

CHANGE

U.S. DEPARTMENT OF TRANSPORTATION
FEDERAL AVIATION ADMINISTRATION

ORDER 8150.1B
CHG 1

Effective Date:
11/23/2010

National Policy

SUBJ: Technical Standard Order Program

1. **Purpose.** This change is written to incorporate numerous policy and guidance changes, deletions, and additions that have occurred since publication of Order 8150.1B in 2002.

2. **Who this change affects.** This change is distributed to the branch level in the Aircraft Certification Service and the Flight Standards Service; to the branch level in the Aircraft Certification Directorate offices and the regional Flight Standards Divisions; to the Federal Aviation Administration Academy and the Regulatory Support Division; to all Air Carrier; General Aviation, and Flight Standards District Offices; to all International Field Offices, International Area Offices; Aircraft Certification Field Offices; Manufacturing Inspection District and Satellite Offices.

3. **Explanation of Changes:** This change revises Appendix 1, Format and Guidance for the Preparation of TSO.

4. **Disposition of Transmittal Paragraph.** Retain this transmittal sheet until the directive is cancelled by a new directive.

PAGE CHANGE CONTROL CHART

Remove Pages	Dated	Insert Pages	Dated
APPENDIX 1. Pages 1 thru 8	5/12/02	APPENDIX 1. Pages 1 thru 8	11/23/2010

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APPENDIX 1. FORMAT AND GUIDANCE FOR THE PREPARATION OF TSO



Department of Transportation
Federal Aviation Administration
Aircraft Certification Service
Washington, D.C.

TSO-C{XXX}
Effective
Date: {mm/dd/yy}

Technical Standard Order

{Note: Use this template for all TSOs. Key: Shaded areas may not be applicable to every TSO. Information in parenthesis {italics} requires you to add data, or provides guidance, or both. If a shaded area is applicable to your TSO, fill in the missing information; if not, delete the shaded section from your TSO.}

Subject: *{Enter title of TSO article}*

1. **PURPOSE.** This technical standard order (TSO) is for manufacturers applying for a TSO authorization (TSOA) or letter of design approval (LODA). In it, we (the Federal Aviation Administration, (FAA)) tell you what minimum performance standards (MPS) your *{insert type of equipment}* must first meet for approval and identification with the applicable TSO marking.

2. **APPLICABILITY.** This TSO affects new applications submitted after its effective date. *{Select additional paragraphs if they apply:}*

a. *{For TSO revisions, use the following statement:}* All prior revisions to this TSO are no longer effective. Generally, we will not accept applications for the previous revision after the effective date of this TSO. We may do so, however, up to six months after it, if we know that you were working against the prior MPS before the new change became effective.

b. *{To allow the continued manufacture of previously approved articles, use the following statement:}* *{insert type of equipment}* approved under a previous TSOA may still be manufactured under the provisions of its original approval.

c. *{To stop the manufacture of previously approved articles, FAA staff must withdraw each approval previously issued by publishing a Federal Register notice. After we have withdrawn each approval, you can use the following statement:}* Effective *{enter date}* under Title 14 of the Code of Federal Regulations (14 CFR) 21 Subpart 0, we are withdrawing each TSOA and LODA that lets the holder identify or mark *{insert type of equipment}* with *{insert applicable versions of TSO}*

3. **REQUIREMENTS.** New models of *{insert type of equipment}* identified and manufactured on or after the effective date of this TSO must meet the MPS qualification and documentation requirements in *{insert the applicable statement: appendix 1, if an FAA MPS is used, or cite the applicable SAE, RTCA, etc. document, name, title, date, etc., as modified by appendix 1 of this TSO, when applicable.}*

a. **Functionality.** This TSO's standards apply to equipment intended to *{state intended function, or refer to a standard or an appendix.}*

b. **Failure Condition Classifications.** *{Choose one or both of the following statements:}* Malfunction of the function defined in paragraph 3.a of this TSO is a *{insert appropriate classification: minor, major, hazardous, catastrophic}* failure condition. *{or,}* Loss of the function defined in paragraph 3.a of this TSO is a *{insert appropriate classification: minor, major, hazardous, catastrophic}* failure condition. Design the system to *{insert appropriate statement: at least this or higher of the two}* failure condition classification*{s}*.

c. **Functional Qualification.** *{Choose one of the following statements:}* Demonstrate the required functional performance under the test conditions specified in *{insert reference to section of MPS}* *{or,}* Demonstrate the required performance under the test conditions in appendix *{insert no.}* of this TSO.

d. **Environmental Qualification.** *{Choose one of the following statements:}* Demonstrate the required performance under the test conditions specified in *{insert reference to section of MPS}* using standard environmental conditions and test procedures appropriate for airborne equipment. *{or,}* Demonstrate the required performance under the test procedures in appendix *{insert no.}* of this TSO using standard environmental conditions and test procedures appropriate for airborne equipment.

NOTE: The use of RTCA/DO-160D (with Changes 1 and 2 only, incorporated) or earlier versions is generally not considered appropriate and will require substantiation via the deviation process as discussed in paragraph 3.g of this TSO.

e. **Software Qualification.** If the article includes software, develop the software according to RTCA, Inc. document RTCA/DO-178B, *Software Considerations in Airborne Systems and Equipment Certification*, dated December 1, 1992 to the design assurance level consistent with the failure condition classification defined in paragraph 3.b of this TSO.

f. **Electronic Hardware Qualification.** If the article includes a complex custom micro-coded component, develop the component according to RTCA, Inc. Document RTCA/DO-254, *Design Assurance Guidance for Airborne Electronic Hardware* to the design assurance level consistent with the failure condition classification defined in paragraph 3.b of this TSO.

g. Deviations. We have provisions for using alternate 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 the provision of 14 CFR 21 Subpart O.

4. MARKING.

a. Mark at least one major component permanently and legibly with all the information in 14 CFR 21. Subpart O. The marking must include the serial number. The marking must include the date of manufacture. *{Use only one requirement as appropriate for this TSO}*

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), and
- (2) Each subassembly of the article that you determined may be interchangeable.

c. If the article includes a deviation per paragraph 3.g of this TSO, the marking should include a means to indicate a deviation was granted.

d. If the article includes software and/or airborne electronic hardware, then the article part numbering scheme must uniquely identify software and airborne electronic hardware. The part numbering scheme can use separate, unique part numbers for software, hardware, and airborne electronic hardware logic.

e. You may use electronic part marking to identify software or electronic hardware components by embedding the identification within the hardware component itself (using software) rather than marking it on the equipment nameplate. If electronic marking is used, it must be readily accessible without the use of special tools or equipment.

5. APPLICATION DATA REQUIREMENTS. You must give the FAA aircraft certification office (ACO) manager responsible for your facility a statement of conformance, as specified in 14 CFR 21 Subpart O and one copy each of the following technical data to support your design and production approval. LODA applicants must submit the same data (excluding paragraph 5.g) through their civil aviation authority.

a. A Manual(s) containing the following:

- (1) Operating instructions and equipment limitations sufficient to describe the equipment's operational capability.

- (2) Describe in detail any deviations. As applicable, identify equipment by part number, version, revision, and criticality level of software/hardware, classification for use, and environmental categories.
- (3) Procedures and limitations sufficient to ensure that the *{insert type of equipment}*, when installed according to the installation or operational procedures, still meets this TSO's requirements. Limitations must identify any unique aspects of the installation. The limitations must include a note with the following statement:

"This article meets the minimum performance and quality control standards required by a technical standard order (TSO). Installation of this article requires separate approval."

- (4) For each unique configuration of hardware, software and airborne electronic hardware, reference the appropriate part numbers and assurance levels (differentiated by function or component as appropriate). Include sufficient information for the installer to determine the appropriate configuration, such as the following:
 - (a). Software part number including revision and software level(s)
 - (b). Airborne electronic hardware logic part number including revision and assurance level(s)
 - (c). Functional description(s)
- (5) A summary of the test conditions used for environmental qualifications for each component of the article. For example, a form as described in RTCA/DO-160F, *Environmental Conditions and Test Procedures for Airborne Equipment*, Appendix A.
- (6) Schematic drawings, wiring diagrams, and any other documentation necessary for installation of the *{insert type of equipment}*.
- (7) List of line replaceable components, by part number, that makes up the *{insert type of equipment}*. Include vendor part number cross-references, when applicable.

- b. Instructions covering periodic maintenance, calibration, and repair, for the continued airworthiness of *{insert type of equipment}*. Include recommended inspection intervals and service life, as appropriate.
- c. If the article includes software: a plan for software aspects of certification (PSAC), software configuration index, and software accomplishment summary.
- d. If the article includes a simple or complex custom micro-coded component, a plan for hardware aspects of certification (PHAC), hardware verification plan, top-level drawing, and hardware accomplishment summary (or similar document, as applicable).

- e. Nameplate drawing with the information required by paragraph 4 of this TSO.
- f. Identify functionality, features or performance contained in the article not evaluated under paragraph 3 of this TSO (that is, non-TSO functions). Non-TSO functions are accepted in parallel with the TSO authorization. For those non-TSO functions to be accepted, you must declare these functions and include the following information with your TSO application:
 - (1) Description of the non-TSO function(s), such as performance specifications and software, hardware, and environmental qualification levels. Include a statement confirming that the non-TSO function(s) don't interfere with the article's compliance with the requirements of paragraph 3.
 - (2) Procedures and limitations sufficient to ensure that the non-TSO function(s), when installed according to the installation procedures, still meets this TSO's requirements. Limitations must identify any unique aspects of the installation.
 - (3) Instructions for continued performance applicable to the non-TSO function(s) described in paragraph 5.f.(1).
 - (4) Interface requirements and applicable installation test procedures to ensure compliance with the performance data defined in paragraph 5.f.(1).
 - (5) Results of test/analysis, as appropriate, to verify that performance of the hosting TSO article is not affected by the non-TSO function(s).
 - (6) Results of test/analysis, as appropriate, to verify the function and performance of the non-TSO function(s) as described in paragraph 5.f.(1).
- g. The quality system description required by 14 CFR 21 Subpart O, including functional test specifications. The quality system should ensure that you will detect any change to the approved design that could adversely affect compliance with the TSO MPS, and reject the article accordingly. (Not required for LODA applicants.)
- h. Material and process specifications list.
- i. List of all drawings and processes (including revision level) that define the article's design.
- j. Manufacturer's TSO qualification report showing results of testing accomplished according to paragraph 3.c through 3.f of this TSO.

{You can add to the above list any other documentation you think essential.}

6. MANUFACTURER DATA REQUIREMENTS. Besides the data given directly to the responsible ACO, have the following technical data available for review by the responsible

ACO: *{The following is a standard list of the generally applicable data. The applicability of each item will vary by TSO, and we may require other data.}*

a. Functional qualification specifications for qualifying each production article to ensure compliance with this TSO.

b. Equipment calibration procedures.

c. Schematic drawings.

d. Wiring diagrams.

e. Material and process specifications.

f. The results of the environmental qualification tests conducted according to paragraph 3.d of this TSO.

g. If the article includes software, the appropriate documentation defined in RTCA/DO-178B including all data supporting the applicable objectives in RTCA/DO-178B Annex A, Process Objectives and Outputs by Software Level.

h. If the article includes a complex custom micro-coded component, the appropriate hardware life cycle data in combination with design assurance level, as defined in RTCA/DO-254, Appendix A, Table A-1. *{Use this paragraph if the condition classification (defined in paragraph 3.b of this TSO) is major, hazardous or catastrophic.}* For simple custom micro-coded components, documentation as described in RTCA/DO-254 paragraph 1.6.

i. If the article contains non-TSO function(s), you must also make available items 6.a through 6.h as they pertain to the non-TSO function(s).

7. FURNISHED DATA REQUIREMENTS.

a. *{Data required will vary with each TSO.}* If furnishing one or more articles manufactured under this TSO to one entity (such as an operator or repair station), provide one copy or on-line access to the data in paragraphs *{insert 5.a through 5.e}* of this TSO. *{We generally consider these data the minimums; if you don't use a shaded area, change the letters accordingly.}* Add any other data needed for the proper installation, certification, use, or for continued compliance with the TSO, of the *{insert type of equipment.}*

b. If the article contains declared non-TSO function(s), include one copy of the data in paragraphs 5.f.(1) through 5.f.(6).

8. HOW TO GET REFERENCED DOCUMENTS. *{List the title, organization name and address for getting all referenced documents.}*

a. Order RTCA documents from RTCA Inc., 1828 L Street NW, Suite 805, Washington, D.C. 20036. Telephone (202) 833-9339, fax (202) 833-9434. You can also order copies online at www.rtca.org.

b. Order SAE documents from SAE International, 400 Commonwealth Drive, Warrendale, PA 15096-0001. Telephone (724) 776-4970, fax (724) 776-0790. You can also order copies online at www.sae.org.

c. Order copies of 14 CFR parts *{list applicable parts}* from the Superintendent of Documents, Government Printing Office, P.O. Box 979050, St. Louis, MO 63197. 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."

d. You can find a current list of technical standard orders and advisory circulars on the FAA Internet website Regulatory and Guidance Library at <http://rgl.faa.gov/>. You will also find the TSO Index of Articles at the same site.

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{Some notes on producing TSOs—

Title: TSO number is not a part of the subject. It will appear on upper right

Page setup: 1" all around

Header/footer: .5" top and bottom. Center the page number. TSO number and date on left and right sides of page top, no alternate pages. For proposed TSOs, mark every page accordingly by header, footer or watermark

Type: Times New Roman 12-point

Graphics: Consider using tables for cross-references and comparisons

Revisions: Use lower-case letter, as in "TSO-C123a"

{Appendix 1 of the TSO should look like one of these samples, depending on whether paragraph 3 of the TSO cites an FAA developed standard or references an SAE, RTCA, or other industry standard.}

**APPENDIX 1. FEDERAL AVIATION ADMINISTRATION MINIMUM
PERFORMANCE STANDARD FOR *{insert type of equipment}***

- 1.1 PURPOSE.** This standard provides the MPS for *{insert type of equipment}*.
- 1.2 SCOPE.** This standard covers *{describe the different types or classes of equipment when applicable}*.
- 1.3 DETAIL REQUIREMENTS.** *{Describe in detail the requirements.}*
- 1.4 TESTS.** *{Specify the material, operational, environmental, performance test requirements.}*
- 1.5 PASS/FAIL CRITERIA.** *{Outline the required pass/fail criteria for each test required in paragraph 1.4. above.}*

or

APPENDIX 1. MINIMUM PERFORMANCE STANDARD FOR *{insert type of equipment}*

This appendix prescribes the MPS for *{insert type of equipment}*. The applicable standard is *{State the SAE, RTCA (or other document), name, title, date, etc. of the required standard. We modified it as follows:*

1. *{For revisions}* Page *{enter page number}*, replace paragraph *{enter paragraph number}* reads as follows:

{Enter the entire paragraph of the referenced MPS with the revised content in italics.}

2. *{For additions}* Page *{enter page number}*, new paragraph *{add new paragraph number}* reads as follows:

{Enter the new paragraph you're adding in italics.}

3. *{For deletions}* Page *{enter page number}*, disregard paragraph *{enter paragraph number to be deleted}*. *{You may add an explanation for a deletion, if needed.}*

{Consider making a TABLE for revisions, additions and deletions.}

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