



**U.S. DEPARTMENT OF TRANSPORTATION  
FEDERAL AVIATION ADMINISTRATION**

**ORDER  
8150.5**

National Policy

Effective Date:  
08/01/2025

**SUBJ:** Guidance for the Preparation of a Technical Standard Order (TSO)

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- 1. Purpose.** This order provides the minimum requirements that must be included in any new or revised TSO. This information was previously contained in appendix G of FAA Order 8150.1D, *Technical Standard Order Program*. The template contained herein is unchanged from the one previously found in Order 8150.1D.
- 2. Audience.** This order is applicable to FAA personnel who create new or revised TSOs.
- 3. Where Can I Find this Order?** You can find this order and its corresponding order on the FAA website at [http://www.faa.gov/regulations\\_policies/orders\\_notices](http://www.faa.gov/regulations_policies/orders_notices) and on the Dynamic Regulatory System (DRS) website at <https://drs.faa.gov>.

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ELGAS

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Daniel J. Elgas  
Director, Policy and Standards Division  
Aircraft Certification Service

## TSO Template



Department of Transportation  
**Federal Aviation Administration**  
 Aircraft Certification Service  
 Washington, DC

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

# Technical Standard Order

**Key:** *Shaded areas may not be applicable to every TSO. Italicized and bracketed text requires you to add data, provides guidance, or both. If a shaded area is applicable to your TSO, fill in the applicable information and remove the shading; if not, delete the shaded section.*

**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 TSO design approval (LODA). In it, we (the Federal Aviation Administration, (FAA)) tell you what minimum performance standards (MPS) your {insert type of equipment} must 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} TSO-C {Previous Revision} will also remain effective until {insert date 18 months after publication date of this TSO revision}. After this date, we will no longer accept applications for TSO-C {Previous Revision}.

**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} pursuant to Title 14 of the Code of Federal Regulations (14 CFR) 21.613(a), 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 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.** *{Use either (1) through (3) or the alternate below it. The failure condition classification may need to be tailored for a specific failure condition, (e.g., unannounced loss of function).}*

(1) Failure of the function defined in paragraph **3a** resulting in *{insert under what conditions as appropriate (e.g., misleading vertical guidance)}* is a *{insert appropriate classification: minor, major, or hazardous, catastrophic}* failure condition.

(2) Loss of the function defined in paragraph **3a** is a *{insert appropriate classification: minor, major, hazardous, catastrophic}* failure condition.

(3) Design the system to at least these failure condition classifications.

*{Alternatively, if the article could be designed for various failure condition classifications based on its intended use, then use the following paragraph}*

**b.** There is no standard minimum failure condition classification for this TSO. The failure condition classification appropriate for the equipment will depend on the intended use of the equipment in a specific aircraft. Document the loss of function and malfunction failure condition classification for which the equipment is designed. *{The following statement may be used if you deem it applicable}* Development to a lower design assurance level may be justified for certain cases and accepted but will lead to installation restrictions and must be documented in the installation and limitations manual defined in paragraph **5a** of this TSO.

**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. You may use a different standard environmental condition and test procedure than *{insert reference to the RTCA/DO-160 version in the MPS}*, provided the standard is appropriate for the *{insert type of 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, without Change 3 incorporated) or earlier versions is generally not considered appropriate and will require substantiation via the deviation process as discussed in paragraph **3g** of this TSO.

**e. Software Qualification.** If the article includes software, develop the software according to RTCA, Inc., document RTCA/DO-178C, *Software Considerations in Airborne Systems and Equipment Certification*, dated December 13, 2011, including referenced supplements as applicable, to at least the software level consistent with the failure condition classification defined in paragraph **3b** of this TSO. You may also develop the software according to RTCA, Inc., document RTCA/DO-178B, dated December 1, 1992, if you follow the guidance in AC 20-115C, *Airborne Software Assurance*, dated July 19, 2013. *{The following statement may be used if you deem it applicable}* Development to a lower design assurance level may be justified for certain cases and accepted but will lead to installation restrictions and must be documented in the installation and limitations manual defined in paragraph **5a** of this TSO.

**f. Electronic Hardware Qualification.** If the article includes complex custom airborne electronic hardware, then develop the component according to RTCA, Inc., Document RTCA/DO-254, *Design Assurance Guidance for Airborne Electronic Hardware*, to at least the Design Assurance Level consistent with the failure condition classification defined in paragraph **3b** of this TSO. For custom airborne electronic hardware determined to be simple, RTCA/DO-254, paragraph 1.6 applies. *{You must use this paragraph if the condition classification defined in paragraph 3.b of this TSO is major, hazardous, or catastrophic.}* *{The following statement may be used if you deem it applicable}* Development to a lower design assurance level may be justified for certain cases and accepted but will lead to installation restrictions and must be documented in the installation and limitations manual defined in paragraph **5a** of this TSO.

**g. Deviations.** We have provisions for using alternate or equivalent means of compliance with 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 pursuant to 14 CFR 21.618.

*{To allow certification branches to approve specific deviations to this TSO, use the following statement:}* The following deviations have been determined to provide an equivalent level of safety (ELOS) for this TSO and may be granted by the appropriate certification branch manager without further AIR-600 involvement.

*{List any deviations specific to this TSO that the certification branch is authorized to grant.}*

#### **4. MARKING.**

**a.** Mark at least one major component permanently and legibly with all the information in 14 CFR 45.15(b).

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

**c.** You may use electronic part marking to identify software or airborne 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 certification branch manager responsible for your facility a statement of conformance, as specified in 14 CFR 21.603(a)(1) 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. Manuals containing the following:**

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

(2) Detailed description of any deviations.

(3) Installation 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 also include a note with the following statement:

“This article meets the minimum requirements of {insert the TSO number and revision letter}. Installation of this article requires separate approval.”

(4) For each unique configuration of software and airborne electronic hardware, reference the following:

(a) Software part number, including revision and design assurance level,

(b) Airborne electronic hardware part number including revision and design assurance level, and

(c) Functional description.

(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-160G, *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) By-part-number list of replaceable components that makes up the *{insert type of equipment}*. Include vendor part number cross-references, when applicable.

**b. Instructions covering periodic maintenance, calibration, and repair, to ensure that the *{insert type of equipment}* continues to meet the TSO approved design. 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 a software accomplishment summary.

**d.** If the article includes simple or complex custom airborne electronic hardware: a plan for hardware aspects of certification (PHAC), a hardware verification plan, top-level drawing, and hardware accomplishment summary (or similar document, as applicable).

**e.** A drawing depicting how the article will be marked with the information required by paragraph 4 of this TSO.

**f.** Identify functionality or performance contained in the article not evaluated under paragraph 3 of this TSO (defined as non-TSO functions). Non-TSO functions can be accepted in parallel with the TSOA. 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, failure condition classifications, software, hardware, and environmental qualification levels. Include a statement confirming that the non-TSO function(s) do not interfere with the article's compliance with the requirements of paragraph 3.

(2) Installation procedures and limitations sufficient to ensure that the non-TSO function(s) meets the declared functions and performance specification(s) described in paragraph 5.f.(1).

(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 non-TSO function(s) performance data defined in paragraph 5.f.(1).

(5) Test plans, and analysis, as appropriate, to verify that the performance of the hosting TSO article is not affected by the non-TSO function(s).

(6) Test plans and analysis as appropriate, to verify that the function and performance of the non-TSO function(s) as described in paragraph 5.f.(1).

**g.** The quality manual required by 14 CFR 21.608, including functional test specifications. The quality system must 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. Applicants who currently hold TSOAs must submit revisions to the existing quality manual as necessary (not required for LODA applicants).

**h.** A description of your organization as required by 14 CFR 21.605.

**i.** Material and process specifications list.

**j.** A list of all drawings and processes (including revision level) that define the article's design.

**k.** Manufacturer's TSO qualification report showing results of testing accomplished according to paragraph **3.c** 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 certification branch, have the following technical data available for review by the responsible certification branch: *{The following is a standard list of the generally applicable data. The applicability of each item will vary by TSO, and you may need to require other data.}*

**Note:** The following data for a LODA applicant may be made available for review through its civil aviation authority. Refer to the implementation procedures of the applicable bilateral agreement for specific details regarding access to this data.

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

**b.** Article 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 **3d** of this TSO.

**g.** If the article includes software, the appropriate documentation defined in RTCA/DO 178B or RTCA/DO-178C specified in paragraph **3.e** of this TSO, 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 complex custom airborne electronic hardware, the appropriate hardware life-cycle data in combination with design assurance level, as defined in RTCA/DO-254, appendix A, table A-1. For simple custom airborne electronic hardware, the following data are required: test cases or procedures, test results, test coverage analysis, tool assessment and qualification data, and configuration management records, including problem reports. *{You must use this paragraph if the failure condition classification defined in paragraph **3.b** of this TSO is major, hazardous, or catastrophic.}*

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

## 7. FURNISHED DATA REQUIREMENTS.

**a.** When furnishing one or more articles manufactured under this TSO to one entity (such as an operator or repair station), provide one copy or online access to the data in paragraphs **5.a** and **5.b** of this TSO. *{We generally consider these data the minimums.}* Add any other data needed for the proper installation, certification, use, or 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.(4)**.

If the article contains software, include one copy of the OPR summary.

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

**a.** Order RTCA documents from RTCA, Inc., 1150 18th Street NW, Suite 910, Washington, DC 20036. Telephone: (202) 833-9339; fax: (202) 833-9434. You can also order copies online at [www.rtca.org](http://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](http://www.sae.org).

**c.** Order copies of parts 21 and 45 *{add additional applicable parts}* from the Superintendent of Documents, Government Publishing Office, PO Box 979050, St. Louis, MO 63197-9000. Telephone: (202) 512-1800, fax: (202) 512-2104 or online at [www.gpo.gov](http://www.gpo.gov). You can also find them online at [www.ecfr.gov](http://www.ecfr.gov).

**d.** You can find a current list of TSOs and advisory circulars on the Dynamic Regulatory System (DRS) at <https://drs.faa.gov/browse>.



## Appendix A. Administrative Information

**1. Authority to Change This Order.** The issuance, revision, or cancellation of the material in this order is the responsibility of AIR-600.

**2. Suggestions for Improvements.** Please forward all comments on deficiencies, clarifications, or improvements regarding the contents of this order to the AIR Directives Management Officer at [9-avs-air-directives-management-officer@faa.gov](mailto:9-avs-air-directives-management-officer@faa.gov).

Your suggestions are welcome. FAA Form 1320-19, Directive Feedback Information, is in appendix B of this order for your convenience.

**3. Records Management.** Refer to the current General Records Schedule (GRS) or FAA Records Retention and Disposition Schedule or contact your respective Service Office Records Coordinator (RC) or File Custodian (FC) for guidance regarding the retention/disposition of records.

## Appendix A. Directive Feedback Information

Please submit any written comments or recommendations for improving this directive or suggest new items or subjects to be added to it. Also, if you find an error, please tell us about it.

Subject: Order 8150.5, Guidance for the Preparation of a Technical Standard Order (TSO)

To: Directive Management Officer, [9-avs-air-directives-management-officer@faa.gov](mailto:9-avs-air-directives-management-officer@faa.gov)

*(Please mark all appropriate line items)*

☐ An error (procedural or typographical) has been noted in paragraph \_\_\_\_\_ on page \_\_\_\_\_.

☐ Recommend paragraph \_\_\_\_\_ on page \_\_\_\_\_ be changed as follows:  
*(attached separate sheet if necessary)*

☐ In a future change to this order, please include coverage on the following subject:  
*(briefly describe what you want added):*

☐ Other comments:

☐ I would like to discuss the above. Please contact me.

Submitted by: \_\_\_\_\_ Date: \_\_\_\_\_

Telephone Number: \_\_\_\_\_ Routing Symbol: \_\_\_\_\_