



Technical Standard Order

PROPOSED (05/24/05)

Subject: EQUIPMENT THAT PREVENT 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 in order 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 the effective date of this TSO. All prior revisions to this TSO are no longer effective and, in general, applications will not be accepted after the effective date of this TSO. However, applications submitted against the previous version of this TSO may be accepted up to six months after the effective date of this TSO, in cases where the FAA has established that the applicant was working against the earlier MPS before the new change became effective.

b. Equipment preventing blocked channels 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 preventing blocked channels identified and manufactured on or after the effective date of this TSO must meet the MPS set forth in Section 2 of 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. The equipment preventing blocked channels 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 early coordination with the local geographic Aircraft Certification Office. 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 The applicant must develop the system to at least the design assurance level commensurate with a major failure condition classification.

Note: The blockage of a communication channel is a hazardous failure condition, whereas the loss of ATS communication on an aircraft is a major failure condition. Guidance on design assurance levels may be found in the SAE, Inc. document SAE/ARP-4754, Certification Considerations for Highly Integrated or Complex Aircraft Systems, dated June 27, 1996, for a system, RTCA/DO-254, Design Assurance Guidance For Airborne Electronic Hardware, dated April 19, 2000, for hardware, and EUROCAE/RTCA document ED-12B/DO-178B, Software Considerations In Airborne Systems and Equipment Certification, dated December 1, 1992 for software. Guidance on establishing quantitative safety objectives for different installations may be found in the latest versions of advisory circulars (AC) 23.1309-1C, Equipment, Systems, And Installations In Part 23 Airplanes, dated March 12, 1999, 25-1309-1A, System Design And Analysis, dated June 21, 1988, 27-1B, Certification of Normal Category Rotorcraft, dated February 12, 2003, and 29-2C, Certification Of Transport Category Rotorcraft, dated February 12, 2003, for aircraft certificated via the provisions of 14 CFR part 23, 25, 27 and 29.

c. Functional Qualification The required performance shall be demonstrated 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. The required equipment performance during the environmental conditions of EUROCAE/RTCA document ED-14E/DO-160E shall be demonstrated under the test conditions specified in RTCA/DO-209, Section 2.3.

e. Software Qualification If the article includes software, the software must be developed in accordance with EUROCAE/RTCA document ED-12B/DO-178B, Software Considerations in Airborne Systems and Equipment Certification, dated December 1, 1992.

f. Deviations The FAA has 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 shall apply for a deviation per 14 CFR § 21.609.

4. MARKING By 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 of 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 in lieu of the optional model number; and the option in 14 CFR § 21.607(d)(3), where the date of manufacture must be used in lieu 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 **3a** 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), the manufacturer must furnish the Manager, Aircraft Certification Office (ACO), Federal Aviation Administration (FAA), responsible for the manufacturer's facilities, one copy each of the following technical data to support the FAA design and production approval:

a. Operating instructions and equipment limitations. The limitations shall be sufficient to describe the operational capability of the equipment. In particular, operational or installation limitations resulting from specific deviations granted must be described in detail.

b. Installation procedures and limitations. Identify the limitations in the installation manual sufficient enough 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. It is the responsibility of those installing this article either on or within a specific type or class of aircraft to determine that the aircraft installation conditions are within the TSO standard. 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 that may have been 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 the applicable continued airworthiness recommendations, must also be described.

g. Equipment specifications.

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 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). The FAA recommends 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 In addition to the data to be furnished directly to the FAA, each manufacturer must have available for review by the manager of the ACO 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 and any other data or information necessary for the proper installation, certification and use for continued airworthiness of the equipment, must accompany each article or multiple articles, if furnished to one source, i.e. operator, repair station, etc., manufactured under this TSO.

8. AVAILABILITY OF REFERENCED DOCUMENTS

a. Copies of RTCA Document Nos. DO-160E, DO-178B, DO-209 and DO-254 may be obtained from the RTCA Inc., 1828 L Street NW, Suite 805, Washington, D.C. 20036-4001. Copies may also be obtained from RTCA Internet Website at: www.rtca.org.

b. Copies of EUROCAE Document Nos. ED-12B and ED-14E may be obtained from the EUROCAE, 17 rue Hamelin, 75116 Paris, France. Copies may also be obtained from EUROCAE Internet Website at: www.eurocae.com.

c. Copies of Society of Automotive Engineers, Inc. (SAE) Document Nos. ARP-4754 may be obtained from the SAE Inc., 400 Commonwealth Drive, Warrendale, PA 15096. Copies may also be obtained from SAE Internet Website at: www.sae.org.

d. Copies of Federal Aviation Regulations 14 CFR part 21, Subpart O, may be purchased from the Superintendent of Documents, Government Printing Office, Washington, DC 20402-

9325. Copies may also be obtained from the Government Printing Office (GPO) Internet Website at: www.gpoaccess.gov/ecfr/.

e. Advisory Circular (AC) 20-110L (or current revision), "Index of Aviation Technical Standard Orders", AC 20-115B (or current revision), "RTCA, Inc., Document RTCA/DO-178B", AC 21-16D (or current revision), "RTCA Document DO-160D", AC 23.1309-1C (or current revision), "System and Equipment Installations in Part 23 Airplanes", AC 25.1309-1A (or current revision), "System Design and Analysis", AC 27-1B (or current revision), "Certification of Normal Category Rotorcraft", and AC 29-2C (or current revision), "Certification of Transport Category Rotorcraft" may be obtained 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. Copies may also be obtained from FAA's Aircraft Certification Internet Website: www.faa.gov/certification/aircraft/.

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