



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

**TSO-C184**

Effective  
Date:  
09/30/2011

# Technical Standard Order

**Subject: Airplane Galley Insert Equipment, Electrical/Pressurized**

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 airplane galley insert 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.
3. **REQUIREMENTS.** New models of airplane galley insert equipment identified and manufactured on or after the effective date of this TSO must meet the MPS qualification and documentation requirements in Society of Automotive Engineers (SAE) Aerospace Standard (AS) 8057, *Minimum Design and Performance of Airplane Galley Insert Equipment, Electrical/Pressurized*, issued July, 2008 as modified by appendix 1 of this document.
  - a. **Functionality.** This TSO's standards apply to equipment intended to be used as airplane galley insert equipment installed in galleys and other areas (e.g., bars). Some examples of Galley Insert Equipment are listed below however, the FAA does not limit the definition to these items only.
    - (1) Ovens (e.g., convection, steam, induction, microwave, bun warmer, plate warmer).
    - (2) Beverage makers (e.g., coffee makers, coffee warmers, water heaters, espresso makers).
    - (3) Beverage cups and jugs (so-called hot cups and jugs).
    - (4) Self-contained refrigeration equipment (e.g., refrigerators, freezers, wine chillers, water coolers, air chillers).
    - (5) Trash compactors.
    - (6) Rail assemblies.
    - (7) Associated components, such as oven racks and trays, beverage servers.
  - b. **Failure Condition Classifications.** Loss of the function defined in paragraph 3.a of this TSO is a minor failure condition. Design the system to at least this failure condition classification.

**c. 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.

**d. 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.

**e. 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 part 21, subpart O, (21.618).

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

**a.** Mark at least one major component permanently and legibly with all the information in 14 CFR part 21, subpart O, (21.616 (d)) Note: refer to part 45.15 (b)(1)&(2) as required. The marking must include the serial number.

**b.** Also, mark the following permanently and legibly, with at least the manufacturer's name, subassembly part number, and the TSO number reference 14 CFR part 21, subpart O, (21.616 (e)) Note: refer to part 45.15 (b)(1)&(2) as required:

(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.e. of this TSO, the marking should include a means to indicate a deviation was granted.

**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 part 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.e) 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 airplane galley insert 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) 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*, dated December 6, 2007, Appendix A.
  - (5) Schematic drawings, wiring diagrams, and any other documentation necessary for installation of the airplane galley insert equipment.
  - (6) List of line replaceable components, by part number, that makes up the airplane galley insert equipment. Include vendor part number cross-references, when applicable.
- b.** Instructions covering periodic maintenance, calibration, and repair, for the continued airworthiness of the airplane galley insert equipment. Include recommended inspection intervals and service life, as appropriate.
    - c.** Nameplate drawing with the information required by paragraph 4 of this TSO.
    - d.** 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 functions 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.d.(1).
- (4) Interface requirements and applicable installation test procedures to ensure compliance with the performance data defined in paragraph 5.d.(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.d.(1).

e. The quality system description required by 14 CFR part 21, subpart O, (21.607), 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.)

f. Material and process specifications list.

g. List of all drawings and processes (including revision level) that define the article's design.

**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:

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

**7. FURNISHED DATA REQUIREMENTS.**

a. 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 5.a through 5.c of this TSO. Add any other data needed for the proper installation, certification, use, or for continued compliance with the TSO, of the airplane galley insert equipment.

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

**8. HOW TO GET REFERENCED DOCUMENTS.**

**a.** Order copies of SAE documents, (such as AS8057, AS8056, & ARP4761) 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).

**b.** Order copies of RTCA documents, (such as DO-160, DO-178, & DO-254), 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 on the RTCA website at [www.rtca.org](http://www.rtca.org).

**c.** Order copies of 14 CFR part 21 subpart "O" & part 45 subpart "B" 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](http://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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## **APPENDIX 1. MINIMUM PERFORMANCE STANDARD FOR AIRPLANE GALLEY INSERT EQUIPMENT, ELECTRICAL/PRESSURIZED**

This appendix prescribes the minimum performance standards (MPS) for airplane galley insert equipment. The applicable standard is SAE AS 8057, *Minimum Design and Performance of Airplane Galley Insert Equipment, Electrical/Pressurized*, issued July, 2008. We modified it as follows:

1. Page 5, replace paragraph 1.3.b. with:  
“The word “should” indicates a criterion for which an alternative, including non-compliance, may be applied.”
2. Page 8, disregard paragraph 2.2 Definitions: “ACCEPTANCE TEST”, “ASSOCIATED COMPONENTS”, “DETRIMENTAL PERMANENT DEFORMATION”, and “FAIL-SAFE”.
3. Page 8, replace paragraph 2.2 Definitions: “FAILURE” with: “FAILURE: is a failure to meet the Minimum Performance Standard of the TSO. The standard ensures a level of safety that is acceptable.
4. Page 9, replace paragraph 2.2 Definitions: INTERCHANGEABILITY with:  
“INTERCHANGEABILITY: That quality which allows an assembly or part to substitute or be substituted for another and to meet all physical, functional, and structural requirements of the original.”
5. Page 9, replace paragraph 2.2 Definitions: MAXIMUM NORMAL OPERATING PRESSURE (MNOP) with: “MAXIMUM NORMAL OPERATING PRESSURE (MNOP): The maximum attainable pressure of the equipment’s pressure system when all the equipment’s components are functioning normally.”
6. Page 9, replace paragraph 2.2 Definitions: OPTION with  
“OPTION: A function capable of being included as part of equipment. It shall be fully developed and able to be incorporated without adverse effects to meeting the performance requirements of this AS included in this TSO.”
7. Page 9, disregard paragraph 2.2 Definitions: “PERIODIC TESTING”.
8. Page 10, disregard paragraph 2.2 Definitions: “PROCESS SPECIFICATION”
9. Page 10, replace paragraph 3.1 with:  
“Table 1 identifies applicable requirements for typical galley insert equipment designs. Novel designs may require compliance to additional requirements, or requirements in Table 1 not identified by a bullet. To use the table, find the equipment in question along the top row, and then read down that column; the row in which a bullet appears indicates requirements that

shall be addressed. A bullet in brackets indicates that the requirements are applicable for only a part of the equipment in question.”

10. Page 11, disregard paragraphs 3.2.1 and 3.2.1.1.
11. Page 12, disregard paragraph 3.2.1.2.a.
12. Page 12, replace paragraph 3.2.1.2.c with:  
“Aluminum honeycomb core shall be finished for corrosion resistance.”
13. Page 12, disregard paragraphs 3.2.1.4. through 3.2.1.6.
14. Page 12, replace paragraph 3.2.1.8 with:  
“Components shall be protected against deterioration or loss of strength in service due to environmental causes. Selection and finishing of material (including fasteners), where dissimilar metals may be placed in contact, shall be per MIL-STD-889 or equivalent. Material not inherently corrosion resistant shall be finished with a protective treatment or coating. Magnesium alloys shall not be used.”
15. Page 13, disregard paragraphs 3.2.1.9. through 3.2.2.3.
16. Page 14, replace paragraph 3.2.2.4 with:  
“Bonded joints shall not be loaded primarily in tension”  
Disregard paragraphs 3.2.2.4.a thru d.
17. Page 14, disregard paragraph 3.2.2.5.
18. Page 14, replace paragraph 3.2.3 with:  
“Construction for Trash Compactors”  
Trash compactors shall be constructed of fire resistant materials (see 14 CFR § 1.1, Amendment 1-63) capable of containing fire (see 3.10) under the conditions expected to result in service.”
19. Page 15, disregard paragraph 3.2.4.
20. Page 15, replace paragraph 3.2.5 with:  
“Interface clearances between equipment and the surrounding galley or structure required for ventilation, heat dissipation, installation, loading, etc. shall be clearly defined and included in the Application Data Requirements, paragraph 5. of the TSO.”
21. Page 15, replace paragraph 3.2.6 with:  
“Equipment shall comply with US Food and Drug Administration (FDA) requirements for sanitary construction in Sections 1, 2, 4, and 6 of Attachment 3 *Guidelines for Sanitary Construction of Aircraft Galleys and Galley Equipment*, to FDA document, *Guide to Inspections of Interstate Carriers and Support Facilities*, (Reference 2.1.5).”

- 22.** Page 15, replace paragraph 3.2.7 with:  
“The manufacturer of a TSO article shall permanently and legibly mark  
(1) Each TSO article with the TSOA holder’s name, trademark, symbol, or other FAA approved identification and part number; and  
(2) Each TSO article, unless otherwise specified in the applicable TSO, with the TSO number and letter of designation, all markings specifically required by the applicable TSO, and the serial number or the date of manufacture of the article or both.
- 23.** Page 16, disregard paragraph 3.2.8.
- 24.** Page 16, replace paragraph 3.3.1.a. with:  
“Equipment shall be designed to meet the structural loading as specified in 4.2.1.”
- 25.** Page 16, replace paragraph 3.3.2.a. with:  
“The structure of equipment shall address the load case in each direction and be verified according to 4.2.1.”
- 26.** Page 16, replace paragraph 3.3.2.b with:  
“The loading conditions shall be determined by assuming installation of equipment around the z-axis of the airplane (see Figure 1).”
- 27.** Page 16, disregard paragraph 3.3.2.c.
- 28.** Page 16, replace paragraph 3.3.2.d. with:  
“Failure shall not occur under ultimate load cases. All permanent deformation that occurs under ultimate or limit load cases shall be reported in the data furnished with each article.”  
Disregard “NOTE” following paragraph 3.3.2.d.
- 29.** Page 16, replace paragraph 3.3.3 with:  
“A local attachment factor of 1.33 shall be applied in addition to the design load factors for attachments (such as door hinges, latches and retaining devices).”
- 30.** Page 16, replace paragraph 3.3.4 with:  
“Material strength properties shall be based on tests of material meeting industry specifications to establish design values on a statistical basis. Design values shall be chosen to minimize the probability of structural failure due to material variability. The applicable specifications are Metallic Materials Process Development and Standardization (MMPDS, formerly MIL-Handbook-5) and the Composite Materials Handbook (CMH-17, formerly MIL-Handbook-17).  
Analytical substantiation of material strength shall be based on material design values shown to be statistically reliable by repeated structural testing. Strength substantiation shown by full scale testing shall account for the variability of the materials and processes used to fabricate the parts by applying an appropriate overload factor. See chapter 2 in General Aviation Manufacturer's Association (GAMA) document Publication 13 for guidance in determining the appropriate overload factor.”

- 31.** Page 18, replace paragraph 3.3.5.i. with:  
“Forces generated by the conditions tested in 3.17, 4.2.1., or the weight of the retaining device itself, shall not cause the retaining device to release.”
- 32.** Page 18, replace paragraph 3.3.5.m. with:  
“Equipment with a stowage compartment (e.g., trash compactors, ovens, refrigerators and freezers, wine chillers) shall be designed such that the stowage compartment completely encloses its contents.
- 33.** Page 18, correct 3.3.6.b.2. to read:  
“maximum wet weight, including associated components used for normal operation of the equipment (with the exception of attached hoses, tubes, pipes and/or electrical conduit), maximum amount of water in the equipment plumbing system and including water in tank, beverage in server, soaked pillow pack (if applicable).”
- 34.** Page 19, disregard paragraph 3.3.8.
- 35.** Page 19, disregard paragraph 3.3.9
- 36.** Page 19, replace paragraph 3.4.1.a. with:  
“Equipment shall be designed for the primary power levels typically found in aircraft (e.g., 28VDC, and/or 115 VAC (Constant frequency (CF) or Wide variable frequency (WF), or 230 VAC (CF) or (WF)).”
- 37.** Page 20, replace paragraph 3.4.4 with:  
“Equipment shall be designed to be capable of withstanding over-voltage events without arcing, sparking, smoke or fire. Equipment shall be designed to pass the following dielectric tests: (Note: Components (filters, protection diodes) normally not capable of withstanding the dielectric withstanding voltage test without damage may be disconnected or individually disabled (e.g., short circuited) for these tests. The dielectric withstanding voltage test shall be run prior to the insulation resistance test.)” Paragraphs 3.4.4.a and b. remain unchanged.
- 38.** Page 21, replace paragraph 3.4.7. with:  
“In addition to the requirements of this document, microwave ovens shall meet 21 CFR § 1030.10, Performance Standards for Microwave and Radio Frequency Emitting Products.”
- 39.** Page 21, replace paragraph 3.4.8.a. with:  
“Equipment shall be designed to minimize the generation of or susceptibility to electromagnetic interference.”
- 40.** Page 21, disregard paragraph 3.4.8.b.

- 41.** Page 22, replace paragraph 3.4.9.b. with:  
“Hidden installed equipment (e.g., remote water heater, air chiller) may have a separate control module capable of being installed on the front of the galley for the following functions:” Information in bullets remains unchanged.
- 42.** Page 23, replace paragraph 3.6.2.a. with:  
“Show the complete equipment plumbing interface in the Application Data Requirements, paragraph 5. of the TSO.”
- 43.** Page 23, disregard paragraphs 3.6.2.c and 3.6.2.d.
- 44.** Page 23, replace paragraph 3.6.3 with:  
“Equipment, capable of being connected to the potable water system of an airplane, that heats and stores water shall incorporate a feature for sensing a low water condition. Indication of low water shall both illuminate a warning light and interrupt power to the equipment heating elements.”
- 45.** Page 23, replace paragraph 3.6.4.a. with:  
“Equipment capable of being connected to an airplane potable water system shall incorporate a self-venting device.”
- 46.** Page 23, replace paragraph 3.6.4.b. with:  
“Equipment capable of being connected to an airplane potable water system shall be self-draining.”
- 47.** Page 24, replace paragraph 3.6.6.a. with:  
“Demonstrate equipment proof and burst pressure values by test and provide pressure values in TSO, Application Data Requirements, paragraph 5 as required.”
- 48.** Page 25, replace paragraph 3.6.7.b. with:  
“Water taps/faucets shall be self-closing unless the Application Data Requirements, paragraph 5. of the TSO specifies this equipment is intended for installation above a sink in the galley monument.”
- 49.** Page 25, revise paragraph 3.8.c. first sentence with:  
“External surfaces that have to be heated directly to meet the equipment purpose (e.g., toaster slot, skillet surface, heating plates of a sandwich press, warmer pad for beverage server) are excluded from 3.8.a. and 3.8.b.
- 50.** Page 25, replace paragraph 3.9 with:  
“Materials (including finishes or decorative surfaces applied to the materials) shall comply with the appropriate paragraphs of 14 CFR part 25, App. F at Amendment 25-111, as follows:”
- 51.** Page 25, replace paragraph 3.9.1.a. with:

“Equipment shall comply with the appropriate flammability requirements of 14 CFR part 25 when tested per appendix F, Part I.”

**52.** Page 25, replace paragraph 3.9.1.b. with:

“Thermal and acoustic insulation material and components (batting, cover foil, foam, etc.) shall comply with the flame propagation requirements of 14 CFR part 25, Appendix F, Part VI, at Amendment 25-111. Consult Advisory Circular AC 25.856-1, *Thermal/Acoustic Insulation Flame Propagation Test Method Details*, for appropriate guidance.”

**53.** Page 26, replace paragraph 3.9.2. with:

“Exposed surfaces of equipment, when stowed, shall meet the heat release and smoke density requirements of 14 CFR part 25, Appendix F, Parts IV and V, at Amendment 25-66.”

**54.** Page 26, replace paragraph 3.10.a. with:

“Equipment dedicated to, or that may be used for, waste stowage (e.g., trash compactors) shall meet AC 25-17A *Transport Airplane Cabin Interiors Crashworthiness Handbook Appendix 8 Fire Containment Test Methods*, Sections 4.2 CARTS and 5.2 ACCEPTANCE CRITERIA.”

**55.** Page 26, replace paragraph 3.11. with:

“Equipment shall be marked using materials and/or processes that will ensure legibility during its lifespan. Markings shall be conspicuous and worded in mandatory “command” English. Non-English language marking is acceptable, in addition to English. Non-English marking may be used alone when airworthiness requirements are not involved. Marking location, style and wording should be consistent. Weight placards shall include both English and metric units.

The location and wording of placards shall be shown in the Application Data Requirements, paragraph 5. of the TSO.”

**56.** Page 26, replace paragraph 3.11.3.a. with:

““No Cigarette Disposal” shall be placed on or near each waste receptacle disposal door (e.g., the waste disposal flap of a trash compactor).”

**57.** Page 27, disregard paragraphs 3.14.a, 3.14.b, and 3.14.c.

**58.** Page 27, disregard paragraph 3.17 Note #1 on Pass/Fail criteria at bottom of Table 2 and replace Note #2 with: “(2) Equipment shall comply with the performance requirements of this TSO in each instance RTCA/DO-160 reads ‘DETERMINE COMPLIANCE WITH APPLICABLE EQUIPMENT PERFORMANCE STANDARDS’. The equipment shall also comply with the performance standards of this TSO after DO-160 testing.

**59.** Page 30, replace paragraph 3.18.1 with:

“The power consumption of the equipment shall be defined in the Application Data Requirements, paragraph 5. of the TSO.”

**60.** Page 32, replace paragraph 3.19. with:

“A Failure Mode and Effects Analysis (FMEA) shall be performed at the equipment level independent of the aircraft. The analysis shall include typical and hidden failure modes throughout the entire operating range and include the effects of mishandling.”

- 61.** Page 33, replace paragraph 4.2.1 Table 3 Note (2) with:  
“(2) Load factors may be increased to meet aircraft flight and ground cases. If increased factors are used, they shall be provided in TSO, Application Data Requirements, paragraph 5.a.(1)”
- 62.** Page 33, replace paragraph 4.2.1 Table 3 Note (5) with:  
“(5) For equipment with a stowage compartment, maximum door deflections shall meet 3.3.5.n.
- 63.** Page 34, replace paragraph 4.2.4.a. with:  
“Proof Pressure Test: The qualification unit shall have its pressurized components tested to the required proof pressure; this pressure shall be held for five minutes. The equipment shall not be damaged nor leak as a result of the test.”
- 64.** Page 35, replace paragraph 4.2.6.2.b. with:  
“The top, sides and front surfaces of equipment shall be tested per 14 CFR part 25, Appendix “F” (at Amendment 25-66), Parts IV and V.”
- 65.** Page 35, correct 4.2.7. to read:  
“Trash compactors used to receive combustible material shall comply with the fire containment requirements of 3.10, when substantiated per AS 8056, 4.6.”
- 66.** Page 35, disregard section 4.2.9.
- 67.** Page 37, replace paragraph 4.2.15. with:  
“Conduct and prepare the FMEA in accordance with ARP 4761 at the equipment level independent from the aircraft.”
- 68.** Page 38, disregard section 4.3.
- 69.** Page 39, replace paragraph 5.1.b.12 with:  
“Maximum amount of discharge air emitted by equipment, if applicable.”
- 70.** Page 40, disregard section 5.2.
- 71.** Page 41, disregard section 6.