATA REQUIREMENTS. In accordance with 14 CFR 21.605(a)(2), a manufacturer must furnish the Federal Aviation Administration (FAA) ACO manager responsible for the 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 operational capability of the equipment. In particular, describe in detail any operational or installation limitations resulting from specific deviations granted.

b. Installation procedures and limitations. Identify the limitations in the installation manual sufficiently to ensure the article, when installed in accordance with the installation procedures, continues to meet the requirements of this TSO and will meet the airworthiness and operating requirements appropriate for the intended type of aircraft and operation. The limitations shall include:

(1) 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 within a specific type or class of aircraft, are responsible for determining that the aircraft installation conditions are suitable for the TSO article. TSO articles must have separate approval for installation in an aircraft. The article may be installed only if performed under 14 CFR part 43 or the applicable airworthiness requirements.

(2) When applicable, identify the equipment as an incomplete system or that the equipment accomplishes additional functions beyond that described in paragraphs 3 and 3a of this TSO. Also describe the functions provided by the equipment.

(3) Identify the development assurance level(s) for the functionality defined in paragraph 3 and 3a of this TSO. The data must be sufficient for those installing the article to determine compliance with applicable airworthiness requirements.

(4) Any unique aspects of the installation, including those relevant to any deviations granted.

- c. Schematic drawings, as applicable to the installation procedures.
- d. Wiring diagrams, as applicable to the installation procedures.
- e. List of the components, by part number, that make up the system complying with the standards prescribed in this TSO. Manufacturers should include vendor part number cross-references when applicable.
- f. Instructions for continued airworthiness, in the form of an installation manual, containing information on the periodic maintenance, calibration and repair of installed equipment, including recommended inspection intervals and service life. Details of deviations granted, as noted in paragraph 5a of this TSO and relevant to continued airworthiness, must also be described.
- g. Equipment specifications.
- h. Material and process specifications list.
- i. The quality control system description required by 14 CFR §§ 21.143(a) and 21.605(a)(3) including functional test specifications used to test each production article to ensure compliance with this TSO.
- j. Manufacturer's TSO qualification test report.
- k. Nameplate drawing providing the information required by paragraph 4 of this TSO.
- l. A list of all drawings and processes, including revision level, necessary to define the article's design. In the case of a minor change, any revisions to the drawing list need only be made available upon request.
- m. An environmental qualifications form as described in EUROCAE/RTCA document ED-14E/DO-160E for each component of the system.
- n. If the article includes a digital computer: plan for software aspects of certification (PSAC), software configuration index (SCI), and software accomplishment summary (SAS).

We recommend that the PSAC be submitted early in the software development process. Early submittal will allow timely resolution of issues such as partitioning and determination of software levels.

6. MANUFACTURER DATA REQUIREMENTS. In addition to the data furnished directly to the FAA, each manufacturer must have available for review by the ACO manager responsible for the manufacturer's facilities the following technical data:

- a. The functional qualification specifications to be used to qualify 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 in accordance with EUROCAE/RTCA document ED-14E/DO-160E.
- h. If the article includes a digital computer, the appropriate documentation as defined in EUROCAE/RTCA document ED-12B/DO-178B, including all data supporting the applicable objectives found in Annex A of EUROCAE/RTCA document ED-12B/DO-178B, Process Objectives and Outputs by Software Level.

7. FURNISHED DATA REQUIREMENTS. One copy of the technical data and information specified in paragraphs **5.a** through **5.f** of this TSO must accompany each article or multiple articles manufactured under this TSO, if furnished to one entity such as an operator or repair station. Add any other data or information necessary for the proper installation, certification and use for continued airworthiness of the equipment.

8. AVAILABILITY OF REFERENCED DOCUMENTS.

a. Order copies of RTCA documents from RTCA Inc., 1828 L Street NW, Suite 805, Washington, D.C. 20036-4001. Copies may also be obtained from the RTCA Internet website at: www.rtca.org.

b. Order copies of EUROCAE documents from EUROCAE, 17 rue Hamelin, 75116 Paris, France. Copies may also be ordered from the EUROCAE Internet website at: www.eurocae.com.

c. Order copies of SAE documents from SAE International, 400 Commonwealth Drive, Warrendale, PA 15096. Copies may also be ordered from the SAE Internet website at: www.sae.org.

d. Order copies of 14 CFR part 21, Subpart O from the Superintendent of Documents, Government Printing Office, P.O. Box 37154, Pittsburgh PA 15250-7954. Telephone

(202) 512-1800, fax (202) 512-2250. You can also order copies online at www.access.gpo.gov. Select "Access," then "Online Bookstore." Select "Aviation," then "Code of Federal Regulations."

e. You can find a current list of technical standard orders on the FAA Internet website Regulatory and Guidance Library at www.airweb.faa.gov/rgl. You will also find the TSO Index of Articles at the same site.

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