



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

TSO-C127b

Effective
Date: mm/dd/yy

Technical Standard Order

Subject: ROTORCRAFT, TRANSPORT AIRPLANE, AND SMALL AIRPLANE SEATING SYSTEMS

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 rotorcraft, transport airplane, and small airplane seating systems must first meet for approval and identification with the applicable TSO marking.
2. **APPLICABILITY.** This TSO affects new applications submitted after its effective date.
 - a. 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. Rotorcraft, transport airplane, and small airplane seating systems approved under a previous TSOA or LODA may still be manufactured under the provisions of its original approval.
3. **REQUIREMENTS.** New models of rotorcraft, transport airplane, and small airplane seating systems identified and manufactured on or after the effective date of this TSO must meet the following MPS qualification and documentation requirements in the following:
 - (1) SAE International's Aerospace Standard (AS) 8049B, *Performance Standard for Seats in Civil Rotorcraft, Transport Aircraft, and General Aviation Aircraft*, dated January 2005, as modified by appendix 1 of this TSO; and
 - (2) SAE Aerospace Recommended Practice (ARP) 5526C, *Aircraft Seat Design Guidance and Clarifications*, dated May 2011, as modified by appendix 1 of this TSO; and
 - (3) Appendix 2 of this TSO for specific elective requirements.
 - a. **Functionality.** This TSO's standards apply to equipment intended to be utilized as aircraft seating systems of the following classifications:

(1) Seat Type and applicable Aircraft Category:

- (a) Type A - Airplane. Aircraft Category: Transport
- (b) Type B – Rotorcraft. Aircraft Category: Transport or Normal
- (c) Type C - Small Airplane. Aircraft Category: Normal, Utility, Acrobatic, or Commuter

(2) Seat Subtype:

- (a) Subtype 1 - Passenger
- (b) Subtype 2 - Flight Attendant
- (c) Subtype 3 - Observer
- (d) Subtype 4 - Pilot / Copilot

(3) Seat Orientation:

- (a) Forward Facing
- (b) Rearward Facing

Note: Seats with installation limitations of angles more than 18 degrees from aircraft centerline are not addressed by this standard. See Appendix 1 of this TSO amending SAE AS8049B subsection 5.3.3.5.i.

b. Failure Condition Classifications. There is no standard minimum failure condition classification for this TSO. The failure condition classification appropriate for the article will depend on the intended use of the article in a specific aircraft.

c. Functional Qualification. Demonstrate the required functional performance under the test conditions specified in:

(1) Sections 3.4 and 5 of SAE International’s Aerospace Standard (AS) 8049B, *Performance Standard for Seats in Civil Rotorcraft, Transport Aircraft, and General Aviation Aircraft*, dated January 2005, as amended by appendix 1 of this TSO, and

(2) Section 3 of SAE Aerospace Recommended Practice (ARP) 5526C, *Aircraft Seat Design Guidance and Clarifications*, dated May 2011, as amended by appendix 1 of this TSO, and

(3) Appendix 2 of this TSO for specific elective requirements.

d. 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 article maintains an equivalent level of safety. Apply for a deviation under the provision of 14 CFR § 21.618.

4. MARKING.

a. Mark at least one major component permanently and legibly with all the information in 14 CFR § 45.15(b). The marking must include the serial number, and:

(1) The specific seat MPS complied with as abbreviated by paragraphs **4.a.(1).(a)** through **4.a.(1).(e)** below. Separate each applicable identifier with a dash. For example a transport airplane passenger seat that is forward facing, and meets the step load on the baggage bar standard as well as meets higher static loads shall be marked as: *Type A-T-1-FF-a-c*.

(a) The seat type use: “**Type A**” for Airplane, “**Type B**” for Rotorcraft, or “**Type C**” for Small Airplane.

(b) The seat type shall be followed by the aircraft category, use: “**T**” for Transport, “**N**” for Normal, “**U**” for Utility, “**A**” for Acrobatic, or “**C**” for Commuter.

(c) The aircraft category shall be followed by the appropriate seat subtype, use: “**1**” for Passenger, “**2**” for Flight Attendant, “**3**” for Observer, or “**4**” for Pilot / Copilot.

(d) The subtype shall be followed by the appropriate seat facing designation, use: “**FF**” for Forward Facing, or “**RF**” for Rearward Facing.

(e) The seat facing designations shall be followed by the applicable paragraph letter of the elective criteria defined in Appendix 2 of this TSO, use: “**a**” for Step Load on Baggage Bars, “**b**” for Flight Attendant Step Load, “**c**” for Testing to Higher Static Loads, “**d**” for Hand Holds, “**e**” for Flammability –Large Exposed Non-metallic Parts.

(2) The seating system, safety belt, and seat cushion part numbers.

(3) For Type A passenger seating systems, the approved seat pitch, or setback from other interior items, necessary to maintain clearance to ensure effective emergency evacuation (see FAA advisory circular (AC) 25.562-1b, *Dynamic Evaluation of Seat Restraint Systems and Occupant Protection on Transport Airplanes*, Appendix 2). Use the statement that applies: “See installation limitations in [installation manual (IM) or drawing number (insert number)],” or “allowable seat pitch (insert number/range).”

(4) When installation limitations restrict installing seats to specific aircraft or operations, mark seats accordingly. For example, mark as: “FOR USE ON (*insert aircraft type or serial number*) ONLY” or “FOR USE ON AIRCRAFT IN PART 91 OPERATIONS ONLY.”

(5) For Type A and Type B-Transport passenger, flight attendant and observer seating systems, mark each seat cushion to be qualified with “Meets provisions of 14 CFR Part 25, Appendix F, Part II, effective March 25, 1998.”

(6) If applicable, identify deviations granted to the article by marking “Deviation. See installation/instruction manual (IM)” after the TSO number. You can abbreviate the marking to “(Dev. See IM).”

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.

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 § 21.603(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.e) through their civil aviation authority.

a. A Manual(s) containing the following:

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

(2) Describe in detail any deviations.

(3) Installation procedures and limitations sufficient to ensure that the aircraft seating system, when installed according to the installation or operational procedures, still meets this TSO’s requirements. Limitations must identify any unique aspects of the installation (e.g. seat pitch, aircraft attachments, orientation angle, maximum seat weight, permanent deformation, etc.). 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) Schematic drawings, wiring diagrams, and any other documentation necessary for installation of the aircraft seating system.

(5) List of replaceable components, by part number, that makes up the aircraft seating system. Include vendor part number cross-references, when applicable.

b. Instructions covering periodic maintenance, calibration, and repair, for the continued airworthiness of the aircraft seating system, including specific guidance on the limits of wear and damage permissible to the seat cushions and safety belt webbing material which would warrant

replacement; i.e., explain how and/or when these materials lose their system effectiveness and when the strength of the webbing would be expected to drop below the specified abrasion breaking strength. 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 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, failure condition classifications, 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)** 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.d.(1)**.
 - (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)** Test plans, analysis and results, as appropriate, to verify that performance of the hosting TSO article is not affected by the non-TSO function(s).
 - (6)** Test plans, analysis and results, 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 § 21.608, 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.
- h.** Manufacturer's TSO qualification report showing results of testing accomplished according to paragraph **3.c** of this TSO.
- i.** Detailed seat cushion drawing and test results used to establish approval as follows:

(1) Configuration drawings including foam, fire blocking layer, as required, and dress cover of all cushions.

(2) Materials specification for all cushions

j. List the specific elective MPS complied with under Appendix 2 of this TSO.

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** and **5.b** of this TSO. Add any other data needed for the proper installation, certification, use, or for continued compliance with the TSO, of the aircraft seating system.

b. If the article contains declared non-TSO function(s), include one copy of the data in paragraphs **5.d.(1)** through **5.d.(4)**.

8. HOW TO GET REFERENCED DOCUMENTS.

a. 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.

b. Order copies of 14 CFR part 21 from the Superintendent of Documents, U.S. 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."

c. 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.

David W. Hempe
Manager
Aircraft Engineering Division

APPENDIX 1. MPS FOR ROTORCRAFT, TRANSPORT AIRPLANE, AND SMALL AIRPLANE SEATING SYSTEMS

1.0. This paragraph prescribes MPS for SAE International’s Aerospace Standard (AS) 8049B, *Performance Standard for Seats in Civil Rotorcraft, Transport Aircraft, and General Aviation Aircraft*, dated January 2005. When the SAE section *recommends (or suggests, advises, etc.)* something, and it is part of the MPS, the recommendation becomes a *requirement*. In addition, we modified it as follows:

Table 1- SAE AS8049B

When reading AS8049B...	<i>Do the following:</i>
Section 1	Disregard
Section 2	Disregard
Section 3	<p>Apply all subsections unless disregarded or modified below:</p> <p>-----</p> <p>Page 5, disregard subsection 3.1</p> <p>-----</p> <p>Page 6, replace subsection 3.2.15 to read as follows:</p> <p>3.2.15 Except for rearward facing seats, the pelvic restraint system shall be designed such that the vertical angle subtended by the projection of the pelvic restraint centerline and the seat reference point (SRP) water line shall not be greater than 55°. The SRP water line is a line/plane passing through the SRP parallel to the floor waterline. The pelvic restraint centerline is formed by a line from the pelvic restraint anchorage to a point located 250 mm (9.75 in) forward of the SRP and 180 mm (7.0 in) above the SRP water line. <i>In addition, the pelvic restraint anchorage point(s) must be located no further than 2.0 inches forward of the SRP (ref Figure 1A).</i></p> <p>-----</p> <p>Page 6, add subsection 3.2.16 to read as follows:</p> <p>3.2.16 <i>All hinged armrest caps installed along an aisle must close as a result of normal movement along the aisle. Caps must not snag clothing or present any other impediment to egress when contacted by a person moving in either direction along the aisle.</i></p> <p>-----</p>

When reading AS8049B...	<i>Do the following:</i>
Section 3, continued	<p data-bbox="467 279 1094 310">Page 6, add subsection 3.2.17, to read as follows:</p> <p data-bbox="467 348 1430 380"><i>3.2.17 Safety belts must be equipped with a metal-to-metal latching device.</i></p> <hr data-bbox="467 436 1484 443"/> <p data-bbox="467 457 1094 489">Page 6, add subsection 3.2.18 to read as follows:</p> <p data-bbox="467 527 1490 705"><i>3.2.18 Design seat stowage compartments to prevent the contents becoming a hazard by shifting under the load conditions identified in Table 4 and subsection 5.3.1. Specify the maximum weight of the contents allowed in each stowage compartment, and report it in accordance with paragraph 5.a of this TSO.</i></p> <hr data-bbox="467 730 1484 737"/> <p data-bbox="467 751 1094 783">Page 6, add subsection 3.2.19 to read as follows:</p> <p data-bbox="467 821 1490 999"><i>3.2.19 The seat reference point (SRP) must be determined using only one of the methods described in Figure 1B. The selected method should be documented, and must be used consistently when evaluating all variations of the seat TSOA model or future changes to the seat TSOA model design.</i></p> <hr data-bbox="467 1056 1484 1062"/> <p data-bbox="467 1077 1133 1108">Page 10, replace subsection 3.4.1 to read as follows:</p> <p data-bbox="467 1146 1500 1545"><i>3.4.1 Test the materials in Type A and Type B Transport Rotorcraft seating systems, ensuring they meet the fire protection properties specified in 14 CFR part 25, Appendix F, Part I, paragraph (a)(1) (per Amendment 25-111). You may also demonstrate the material's fire protection properties using the methods provided in the FAA policy statement, PS-ANM-25.853-01, Flammability Testing of Interior Materials, which may permit substantiation based on previously tested materials. The definition and use of parts that are considered small parts that would not contribute significantly to the propagation of a fire must be approved in advance by the manager of the FAA aircraft certification office (ACO) to which this TSO data is to be submitted.</i></p> <p data-bbox="558 1587 1479 1873"><i>Materials in Normal, Utility and Acrobatic category Type C seating systems must have flame-resistant properties as defined in 14 CFR part 1. Test the materials to meet the requirements of paragraph 8.b of FAA advisory circular (AC) 23-2A, Flammability Tests, dated May 11, 2007. Commuter category Type C seating systems shall meet the flammability performance requirements defined in 14 CFR § 23.853(d)(3) (per Amendment 23-62), and tested as prescribed in 14 CFR, part 23, Appendix F, Part I (per Amendment 23-62).</i></p>

When reading AS8049B...	Do the following:
Section 3, continued	<p><i>Materials in Type B Normal Rotorcraft seating systems must have flame-resistant properties as defined in 14 CFR part 1. Test the materials to meet the requirements of paragraph 8.b of FAA advisory circular 23-2A, Flammability Test, dated May 11, 2007. You may also demonstrate the material's fire protection properties by analysis (similarity) to provide equivalent protection.</i></p> <p><i>Type A - Transport airplane insulation on electrical wire and electrical cable, and materials used to provide additional protection for the wire and cable, must be self-extinguishing when tested in accordance with the applicable portions of Appendix F, part I, as defined per Amendment 25-111 of 14 CFR part 25.</i></p> <p><i>Type B – Rotorcraft insulation on electrical wire and cable must be self-extinguishing when tested in accordance with Appendix F, Part I(a)(3), as defined per Amendment 25-111 of 14 CFR part 25.</i></p> <p><i>Type C seats with insulation on electrical wire and electrical cable must be self-extinguishing when tested at an angle of 60 degrees in accordance with the applicable portions of Appendix F as defined per Amendment 23-62 of 14 CFR Part 23. The average burn length must not exceed 3 inches (76 mm) and the average flame time after removal of the flame source must not exceed 30 seconds. Drippings from the test specimen must not continue to flame for more than an average of 3 seconds after falling.</i></p> <hr/> <p>Page 10, replace subsection 3.4.2 to read as follows:</p> <p><i>Type A and Type B Transport Rotorcraft - passenger, flight attendant, and observer seat cushion systems shall be tested to and shall meet the fire protection provisions of 14 CFR part 25 Appendix F, Part II (effective March 25, 1998). You may also demonstrate the material's fire protection by following AC 25.853-1, Flammability Requirements for Aircraft Seat Cushions, and, where applicable, ANM-115-07-002, Policy Statement on certification for flammability of lightweight seat cushions.</i></p>
Section 4	<p>Apply all subsections unless disregarded or modified below:</p> <hr/> <p>Page 16, replace note (2) in Table 4 to read as follows:</p> <p>(2) <i>Elective:</i> Increase these load factors as necessary for reduced weight gust/flight loads or landing requirements. All seat adjustment positions</p>

When reading AS8049B...	Do the following:
Section 4, continued	<p>and occupancy variations, including those used in flight, must be evaluated when using these increased load factors. <i>Document the increased load factors and report them in accordance with paragraph 5.a of this TSO. You must also mark them on the TSO placard. (See Appendix 2 of TSO-C127b.)</i></p> <p>-----</p> <p>Page 16, replace note (4) in Table 4 to read as follows:</p> <p>(4) Normal, Utility, <i>Acrobatic</i> and Commuter Category.</p> <p>-----</p> <p>Page 16, delete note (7) in Table 4</p> <p>Explanation: The seating system’s manufacturer doesn’t control the 14 CFR part 23 requirements applying to the seat installation. The manufacturer may test to load factors higher than required in Table 4 under the provisions in Appendix 2, paragraph c, of this TSO.</p> <p>-----</p> <p>Page 16, add a reference of note (8) to be applicable to the <i>Upward</i> load direction for <i>Type C Seat</i> in Table 4. Add note (8) to Table 4 to read as follows:</p> <p>(8) <i>Use a factor of 4.5 for Acrobatic Category seats.</i></p>
Section 5	<p>Apply all subsections unless disregarded or modified below:</p> <p>-----</p> <p>Page 21, replace subsection 5.1.9 to read as follows:</p> <p>5.1.9 The load due to any item of mass, including the seat that is not restrained by the occupant restraint system <i>must</i> be applied in a representative manner at the c.g. of the mass.</p> <p><i>Note: If you demonstrate retention of an item of mass attached to the seat (by the dynamic qualification tests of subsection 5.3), you don’t need to further demonstrate static retention for the forward and down static conditions. However, you must still demonstrate retention of items of mass for the side and aft static conditions.</i></p> <p>-----</p> <p>Page 23, replace subsection 5.2.2 to read as follows:</p> <p>5.2.2 The seat structure must be able to support ultimate loads without failure for at least 3 <i>seconds</i>. If it can be shown that failure of an armrest on a seat assembly does not reduce the degree of safety afforded the</p>

When reading AS8049B...	<i>Do the following:</i>
Section 5, continued	<p>occupant(s) or become a hazard, such failure will not be cause for rejection.</p> <p><i>Note: If you demonstrate the retention of an item of mass attached to the seat by the dynamic qualification tests of subsection 5.3, you don't need to further demonstrate static retention for the forward and down static conditions. However, you must still demonstrate retention of items of mass for the side and aft static conditions.</i></p> <hr/> <p>Page 23, replace 5.3 to read as follows:</p> <p>5.3 Dynamic Qualification Tests:</p> <p>This section specifies the dynamic tests to satisfy the requirements of this document.</p> <p><i>For Type A Seats: You may demonstrate compliance with the dynamic test procedures and documentation of subsection 5.3.1 Dynamic Impact Test Parameters: through subsection 5.3.9.2 Impact Pulse Shape: of SAE AS 8049B by the equivalent procedures of AC 25.562-1B. The equivalent method should be documented, and must be used consistently when evaluating all variations of the seat or future changes to the seat design.</i></p> <p><i>For Type A Seats: You can also use the simplified procedures for head injury criteria (HIC) outlined AC 25.562-1B instead of the test conditions in AS8049B subsection 5.3.6.2.</i></p> <p><i>Except for Hybrid III ATDs (49 CFR Part 572, Subpart E) modified in accordance with SAE Technical Paper 1999-01-1609, use of an equivalent ATD must be established by the applicant and accepted by the manager of the FAA aircraft certification office (ACO) with geographic control of the applicant's facility.</i></p> <hr/> <p>Page 23, replace subsection 5.3.1.2 to read as follows:</p> <p>5.3.1.2 Test 2 (Figures 6, 7A, and 7B), as a single row seat test, determines the performance of a system in a test condition where the predominant impact force component is along the aircraft longitudinal axis and is combined with a lateral impact force component. This test evaluates the structural adequacy of the seat, permanent deformation of the structure, the pelvic restraint and upper torso restraint (if applicable) behavior and loads, and may yield data on ATD head displacement, velocity, and acceleration time histories and the seat leg loads imposed on the seat</p>

When reading AS8049B...	<i>Do the following:</i>
Section 5, continued	<p>tracks or attachment fittings.</p> <p><i>For seats intended to be installed at an angle relative to the longitudinal axis of the airplane that is greater than 2° (but less than 18 °), the test yaw angle for the test that substantiates those seats shall be 10° plus or minus the intended installation angle (if more critical) depending on which yaw angle results in the most critical attachment fitting resultant loads.</i></p> <p>-----</p> <p>Page 37, replace subsection 5.3.3.5.i to read as follows:</p> <p>i. Side-Facing Seats: Seats with installation limitations of angles more than 18 degrees from aircraft centerline <i>are not addressed by this standard.</i></p> <p>-----</p> <p>Page 37, replace subsection 5.3.3.6 to read as follows:</p> <p>5.3.3.6 Multiple Row Test Fixtures: In tests of passenger seats that are normally installed in repetitive rows in the aircraft, head and knee impact conditions are best evaluated through tests that use at least two rows of seats. These conditions are usually critical only in Test 2. This test allows direct measurements of the head and femur injury data.</p> <p>a. The fixture shall be capable of setting the aircraft longitudinal axis at a yaw angle of -10° and +10°. The fixture should also allow adjustment of the seat pitch.</p> <p>b. To allow direct measurement of head acceleration for head injury assessment for a seat installation where the head of the occupant is within striking distance of structure, a representative impact surface may be attached to the test fixture in front of the front row seat at the orientation and distance from the seat representing the aircraft installation.</p> <p><i>c. Test 2 (Figures 6, 7A, & 7B) conducted solely to collect head/knee path data should be conducted with 0° yaw and without floor deformation. The test must be conducted on the seat with the greatest overhang among the seats selected for the applicable forward longitudinal dynamic structural test. It is acceptable to use the opposite-hand part for this seat. The occupancy used in the applicable forward longitudinal dynamic structural test must be used for this test. For consistency, a floor should be used for tests used to gather head path</i></p>

When reading AS8049B...	<i>Do the following:</i>
Section 5, continued	<p data-bbox="565 268 1458 342"><i>data. It is acceptable to collect ATD head path data in the applicable forward longitudinal dynamic structural test.</i></p> <p data-bbox="565 380 1500 636"><i>d. Seats designed for seat tracks that are not in-line and parallel (track-break seats) typically require special floor attachment fittings. The installation of the seat tracks on the test fixture for these seats is unique, and depends on the intended seat location in the airplane. The test setup must represent the seat track orientation on the airplane (that is, angles, offsets, forward/aft distance, and so forth) of seat tracks under the aft attachments vs. the forward attachments).</i></p> <hr/> <p data-bbox="467 709 1143 743">Page 43, replace subsection 5.3.5 to read as follows:</p> <p data-bbox="467 783 1487 1108">5.3.5 Selection of Test Articles: Many seat designs comprise a family of seats that have the same basic structural design but differ in detail. For example, a basic seat frame configuration can allow for several different seat leg locations to permit installation in different aircraft. If these differences are of a nature that their effect can be determined by rational analysis, then the analysis can determine the most critical configuration. As a minimum, the most <i>critically</i> stressed configuration shall be selected for the dynamic tests so that the other configurations could be accepted by comparison with that configuration.</p> <p data-bbox="565 1150 1500 1619">There are two factors that must be considered in selecting the critical structural test configurations. First, the seat to aircraft interface loads (undeformed seat) can be determined by rational analysis for the seat design and load configurations. The rational analysis can be based on static or dynamic seat/occupant analytical methods. The rational analysis can form the basis for selecting the most highly stressed critical configuration based on load. Additionally, the effects of seat deformation should be considered. As noted, a family of seats typically includes seat models with varied seat leg locations. The effects of floor deformation are more critical for narrowly spaced legs. Thus, a test or rational analysis of the seat model with the minimum seat leg spacing must be conducted to evaluate the most highly stressed critical configuration based on deformation.</p> <hr/> <p data-bbox="467 1734 1159 1768">Page 44, replace subsection 5.3.5.1 to read as follows:</p> <p data-bbox="467 1808 1500 1873">5.3.5.1 In all cases, the test article must be representative of the final production article in all structural elements, and shall include the seat, seat cushions,</p>

When reading AS8049B...	<i>Do the following:</i>
Section 5, continued	<p>restraints and armrests. It must also include a functioning position adjustment mechanism and correctly adjusted break over (if present).</p> <p>Weights simulating luggage carried by luggage restraint bars [9.1 kg (20 lb) per passenger place] need only be representative masses.</p> <p>Items 0.15 kg (0.33 lb) or greater that are part of the seat and affect the dynamic performance of the seat, including occupant injury and egress, must be representative of the production item and production means of attachment on the test article.</p> <p>Items 0.15 kg (0.33 lb) or greater that are part of the seat but do not affect the dynamic performance of the seat, including occupant injury and egress, may be representative masses, but the production means of attachment must be on the test article.</p> <p>Items less than 0.15 kg (0.33 lb) and their means of attachment are not required to be on the test article. However, the mass of the item must be included on the test article as ballast.</p> <p>Wiring harnesses, regardless of weight, may be represented on the test article by ballast weights. The production means of attachment need not be included in the test.</p> <p>Life vests must be installed on the test article, if provisions are provided, but are not required to be the production life vest. Any life vest of equivalent weight, or greater, may be included on the test article. The life vest may be ballasted to substantiate heavier life vests. <i>The life vest must represent the size and configuration of the production life vest if its size or configuration could affect retention of the life vest.</i></p> <p><i>If an item of mass that does not affect the dynamic performance of the seat fails during a test that is otherwise acceptable, then you may validate the design by a 24g static test. Apply the load for the 24g test in the same direction as the load vector in the dynamic test where the failure occurred.</i></p> <p>In any case, the separation of an item of mass should not leave any sharp or injurious edges. Function of equipment or subsystems after the test is not required. Once it has been demonstrated that an item of mass can be retained in its critical loading case, subsequent tests may be conducted with the item secured for test purposes.</p> <p>-----</p>

When reading AS8049B...	Do the following:
Section 5, continued	<p>Page 45, replace subsection 5.3.6.3 to read as follows:</p> <p>5.3.6.3 If a non-symmetrical upper torso restraint system (such as a single diagonal shoulder belt) is used in a system, it shall be installed on the test fixture in a position representative of that in the aircraft. For a forward-facing seat equipped with a single diagonal shoulder belt, the Test 2 yaw direction should be selected such that the belt passes over the <i>leading</i> shoulder.</p> <p><i>Note: For a Type A seat, additional tests may be required with the single diagonal shoulder belt passing over the trailing shoulder in order to evaluate retention of the harness on the occupant shoulder. Refer to AC-25.562-1B, paragraph 3.b.(3) for additional guidance.</i></p> <p>-----</p> <p>Page 54, replace subsection 5.3.9.9 to read as follows:</p> <p>5.3.9.9 Femur Load (Type A Seats): Data for measuring femur loads can be collected in the tests discussed in this document if the ATD's legs contact seats or other structure. The maximum compressive load in the femur can be obtained directly from a plot or listing of each femur load transducer output. If the value of peak acceleration measured in the test exceeds the level given in Figure 6, 7A, or 7B, the femur load measured in the test may be adjusted by no more than 10% by multiplying the measured values by the ratio of the peak acceleration given in Figure 6, 7A, or 7B divided by the measured peak acceleration, if necessary. Data need not be recorded in each individual test if rational comparative analysis is available for showing compliance. For large clearance installations (distance from seat SRP to strike target is greater than 100 cm (40 in) nominally), no data is necessary to substantiate femur loads. <i>However, appropriate limitations must be included in the installation instructions required in TSO paragraph 5.a.</i></p> <p><i>Extensive seat testing has shown that the femur loading criterion is not usually exceeded therefore, recording femur loads may not be necessary during the test if you can show compliance by rational comparative analysis using data from previous tests. However, the rational analysis must show that the testing applies to the seat design, and you must include appropriate limitations in the installation instructions and limitations required in this TSO, paragraph 5.a.</i></p> <p>-----</p> <p>Page 56, replace subsections 5.3.10.1.1.e and 5.3.10.1.1.f to read as follows:</p>

When reading AS8049B...	Do the following:
Section 5, continued	<p>e. A statement confirming that the data collection was done in accordance with the <i>requirements</i> of this document, or a detailed description of the actual procedure used and technical analysis showing equivalence to the <i>requirements</i> of this document.</p> <p><i>Note: Unless otherwise specified in the TSO, you must obtain FAA approval for any deviations from the requirements of AS8049B subsections identified as MPS of this TSO. Address deviations according to this TSO, paragraph 3.d.</i></p> <p>f. Manufacturer, governing specification, serial number, and test weight of ATDs used in the tests, and a description of any modifications or repairs performed on the ATDs that could cause them to deviate from the specification.</p> <p><i>Note: Unless otherwise specified in the TSO, you must obtain FAA approval for any deviations from the requirements of AS8049B subsections identified as MPS of this TSO. Address deviations according to this TSO, paragraph 3.d.</i></p>
Section 6	Disregard and refer to paragraph 4 of the TSO
Section 7	Disregard
Appendix A	No Changes

2.0. This paragraph prescribes MPS for SAE International ARP5526C, *Aircraft Seat Design Guidance and Clarifications*, dated May 2011. When the SAE section *recommends (or suggests, advises, etc.)* something, and it is part of the MPS, the recommendation becomes a *requirement*. In addition, we modified it as follows:

Table 2- SAE ARP5526C

When reading ARP5526C...	<i>Do the following:</i>
Section 1	Disregard
Section 2	Disregard
Section 3	<p>Disregard all subsections in Section 3 not listed below. The following subsections apply as modified:</p> <p>Page 9, replace subsection 3.3.2 to read as follows:</p> <p>3.3.2 Definition and Criteria: <i>When a life preserver (vest) is included as part of the seat design, a life preserver stowage provision should be provided at each seating position. The life preserver stowage should be designed and located such that the following minimum requirements are met:</i></p> <p><i>a. The life preserver is restrained under all applicable loading conditions; i.e., the retention device should not allow the preserver to come free during emergency landing conditions, takeoff, turbulence, and normal under-seat activity such as stowage and removal of baggage.</i></p> <p><i>b. The life preserver location is readily apparent. A life preserver locating placard installed on the seat should accurately state the location of the life preserver, e.g. “Life preserver under center armrest.” For other than the typical under-seat location, mark “Life preserver” or “Life preserver inside” on the container or compartment.</i></p> <p><i>c. The retrieval path of the life preserver is free of obstructions due preserver container movement and/or seat or aircraft components (e.g., seat legs, cushions, baggage bars, shrouds, etc.).</i></p> <p><i>d. The life preserver stowage does not present any sharp edges or points that could damage the life preserver or cause injury.</i></p> <p><i>e. For under seat storage:</i></p> <p><i>1) A pull strap is connected to the life preserver storage package, such that when the strap is pulled, the preserver comes out with the strap; i.e., one motion of the occupant will result in complete retrieval.</i></p>

When reading ARP5526C...	Do the following:
Section 3, continued	<p style="text-align: center;">2) Pull strap is located no more than 3 inches aft of the front edge of the seat bottom, i.e., the seat frame or cushion, whichever is more forward.</p> <p style="text-align: center;">3) The pull strap permits preserver retrieval when pulled from all reasonably anticipated angles, including any angle between +45 and -50 degrees from the horizontal, unless limited by seat cushions or structure.</p> <p style="text-align: center;">4) Normal seat operation or under seat baggage storage activities do not sweep the pull strap into an unreachable location.</p> <p style="text-align: center;">5) It is recommended that the location of pull straps be adequately marked per 3.8.2 of this ARP5526 Rev C document. It is recommended that pull straps be red or labeled "PULL" or "PULL FOR LIFE PRESERVER" in contrasting color.</p> <p><i>f. The life preserver is within easy reach of, and can be readily removed by a seated and belted occupant for all seat orientations, and installations that are intended for use during taxi, takeoff and landing; i.e. the life preserver can be quickly (less than 10 seconds) and reliably (on the first attempt) retrieved by both large and small occupants (5th Percentile size female and 95th Percentile size male) when seated and belted in a seat (including surrounding seats and structure) that is configured for takeoff and landing.</i></p> <hr/> <p>3.6.2 Apply as written</p> <hr/> <p>Page 13, replace subsection 3.8.2 to read as follows:</p> <p>3.8.2 Definition and Criteria: Safety placards on occupant seats should be permanently affixed, located such that they cannot be easily obscured and of a type that cannot be easily erased. The lettering height and color contrast should be sufficient to allow the placard to be read by the intended occupant (e.g. placards located on the back of the seat should be designed to allow the occupant seated behind to easily read it at the anticipated installed pitch.)</p> <hr/> <p>3.9.2 Apply as written 3.10.2 Apply as written 3.11.2 Apply as written</p> <hr/> <p>Page 20, replace subsection 3.12.2 to read as follows:</p>

When reading ARP5526C...	Do the following:
Section 3, continued	<p>3.12.2 Definition and Criteria: Edges that could cut skin during normal use should be eliminated and for maintenance should be minimized. <i>Edges that are accessible (as defined in section 3.11.2.1) during normal use shall meet:</i></p> <p>1. <i>NASA Standard 3000 Volume I (NASA–STD-3000 Vol I), Man-Systems Integration Standards, Revision B, July 1995, Section 6.3.3, or</i></p> <p>2. <i>UL 1439, Standard for Tests for Sharpness of Edges on Equipment, Edition 4, February 26, 1998, with revisions through 6/1/2004.</i></p> <p>In addition, the seat should not have any feature whose edges or corners are exposed when deployed, that presents a potential to impede an occupant's egress (e.g., cocktail table, seat back and in-arm video, flip-out PCU, ashtray, etc.)</p> <hr/> <p>3.13.2 Apply as written 3.14.2 Apply as written 3.15.2 Apply as written 3.17.2 Apply as written 3.20.2 Apply as written</p>
Appendix A	Apply Appendix A as necessary to comply with the requirements of this TSO.
Appendix B	<p>Disregard all subsections in Appendix B not listed below. The following subsections apply as modified:</p> <p>Page 45 replace subsection B.1.1.11 to read as follows:</p> <p><i>B.1.1.11 Restraint system anchorages should provide self-aligning features. If self-aligning features are not provided, the static and dynamic tests in this document should be conducted with the restraints and anchorages positioned in the most adverse configuration allowed by the design. The anchorage system should minimize the possibility of incorrect installation or inadvertent disconnection of the restraints. Evaluate per ARP 5526C subsection 3.2.2.</i></p> <p>B.1.1.14 Apply as written B.1.1.24 Apply as written B.1.1.25 Apply as written B.1.1.26 Apply as written B.1.1.28 Apply as written</p>

APPENDIX 2. ELECTIVE MPS FOR ROTORCRAFT, TRANSPORT AIRPLANE, AND SMALL AIRPLANE SEATING SYSTEMS

Complying with the MPS in these paragraphs is elective. However, if you elect to comply with one or more, you must follow the MPS. Address deviations from an elective MPS per paragraph **3.d** of the TSO. Per TSO paragraph **5.j**, document and report which elective MPS subparagraphs you complied with so that you receive credit under this TSO. In addition, see TSO paragraph **4.a.(1)** for marking requirements and **5.h** for reporting requirements.

- a.** Step Load on Baggage Bars: For seats where the baggage restraint allows application of a foot step load, apply the test criteria of ARP5526C subsection 3.7.2. The testing must not degrade either the basic forward or side load carrying capabilities noted in AS8049B Table 4, or result in deformation, posing a tripping hazard.
- b.** Flight Attendant Step Load: For seats that include a built-in flight attendant step in the seat design, demonstrate that such a step design meets expected service loads. Apply ARP5526C, Appendix B, subsection B.1.1.29 Table B1, to qualify the design.
- c.** Testing to Higher Static Loads: To substantiate the seat to load factors higher than those specified in Table 4 of AS8049B or to combined load factors, you must report the higher load factors along with paragraph **5.h** requirements. You must mark the higher load factors on the TSO placard.
- d.** Hand Holds: For seats designed to provide a handhold for passengers moving about the airplane, apply ARP5526C, Section 3.1.2.
- e.** Flammability –Large Exposed Non-metallic Parts: For Type A seats incorporating large non-metallic panels in their design, test and meet the fire protection provisions of Appendix F, parts IV and part V (heat release and smoke emission) of 14 CFR part 25, effective September 26, 1988. In addition, you must report which parts were tested and meet the requirements of Appendix F, parts IV and part V as part of your Furnished Data Requirements in paragraph 7 of this TSO.