



Technical Standard Order

Subject: TSO-C1d, CARGO COMPARTMENT FIRE DETECTION INSTRUMENTS

1. **PURPOSE.** This order is for manufacturers of cargo compartment fire detection instruments applying for a TSO authorization or letter of design approval. In it, we tell you what minimum performance standards (MPS) your instruments must meet for approval and identification with the applicable TSO marking.

2. **APPLICABILITY.** All prior revisions to this TSO are no longer effective. Generally we will not accept applications after the effective date of this TSO. However, we may do so up to six months after it, if we know that you were working against the earlier MPS before the new change became effective.

3. **REQUIREMENTS.**

a. **Minimum Performance Standard.** This TSO prescribes the minimum performance standard (MPS) that cargo compartment fire detection instruments must meet in order to be identified with the applicable TSO marking. New models of cargo compartment fire detection instruments that are to be so identified and manufactured on or after the date of this TSO must meet the standards set forth in the Society of Automotive Engineers, Inc., (SAE) Aerospace Standard (AS) Document No. AS 8036, "Cargo Compartment Fire Detection Instruments," dated April 1, 1985. In addition to the performance provisions of AS 8036, all cargo compartment fire detection instruments meeting this TSO must also be shown to not "false warn" when subjected to a sudden cabin pressure decrease or a pressure increase to an ambient pressure of 50 in. (127 cm) of mercury absolute.

b. **Environmental Standard.** AS 8036 incorporates as a reference RTCA/DO-160D, "Environmental Conditions and Test Procedures for Airborne Equipment," dated July 29, 1997.

c. **Computer Software.** If the equipment design implementation includes a digital computer, develop the computer software in an acceptable manner. One acceptable means of compliance is to develop the software according to RTCA/DO-178B, "Software Considerations in Airborne Systems and Equipment Certification," dated December 1, 1992. Applicants using RTCA/DO-178B to secure FAA approval for computer software must meet the following requirements:

(1) RTCA/DO-178B defines five levels of software: Level A, Level B, Level C, Level D and Level E. You must declare the level to which each computer software component has been developed. This equipment may incorporate software components developed to more than one software level.

(2) Submit the required plans for review and approval.

NOTE: We strongly recommend early discussion and agreement between you and us on your proposed software plans, and your proposed software level or levels.

4. **MARKING.** In addition to the marking specified in Title 14 of the Code of Federal Regulations (14 CFR) § 21.607(d), mark the following information legibly and permanently:

- a. On the major equipment components, the part number must include both hardware and software identification if the component includes a digital computer.
- b. 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 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, that have been approved to different software levels, must be differentiated by part number. The level(s) to which the software has been developed must also be marked.

5. **APPLICATION DATA REQUIREMENTS.** In addition to 14 CFR § 21.605, you, as the manufacturer, must give the FAA's Aircraft Certification Office (ACO) manager responsible for your facilities, one copy each of the following technical data:

- a. Operating instructions and equipment limitations, sufficient to describe the equipment's operation capability.
- b. Installation procedures and limitations, sufficient to ensure that the fire detection instrument, 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 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 Part 43 or the applicable airworthiness requirements.

- c. Schematic drawings as applicable to the installation procedures.
- d. Wiring diagrams as applicable to the installation procedures.
- e. List of major components (by part number) making up the equipment system complying with the standards in this TSO. In addition, where software identification applies to other than major components, furnish those components by part number.
- f. An environmental qualification form, as described in RTCA/DO-160D.
- g. Manufacturer's TSO qualification test report.
- h. Nameplate drawing.
- i. The documentation defined in RTCA/DO-178B, or equivalent, necessary to support the development of the computer software to Level A, Level B, Level C, Level D or Level E. If you develop the software to more than one level, submit the appropriate documentation for all levels.

6. MANUFACTURER DATA REQUIREMENTS. In addition to the data given directly to the FAA, a manufacturer must have the following technical data available for review by the responsible ACO:

- a. A list numbering all the drawings and processes necessary to define the article's design.
- b. The functional test specification to be used to test each production article to ensure compliance with this TSO.
- c. Equipment calibration procedures.
- d. Corrective maintenance procedures (within 12 months after TSO authorization).
- e. Schematic drawings.
- f. Wiring diagrams.
- g. Documentation as defined in RTCA/DO-178B, or equivalent, necessary to support the development of the computer software to Level A, Level B, Level C, Level D or Level E. If you develop the software to more than one level, make documentation for all levels available for review.
- h. Results of environmental qualification tests conducted under RTCA/DO-160D.

7. FURNISHED DATA REQUIREMENTS. One copy of the data and information specified in paragraphs **5a** through **5i** of this TSO, and instructions for periodic maintenance and

calibration necessary for continued airworthiness, must go to each person receiving for use one or more articles manufactured under this TSO.

8. HOW TO FIND REFERENCED DOCUMENTS.

- a.** You can buy copies of SAE Document No. AS 8036 from the Society of Automotive Engineers, Inc., 400 Commonwealth Drive, Warrendale, PA 15096.
- b.** You can buy copies of RTCA Document Nos. RTCA/DO-178B and RTCA/DO-160D from RTCA, Inc., 1828 L Street, N.W., Suite 805, Washington, DC 20036.
- c.** You can review Title14 CFR Part 21, Subpart O, and Advisory Circular (AC) 20-110C, Index of Aviation Technical Standard Orders, at FAA Headquarters in the Office of Aircraft Certification, Aircraft Engineering Division, (AIR-100), and at all regional ACOs.

/s/Susan JM Cabler

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