Number：CTSO-C127c
Date of approval：September 29, 2024
Approved by：Xu Feng

China Civil Aviation Technical Standard Order

This China Civil Aviation Technical Standard Order (CTSO) is issued according to Part 37 of the China Civil Aviation Regulations (CCAR-37). Each CTSO is a criterion which the concerned aeronautical materials, parts or appliances used on civil aircraft must comply with when it is presented for airworthiness certification.

Rotorcraft, Transport Airplane, and Small Airplane Seating Systems

1. Purpose

This China Civil Aviation Technical Standard Order (CTSO) is for manufacturers applying for Rotorcraft, Transport Airplane, and Small Airplane Seating Systems CTSO authorization (CTSOA). This CTSO specifies the minimum performance standards (MPS) that rotorcraft, transport airplane, and small airplane seating systems must meet for approval and identification with the applicable CTSO marking.

2. Applicability

This CTSO affects new applications submitted after its effective date.

a. Since the effective date of this CTSO, applicants who wish to obtain the CTSOA of Rotorcraft, Transport Airplane, and Small Airplane Seating Systems should submit applications in accordance with this CTSO. CTSO-C127b will also remain effective until 24 months from this CTSO release. After this date, Civil Aviation Administration of China

(CAAC) will no longer accept new applications for CTSO-C127b.

b. Since the effective date of this CTSO, rotorcraft, transport airplane and small airplane seating systems approved under a previous CTSOA may still be manufactured under the provisions of its original approval.

c. Major design changes to article approved under this CTSO will require a new authorization in accordance with Section 21.353 of CCAR-21-R4.

3. Requirements

New models of rotorcraft, transport airplane and small airplane seating systems identified and manufactured on or after the effective date of this CTSO must meet the requirements in the following:

(1) SAE AS8049C, *Performance Standard for Seats in Civil Rotorcraft, Transport Aircraft, and General Aviation Aircraft*, dated August 2015, as modified by appendix 1 of this CTSO;

(2) SAE AS8049/1B, *Performance Standards for Side-Facing Seats in Civil Rotorcraft, Transport Aircraft, and General Aviation Aircraft*, dated December 2016, as modified by appendix 1 of this CTSO;

(3) SAE ARP5526D, *Aircraft Seat Design Guidance and Clarifications*, dated July 2015, as modified by appendix 1 of this CTSO;

(4) SAE AS6316, *Performance Standards for Oblique Facing Passenger Seats in Transport Aircraft, dated June 2017,* as modified by appendix 1 of this CTSO;

(5) Appendix 2 of this CTSO (for specific elective requirements).

a. Functionality

This CTSO'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 (Before CCAR-23-R4), Normal Level 1, Normal Level 2, Normal Level 3, Normal Level 4 (CCAR-23-R4 and later).

(2) Seat Subtype:

(a) Subtype 1 - Passenger

(b) Subtype 2 - Flight Attendant

(c) Subtype 3 - Observer

(d) Subtype 4 - Pilot / Copilot

(3) Seat Orientation:

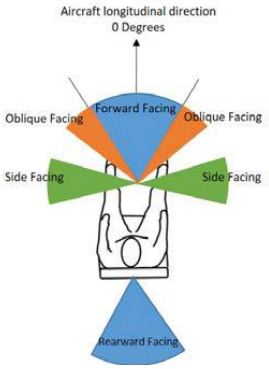
(a) Forward Facing - Seating systems installed forward facing in the aircraft up to an angle of 18° relative to the aircraft longitudinal

axis.

(b) Rearward Facing - Seating systems installed rearward facing in the aircraft up to an angle of 18° relative to the aircraft longitudinal axis.

(c) Side Facing - Seating systems installed sideward facing in the aircraft between 80° and 100° relative to the aircraft longitudinal axis.

(d) Oblique Facing - Seating systems installed forward facing in the aircraft, greater than 18° and no greater than 45° relative to the aircraft longitudinal axis.



b. Failure Condition Classifications

There is no standard minimum failure condition classification for this CTSO. The failure condition classification appropriate for the equipment will depend on the intended use of the equipment in a specific aircraft. The loss of function and malfunction failure condition classification for which the equipment is designed should be documented.

c. Functional Qualification

Demonstrate the required functional performance under the test conditions specified in:

(1) SAE AS 8049C, *Performance Standard for Seats in Civil Rotorcraft, Transport Aircraft, and General Aviation Aircraft*, dated August 2015, as amended by appendix 1 of this CTSO for forward and aft facing seats;

(2) SAE AS8049/1B, *Performance Standards for Side-Facing Seats in Civil Rotorcraft, Transport Aircraft, and General Aviation Aircraft*, dated December 2016, as modified by appendix 1 of this CTSO for side facing seats;

(3) SAE AS6316, *Performance Standards for Oblique Facing Passenger Seats in Transport Aircraft*, dated June 2017, as modified by appendix 1 of this CTSO for oblique facing seats;

(4) SAE ARP5526D, *Aircraft Seat Design Guidance and Clarifications*, dated July 2015, as amended by appendix 1 of this CTSO;

(5) Appendix 2 of this CTSO for specific elective requirements.

d. Deviations

For using alternative or equivalent means of compliance to the criteria in the MPS of this CTSO, the applicant must show that the equipment maintains an equivalent level of safety. Apply for a deviation pursuant to Section 21.368(a) in CCAR-21-R5.

4. Marking

a. Mark at least one major component permanently and legibly with

all the information in Section 21.423(b) in CCAR-21-R5 .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 may be used as a forward facing, or rearward facing seat, meets the step load on the baggage bar standard, and meets higher static loads must be marked as: Type A-T-1-FF-RF-a-d.

(a) The seat type, use: “Type A” for Airplane, “Type B” for Rotorcraft, or “Type C” for Small Airplane (Before CCAR-23-R4), or Normal Airplane (CCAR-23-R4 and later)..

(b) The seat type must be followed by the aircraft category, use: “T” for Transport, “N” for Normal, “U” for Utility, “A” for Acrobatic, or “C” for Commuter. If the seat is intended to be used on aircraft compliant with CCAR-23-R4 or later, the seat type must be followed by the aircraft category, use “NL” for Normal and 1, 2, 3, 4 for the airplane certification level, for example NL1 for Normal category Level 1, NL2 for Normal category Level 2, etc.

(c) The aircraft category must 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 must be followed by the appropriate seat facing designation, use: “FF” for Forward Facing, “RF” for Rearward Facing, “SF” for Side Facing, and “OF” for Oblique Facing.

(e) The seat facing designations must be followed by the applicable paragraph letter of the elective criteria defined in appendix 2 of this CTSO, use: “a” for Step Load on Baggage Bars, “b” for Electrically Actuated Features, “c” for Secondary Structure Abuse Loads, “d” for Testing to Higher Static Loads, “e” for Hand Holds, “f” for Lithium Containing Batteries, “g” for Flammability – Non-Traditional, Large, Non-metallic Parts.

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

(3) The document reference that contains installation instructions and limitations per the requirements of section 5.a.(3).

(4) 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 CCAR-25-R4, Appendix F, Part II.”

b. Mark the following permanently and legibly, with at least the manufacturer’s name, subassembly part number, and the CTSO number:

(1) Each component that is easily removable (without hand tools);

(2) Each subassembly of the article that you determined may be

interchangeable.

5. Application Data Requirements.

The applicant must give CAAC a statement of conformance, as specified in Section 21.353(a) (1) in CCAR-21-R5 and one copy each of the following technical data to support the design and production approval.

a. Manuals containing the following:

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

(2) Detailed description of all 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 CTSO'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. 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 the components, by part number, that make up the seating system complying with the standards prescribed in this CTSO.

(6) List the specific elective MPS complied with under appendix 2 of this CTSO.

(7) By-part number list of replaceable components that make up the seating system. Include vendor part number cross-references, when applicable.

b. Instructions covering periodic maintenance, calibration, and repair, to ensure that the seat system continues to meet the CTSO approved design, including specific guidance on the limits of wear and damage permissible to the seat cushions, components within the primary load path, and safety belt restraint system 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. A drawing depicting how the article will be marked with the information required by paragraph 4 of this CTSO.

d. Identify functionality or performance contained in the article not evaluated under paragraph 3 of this CTSO (defined as non-CTSO functions). Non-CTSO functions can be accepted in parallel with the CTSOA. For those non-CTSO functions to be accepted, you must declare

these functions and include the following information with your CTSO application:

(1) Description of the non-CTSO function(s), such as performance specifications, failure condition classifications, software, hardware, and environmental qualification levels. Include a statement confirming that the non-CTSO 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-CTSO 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-CTSO 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 CTSO article is not affected by the non-CTSO function(s).

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

e. The quality system description required by Section 21.358 in

CCAR-21-R5, 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 CTSO MPS and reject the article accordingly.

f. Provide a description of the organization as required by Section 21.355 in CCAR-21-R4.

g. Material and process specifications list.

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

i. Manufacturer's CTSO qualification report showing results of testing accomplished according to paragraph 3.c of this CTSO.

j. Detailed seat cushion drawings used to establish approval as follows:

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

(2) Materials specification for all cushions.

k. Detailed drawings and materials and process specifications for primary load path components.

6. Manufacturer Data Requirements.

Besides the data given directly to CAAC, have the following technical data available for review by CAAC:

a. Functional qualification specifications for qualifying each

production article to ensure compliance with this CTSO.

b. Article calibration procedures.

c. Schematic drawings.

d. Wiring diagrams.

e. Material and process specifications.

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

7. Furnished Data Requirements.

a. When furnishing one or more articles manufactured under this CTSO to one entity (such as an operator or repair station), provide one copy access to the data in paragraphs 5.a and 5.b of this CTSO. Add any other data needed for the proper installation, certification, use, or continued compliance with this CTSO.

When furnishing one or more articles manufactured under this CTSO to one entity (such as an operator or repair station), provide one copy or online access to the data in paragraphs 5.a, 5.b, 5.g and 5.h of this CTSO; as well as static and dynamic qualification test results on the seating system per AS8049C, section 5, AS8049/1B, section 5, or AS6316, section 5, as modified by Appendix 1 of this CTSO. Add any other data needed for the proper installation, certification, use, or for continued compliance with the CTSO, of the aircraft seating system.

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

8. Availability of Referenced Documents.

Order SEA documents from Society of Automotive Engineers, Inc. 400 Commonwealth Drive, WARRENDALE, PA 15096-001, USA. You can also order copies online at www.sae.org.

Obtain copies of FAA PS-ANM-25.853-01 R2 online at https://drs.faa.gov/browse/excelExternalWindow/2E766E58ED65176D86257BAA0063ECA7.0001.

Obtain copies of DOT/FAA/AR-00/12 online at https://www.regulations.gov/document/FAA-2019-0491-0027.

Obtain copies of ANM-115-07-002 online at https://drs.faa.gov/browse/excelExternalWindow/4FD585EEF694EBC4862575A700690BD4.00012.

Appendix 1. MPS for Rotorcraft, Transport Airplane, and Small Airplane Seating Systems

1.0. Forward and aft facing seats must meet the requirements of Table 1 of this appendix. This appendix prescribes MPS for SAE AS 8049C, *Performance Standard for Seats in Civil Rotorcraft, Transport Aircraft, and General Aviation Aircraft*, dated August 2015. When the SAE section *recommends (or suggests, advises, etc.)* something, and it is part of the MPS, the recommendation becomes a *requirement*. In addition, modify AS8049C as follows:

Table 1- SAE AS8049C

When reading AS8049C	Do the following:
Section 1	Disregard
Section 2	Disregard

When reading AS8049C	Do the following:
Section 3	Apply all subsections unless disregarded or modified as shown below: ---------- On page 6, replace subsection 3.2.15 by the following: 3.2.15 Except for rearward facing seats and seats equipped with multiple anchorage point pelvic restraints (e.g. Y-belts), the pelvic restraint system must be designed such that the vertical angle between the pelvic restraint centerline and the seat reference point (SRP) waterline must range from 35° to 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 9.75 inches (250 mm) forward of the SRP and 7.0 inches (180 mm) above the SRP water line. In addition, the pelvic restraint anchorage point(s) must be located no further than 2.0 inches (51 mm) forward of the SRP (ref. ARP5526D). See AC 21-34 for additional guidance for acceptable seat belt geometry. ---------- On Page 6, Replace subsection 3.2.17 by the following: 3.2.17 Safety belt restraint systems must meet the requirements of CTSO-C114 Safety Belts (or later CAAC revisions), and must be equipped with a metal-to-metal latching device. ---------- On Page 7, Replace subsection 3.3.1 by the following: 3.3.1 Materials must be suitable and durable for use in aircraft seats, as established by tests or experience, accounting for statistical variability of the material and the effects of environmental conditions such as temperature and humidity expected in service. Materials which could affect aircraft or occupant safety must be controlled to ensure the strength and other properties defined in the design data. Special factors must be developed for application per subsection 4.1 for each part of the structure whose strength is: (1) Uncertain; (2) Likely to deteriorate in service before normal replacement; or (3) Subject to appreciable variability due to: i. Uncertainties in manufacturing processes; or ii. Uncertainties in inspection methods. Use of materials such as fiber reinforced materials (i.e. composites) used to fabricate components of the seat within the primary load path (to include seat backs and pans) requires unique considerations for material and process control, generation of design values, consideration of environmental and variability factors, identification and substantiation of potential damage, developing criteria to assess post-impact structural integrity, and creating instructions for continued airworthiness. Applicants may follow the relevant guidance in FAA AC 20-107B when addressing these concerns.

When reading AS8049C	Do the following:
	Test plans to develop design allowable data and special factors or alternative justification for use of service history must be approved in advance by CAAC to which this CTSO data is to be submitted. **Note:** A CTSO approval does not include installation approval in an aircraft and an issue paper may be required to gain installation approval if the design includes new and novel materials and processes (e.g., composite materials, bonded joints, or additive manufacturing) in the primary load path. Applicants for seat installations under parts 23, 25, 27, and 29 should ensure that all composite seat components comply with the relevant regulatory requirements for material and process control and that manufacturing and service instructions are adequate to ensure the seat complies with crashworthiness requirements throughout its life. --- On Page 7, Replace subsection 3.3.2 by the following: 3.3.2 The methods and processes of fabrication and assembly used must produce consistently sound seats. If a fabrication process requires close control to reach this objective, the process must be performed in accordance with the design data (e.g., process specification). --- On Page 7, add subsection 3.3.4 as follows: 3.3.4 Each part of the seat structure must be protected against deterioration or loss of strength in service due to any cause (such as corrosion, wear, impact damage, environmental degradation, etc.) and have provisions for ventilation and drainage where necessary for protection. --- On Page 7, Replace subsection 3.4.1 by the following: 3.4.1 All materials used on seats must meet the requirements of subsection 3.4.1.1, 3.4.1.2, 3.4.1.3, or 3.4.1.4. 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 CAAC to which this CTSO data is to be submitted. When inflatable materials are used (i.e., material used in the fabrication of inflatable restraints, airbags, etc.), the inflatable material must meet the flammability requirements of CCAR-25-R4 Appendix F, Part I (a)(iv). **Note:** Inflatable materials used in devices to increase occupant safety are a novel or unusual design feature that may be subject to special conditions and additional certification requirements for installation approval. The material's fire protection properties may be demonstrated by following

When reading AS8049C	Do the following:
	FAA Policy Statement PS-ANM-25.853-01 R2, Flammability Testing of Interior Materials (dated July 3, 2013) or tested in accordance with the applicable chapter of Aircraft Materials Fire Test Handbook – DOT/FAA/AR-00/12. ---------- Add subsections 3.4.1.1, 3.4.1.2, 3.4.1.3, and 3.4.1.4 as follows: 3.4.1.1 All materials used on Type A-T and Type B-T seats must be tested in accordance with the procedures of and meet the fire protection requirements of CCAR-25-R4, Appendix F, Part I, except where material properties, size and quantity would not create or propagate a cabin fire. The material's fire protection properties may also be demonstrated by following FAA Policy Statement PS-ANM-25.853-01 R2, Flammability Testing of Interior Materials (dated July 3, 2013) or tested in accordance with the Aircraft Materials Fire Test Handbook – DOT/FAA/AR-00/12, Chapters 1 or 3. 3.4.1.2 All materials used on Type B-N, Type C-N, Type C-NL1, Type C-NL2, Type C-NL3, Type C-U, and Type C-A seats must have flame-resistant properties. The materials must be tested to and must meet the requirements of paragraph 8.b of FAA AC23-2A Change 1, Flammability Tests (dated February 15, 2013). 3.4.1.3 All materials used on Type C-C seats must be tested pursuant to the test procedures of CCAR-23-R3, Appendix F, Part I or the Aircraft Materials Fire Test Handbook – DOT/FAA/AR-00/12, Chapters 1 or 3 and must meet the following flammability performance requirements: 3.4.1.3.1 Panels, walls, structural flooring, and materials used in the construction of stowage compartments (other than underseat stowage compartments and compartments for stowing small items such as magazines and maps) must be self-extinguishing. The average burn length may not exceed 6 inches and the average flame time after removal of the flame source may not exceed 15 seconds. Drippings from the test specimen may not continue to flame for more than an average of 3 seconds after falling. 3.4.1.3.2 Floor covering, textiles (including draperies and upholstery), seat cushions, padding, decorative and non-decorative coated fabrics, leather, electrical conduit, transparencies, molded and thermoformed parts, and trim strips (decorative and chafing), that are constructed of materials not covered in subsection 3.4.1.3.3 must be self-extinguishing. The average burn length may not exceed 8 inches and the average flame time after removal of the flame source may not exceed 15 seconds. Drippings from the test specimen may not continue to flame for more than an average of 5 seconds after falling. 3.4.1.3.3 Acrylic windows and signs, parts constructed in whole or in part

<table>
<tr><td>When reading AS8049C</td><td>Do the following:</td></tr>
<tr><td></td><td>of elastomeric materials, seatbelts, and shoulder harnesses may not have an average burn rate greater than 2.5 inches per minute.
3.4.1.3.4 Except for electrical wire cable insulation, and for small parts where material properties, size, and quantity would not create or propagate a cabin fire, materials in items not specified in subsections 3.4.1.3.1 through 3.4.1.3.3 may not have a burn rate greater than 4.0 inches per minute.
3.4.1.4 All materials used on Type C-NL4 seats must be self-extinguishing and tested pursuant to the test procedures of CCAR-23-R3, Appendix F, Part I, (d) or the Aircraft Materials Fire Test Handbook – DOT/FAA/AR-00/12, Chapter 1.

On Page 8, Replace subsection 3.4.2 by the following:
3.4.2 Cushion systems on Type A-T and Type B-T passenger, flight attendant and observer seats must meet the fire protection requirements of CCAR-25-R4, Appendix F, Part II. The material’s fire protection properties may also be demonstrated by following FAA AC 25.853-1, Flammability Requirements for Aircraft Seat Cushions (dated September 17, 1986), tested in accordance with the Aircraft Materials Fire Test Handbook – DOT/FAA/AR-00/12, Chapter 7 and, where applicable, FAA Policy Statement ANM-115-07-002, Policy Statement on Certification for Flammability of Lightweight Seat Cushions (dated April 16, 2009).

On Page 8, Replace subsection 3.4.3 by the following:
3.4.3 Insulation on electrical wire and cable on all Type A, Type B and Type C seats must meet the fire protection requirements of CCAR-25-R4, Appendix F, Part I, (a)(3) or the Aircraft Materials Fire Test Handbook – DOT/FAA/AR-00/12, Chapter 4.</td></tr>
<tr><td>Section 4</td><td>Apply all the subsections unless disregarded or modified as shown below:

On Page 14, Revise column 5 in Table 4A to read as follows:
<table>
<tr><td>Type C-C and C-NL4 Seats</td></tr>
<tr><td>General Aviation (Commuter Category)
General Aviation (Normal Category Level 4)</td></tr>
<tr><td>Factor</td></tr>
<tr><td>9.0(4)</td></tr>
<tr><td>1.5(2)(4)</td></tr>
<tr><td>3.0(2)(4)</td></tr>
<tr><td>6.0(2)(4)</td></tr>
<tr><td>N/A</td></tr>
<tr><td>77 kg（170 pounds）(5)</td></tr>
</table></td></tr>
</table>

<table>
<tr><td>When reading AS8049C</td><td>Do the following:</td></tr>
<tr><td></td><td>

On Page 14, Add an additional column in Table 4A to read as follows:
<table>
<tr><td>Type C-NL1、NL2 and NL3 Seats</td></tr>
<tr><td>General Aviation
(Normal Category Level 1, Level 2 and Level 3)</td></tr>
<tr><td>Factor</td></tr>
<tr><td>9.0(4)</td></tr>
<tr><td>1.5(2)(4)</td></tr>
<tr><td>3.0 or 4.5(2)(4)</td></tr>
<tr><td>3.0(2)(4)</td></tr>
<tr><td>N/A</td></tr>
<tr><td>77 kg (170 pounds) or 86 kg (190 pounds)(5) (6)</td></tr>
</table>

On Page 14, Replace note (6) in Table 4A by the following:
Use a 190-pound occupant weight to account for the weight of a parachute.

On Page 14, Replace note (4) in Table 4A by the following:
For Type C seats, load factors may need to be increased according to CCAR 23.562(d) (CCAR-23-R3) or CCAR 23.2270(CCAR-23-R4).

On Page 14, Replace note (2) in Table 4A by the following:
Elective: Increase these load factors as necessary for airplane model specific flight and ground loads. All seat adjustment positions and occupancy variations, including those used in flight, must be evaluated when using these increased load factors. Load factors at directions other than those prescribed by Table 4A as modified by this appendix may be tested. Document the increased load factors and report them in accordance with paragraphs 5.a 5.h, and 5.i of this CTSO. You must also mark them on the CTSO placard (See Appendix 2 paragraph d. of CTSO-C127c).

On Page 17, Replace note (1) in Table 4C by the following:
Applicable only to Type C-N, C-NL1, C-NL2, C-NL3, C-NL4, Type C-U, Type C-C, and Type C-A seats.
</td></tr>
<tr><td>Section 5</td><td>Apply all subsections unless disregarded or modified as shown below:

On Page 18, Replace section 5.0 by the following:
5.0 Initial qualification of a seat shall be performed by static and dynamic tests. Computer modeling analytical techniques may be used as established by AC 20-146, Revision A, paragraph 2.5. Use of computer modeling analytical techniques must be established by the applicant and accepted by</td></tr>
</table>

When reading AS8049C	Do the following:
	the manager of the FAA aircraft certification office branch with geographic control of the applicant's facility. On Page 22, Replace subsection 5.1.9 by the following: 5.1.9 The load due to any item of mass, including the seat that is not restrained by the occupant restraint system must be applied in a representative manner at the c.g. of the mass, or with a corrective factor applied in a conservative manner relative to the c.g. of the item of mass. **NOTE:** If retention of an item of mass attached to the seat is demonstrated by the dynamic qualification tests of subsection 5.3, no further demonstration of retention for the forward and down static conditions is required; however, demonstration of retention of items of mass for the side, up, and aft static conditions is still required. On Page 24, Replace subsection 5.3 by the following: 5.3 Dynamic Qualification Tests: This section specifies the dynamic tests to satisfy the requirements of this document. For Type A Seats: You may demonstrate compliance with the dynamic test procedures and documentation of subsections 5.3.1 Dynamic Impact Test Parameters: through subsection 5.3.9.2 Impact Pulse Shape: of SAE AS 8049C by the equivalent procedures of FAA AC 25.562-1B, Change 1. The equivalent method must be included in the document that contains installation instructions and limitations per the requirements of section 5.a.3 of this TSO, and must be used consistently when evaluating all variations of the seat and subsequent changes to the seat design. For Type A Seats: You can also use the simplified procedures for head injury criteria (HIC) outlined in AC 25.562-1B, Change 1 instead of the test conditions in AS8049C subsection 5.3.6.2. 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 branch with geographic control of the applicant's facility. Add subsection 5.3.1.5 as follows: 5.3.1.5 If a sensor-driven restraint system (e.g. airbag, inflatable restraint, seatbelt pre-tensioner, deployable panel) is used as part of the seating system, additional threshold testing must be conducted to ensure the structural and occupant injury criteria continue to be met when the sensor-driven restraint system does not activate. The threshold test must test the seating system at an inertial load no less than the maximum dynamic

When reading AS8049C	Do the following:
	impact acceleration allowed by the sensor-driven restraint system without activating. For seats with sensor-driven restraint systems, it must be shown that the system will activate and provide protection under emergency landing conditions where it is necessary to prevent serious injury. The system must provide a consistent approach to injury protection throughout the range of occupants (two-year-old child to 95th percentile male) whether it is designed to manage injury parameters (e.g., HIC, N_{ij}, neck rotation, etc.) or occupant motion. The system must be included in each test. If sensor-driven restraint systems influence the test results, they must be active during the test. Seats that require a sensor-driven restraint system to meet the requirements of this CTSO must include the detailed design definition of the system and any other information required for installation as part of the installation instructions and limitations as defined in paragraph **5.a.(3)** of this CTSO. Sensor-driven restraint systems may be used to control occupant motion. The intended function of the system must be demonstrated during each applicable test. ---------- On Page 35, Replace subsection 5.3.3.5.i by the following: Side Facing Seat requirements are defined in Table 3 of this CTSO appendix. ---------- On Page 35, Replace subsection 5.3.3.5.j by the following: Oblique Facing Seat requirements are defined in Table 4 of this CTSO appendix. ---------- On Page 39, Replace subsection 5.3.4.1.a by the following: a. Sled or drop tower vehicle acceleration data measurements must be in accordance with Channel Class 60 requirements. ---------- On Page 42, Replace subsection 5.3.6.3 by the following: 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 must 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 must be selected to address the direction which would increase the likelihood of the occupant not being restrained (typically over the training shoulder) and assessment of the maximum upper torso restraint load, which requires testing in the critical structural direction. In some cases this may require testing in both directions of yaw. For a Type A seat, testing per FAA AC-25.562-1B, Change 1, paragraph 3.b.(3) may be used.

When reading AS8049C	Do the following:

	On Page 44, Replace subsection 5.3.8.3.a by the following: a. Prior to seating the ATD, all seat adjustments and controls must be set as indicated in 5.3.6.4. To the extent that they influence the injury criteria, all seat adjustments and controls should be in the design position intended for the 50th percentile male occupant. If seat restraint systems are being tested that are to be used in applications where special requirements dictate their position for landing or takeoff, those positions should be used in the tests.

	On Page 44, Replace subsections 5.3.8.3.d and 5.3.8.3.e by the following: d. Once all lifting devices have been removed from the ATD, it should be rocked slightly to settle it in the seat. e. The ATD's knees should be separated approximately 4 inches (100 mm).

	On Page 47, Replace subsection 5.3.9.4 by the following: 5.3.9.4 Head Injury Criteria (HIC) Head Injury Criterion (HIC) Data for determining the HIC needs to be collected during the tests discussed in this document only if the ATD's head is exposed to impact on aircraft interior features (not including the floor or the ATD's own leg) during the test. The HIC is calculated according to the following equation: $$\mathrm{HIC} = \left[(t_2 - t_1) \left\{ \frac{1}{(t_2 - t_1)} \int_{t_1}^{t_2} a(t)dt \right\}^{2.5} \right]_{\max}$$ Where t_1 and t_2 are any two points in time (in seconds) during the head impact, and $a(t)$ is the resultant head acceleration (expressed in g's) during the head impact. The HIC is a method for defining an acceptable limit; i.e., the maximum value of the HIC must not exceed 1000 for head impact against interior surfaces in a crash. The HIC is invariably calculated by computer based data analysis systems, and the discussion that follows outlines the basic method for computation. The HIC is based on data obtained from three mutually perpendicular accelerometers installed in the head of the ATD in accordance with the ATD specification. Data from these accelerometers are obtained using a data system conforming to Channel Class 1000, as described in SAE J211. Only the data taken during head impact with the aircraft interior need be considered; this is usually indicated by a rapid change in the magnitude of the acceleration data. Film of the test may show head impact that can be correlated with the acceleration data by using the time base common to both electronic and photographic instrumentation. Simple contact switches that do not significantly alter the surface profile

When reading AS8049C	Do the following:
	could also be used to define the initial contact time. In many cases, a full system sled test to evaluate specific occupant injury conditions may not be needed to evaluate a redesign of the seat system that affects only HIC. In such cases, the photometric head path data can be gathered and used to ensure no contact will occur, or to define the head angle and velocity at impact. These data can then be used in a component test of severity comparable to the whole system sled test. Other factors, such as the inertial response of the impact target, must be accounted for in the component test condition so that the impact condition is representative. Component testing methods used for HIC measurement must be demonstrably equivalent to whole system sled test HIC measurements. Additionally, a seat may be designed for use in multiple locations where head contact against a range of unknown bulkhead targets is anticipated (e.g., front row seats). For these seats, HIC may be measured using a representative impact target mounted in front of the seat at the installation setback, or range of setbacks. This target will represent typical fixtures such as galleys, partitions, lavatories, and closets, and its stiffness will be representative for those monuments. If contact occurs, the HIC must not exceed 1000. When the seat is evaluated against unknown bulkhead targets using a representative impact target, the detailed design definition of the impact target, and any other information required for installation (e.g. stiffness), must be included as part of the installation instructions and limitations as defined in paragraph **5.a.(3)** of this CTSO. When considering multiple seat pitches or set-backs from interior components, or considering a range of occupant statures, the HIC evaluation should be made when a solid head strike occurs during the dynamic test. Regardless of whether the head contact is a solid strike or a glancing blow, the HIC value must be calculated and must not exceed 1000. The ATD head should not sweep by the seat back/interior component with no apparent interruption in the head path movement, even though there may have been contact on the top of the head. The following evaluations of the test data can be used to determine whether a solid head strike has occurred: a. A review of the dynamic test videos and evaluation of the ATD head path movement, head contact, and head reaction at contact should be made. There should be a noticeable change in the head movement at the time of contact. b. A review of the post-test photographs and evaluation of the ATD head contact markings should be made. The contact marks (see subsection 5.3.8.4) should show that the area of ATD head contact was not only across the top of the head.

When reading AS8049C	Do the following:
	c. A review and evaluation of the ATD head acceleration plots (x, y, z and resultant) should be made. The resultant ATD head acceleration plot during the time period in which the critical HIC calculation was made should show an abrupt change in the head acceleration. In addition, the individual direction ATD head acceleration plots should be evaluated as to which component direction contributes primarily to the resultant head acceleration. Primary contribution of the x-component indicates more of a solid head strike occurring. Primary contribution of the z-component indicates more of a top of head contact and the top of head moving forward into the seat/interior component as the head is sweeping by the seat/interior component. --- On Page 49, Replace subsection 5.3.9.9 by the following: 5.3.9.9 Femur Load (Type A-T 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 40 inches (100 cm) nominally), no data is necessary to substantiate femur loads; however, appropriate limitations must be included in the installation instructions and limitations required in CTSO paragraph 5.a. 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 CTSO, paragraph 5.a. --- On Page 49, Replace subsection 5.3.9.12 by the following: 5.3.9.12 Seat Attachment Reactions Data of maximum loads imposed on the tracks or fittings at all the seat attachment points must be collected and recorded (see subsection 5.3.3.2). These data can be obtained directly from the output of the load cell at each attachment location.

When reading AS8049C	Do the following:
	On Page 50, Replace subsections 5.3.10.1.1.e and 5.3.10.1.1.f by the following: e. A statement confirming that the data collection was done in accordance with the requirements of this document, or a detailed description of the actual procedure used and technical analysis showing equivalence to the requirements of this document. **Note:** Unless otherwise specified in the CTSO, you must obtain CAAC approval for any deviations from the requirements of AS8049C subsections identified as MPS of this CTSO. Address deviations according to this CTSO, paragraph **3.d.** 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. **Note:** Unless otherwise specified in the CTSO, you must obtain CAAC approval for any deviations from the requirements of AS8049C subsections identified as MPS of this CTSO. Address deviations according to this CTSO, paragraph **3.d.** Add subsection 5.4.11 as follows: If the ATD is exposed to impact with aircraft interior features during the test: (a) If the test uses a Hybrid II ATD, then (1) The interaction must not rotate the head about its vertical axis, relative to the torso, greater than 105 degrees in either direction from forward facing, or introduce a feature or surface that produces concentrated loading on the neck, and (2) The head center of gravity must not stop for more than 10 milliseconds from sliding down the seat back while the torso is still moving downward, or (b) If the test uses an FAA Hybrid III or equivalent, then (1) the interaction must not rotate the head about its vertical axis, relative to the torso, greater than 105 degrees in either direction from forward facing, or introduce a feature or surface that produces concentrated loading on the neck, and (2) The N_{ij} (calculated in accordance with 49 CFR 571.208) must be below 1.0, where $N_{ij} = (F_z/F_{zc}) + (M_{ocy}/M_{yc})$, and N_{ij} critical values

When reading AS8049C	Do the following:
	are: i. F_{zc} = 1530 lbf for tension ii. F_{zc} = 1385 lbf for compression iii. M_{yc} = 229 lbf ft in flexion iv. M_{yc} = 100 lbf ft in extension (3) Peak upper neck F_z is below 937 lbf in tension and 899 lbf in compression. (c) If testing is first conducted with the Hybrid II ATD and the interaction could cause serious human injury as defined in paragraph (a)(2), (e.g., chin snagging on a horizontal seat back feature), then subsequent testing may be accomplished with the FAA Hybrid III or equivalent. To show acceptability using the FAA Hybrid III or equivalent: (1) The ATD must be positioned so the chin will strike above the seat feature which caused the unacceptable interaction in the initial Hybrid II ATD test, (2) Testing must demonstrate the same behavior as shown with the Hybrid II ATD in order for the safety demonstration to be valid, and (3) The loads in (b)(1) and (b)(2) must be reported. (4) If the test demonstrates an acceptable interaction per paragraph (a)(1) and the loads in (b)(1) and (b)(2) are below the limits, no further substantiation is necessary. (5) Due to differing chin shape and neck stiffness, the chin of the FAA Hybrid III ATD or equivalent may or may not hang up on the seat feature. If the head stops, the stop time may exceed 10ms as long as the loads in (b)(1) and (b)(2) are not exceeded.
Section 6	Disregard and refer to paragraph **4** of the CTSO
Section 7	Disregard
Appendix A	No Changes

2.0. Table 2 of this appendix prescribes MPS for SAE ARP5526D, *Aircraft Seat Design Guidance and Clarifications*, dated July 2015. When the SAE section recommends (or suggests, advises, etc.) something, and it is part of the MPS, the recommendation becomes a requirement. In addition, modify ARP5526D as follows:

Table 2- SAE ARP5526D

When reading ARP5526D	Do the following:
Section 1	Disregard
Section 2	Disregard
Section 3	Disregard all subsections in Section 3 not listed below. The following subsections apply as modified: ---------- On page 7, replace subsection 3.2.2 by the following: 3.2.2 Recommended Practice: Seatbelt misalignment is a condition where the seatbelt and/or shackle is positioned to give the impression that the belt has been properly tightened, when in fact there is slack in the system or the shackle is positioned so that it will not carry the force generated in an emergency landing or turbulence condition. 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 must minimize the possibility of incorrect installation or inadvertent disconnection of the restraints. The seat belt installation should not appear to the belted occupant to be properly adjusted (snug) while there is significant [2.54 cm (one inch) or more] slack in the system which may pay out in an emergency landing situation. For example, the belt installation should not be able to be caught between seat features such that the occupant would not know there was slack in the belt, which may allow the occupant to slide forward during emergency landing or turbulence. When the seat system is adjusted to and from all in-flight positions, it must not allow the occupant restraint to become trapped or damaged in the seat structure or mechanisms. To evaluate this requirement, translate the unoccupied seat through all adjustable positions with the restraint system unfastened and the seat cushions installed. Evaluate the size and location of any gap created for the potential of the unfastened restraint to become trapped or damaged with

When reading ARP5526D	Do the following:
	subsequent seat motion. To test the installed seat belt for misalignment, the seat should be positioned in its taxi, takeoff and landing condition. Installations on seats having bottom cushions that can be removed or incorrectly repositioned without tools should be evaluated with the cushions installed, removed and incorrectly repositioned. The belt and shackle combination should be manipulated with one hand in an attempt to place the restraint in a non-design configuration where it could carry the seatbelt adjustment forces. Particular effort should be made to place the restraint in a position that the restraint forces would not be applied to the hook of the shackle in the same manner as they would be applied in a straight tension pull on the belt. Attempts should be made with the restraint in its normal shape, a single twist of the webbing and/or a single fold of the webbing. Typical areas around the restraint shackle that should be checked are the plastic shrouding around the armrest, the hydraulic seat recline device, the seat pan, anti-rotation brackets/stops, seat pan supports and exposed fasteners. If a condition of potential misalignment is identified, the seatbelt and shackle, in that condition, should be loaded by a restorative force of 22.2 N (five pounds) applied through the belt in the direction that it would be loaded in the emergency landing or turbulence situation. If the load is carried in the misaligned condition, the design is unacceptable. The examples in subsection 3.2.3 illustrate various misalignment conditions that have been found to be unacceptable, as indicated. These examples are not intended to be all-inclusive. To test the belt for inadvertent disengagement, where disengagement is defined as the separation of the restraint's attachment fitting from the seat structure, the belt should be tested in all orientations with the seat in the taxi, takeoff and landing conditions with the seat cushions installed. Interaction of belts in adjacent seats, where the belts could be inadvertently crossed and used by occupants in those adjacent seats, must be evaluated for the possibility of disengagement. ---------- On Page 13, Replace subsection 3.3.2 by the following: 3.3.2 Recommended Practice: The term life preserver, life vest and life jacket may be used interchangeably. When life preserver stowage provisions are included as part of the seat design, the stowage provisions must provide access to a life preserver for each seating position. The life preserver stowage must be designed and located such that the requirements of this section are met. Per paragraph **5.a** of this CTSO, the installation, operating and maintenance instructions must also reflect the requirements of this section. For example,

When reading ARP5526D	Do the following:
	installation instructions must account for the allowable life preserver weight and size, marking requirements, as well as the required unobstructed area to remove the life preserver from the container. Furthermore, the operating instructions must report the detailed content of the simulated preflight briefing and any special instructions for unique aspects of the design operation that should be considered for operational use and continued performance. a. The life preserver must be restrained under all applicable loading conditions; i.e., the retention device must not allow the preserver to come free during emergency landing static and dynamic conditions, taxi, takeoff, landing, turbulence, and during stowage and removal of under seat baggage. b. Any life preserver locating placard installed on the seat must accurately state the location of the life preserver and be adequately marked per 3.8.2 of ARP5526D, as modified by this appendix (e.g. “Life preserver under center armrest”). For life preserver locations other than under the seat or under a console between the seats, mark “Life preserver” or “Life preserver inside” on the container or compartment, unless the location is identified with a pull strap. Pull straps must be red or labeled "PULL" or "PULL FOR LIFE PRESERVER" in contrasting color. A symbolic placard may be used in lieu of text provided it has been shown to be comprehensible to the flying public. For seats intended to be installed in sequential rows, a placard may be on the seat back stating the location of the life preserver for the occupant seated behind. c. The retrieval path of the life preserver must be free of obstructions due to life preserver container movement and/or seat or aircraft components (e.g., seat legs, cushions, baggage bars, shrouds, etc.) when the seat is in the configuration for taxi, takeoff and landing. d. The life preserver stowage must not present any sharp edges or points that could damage the life preserver or cause injury. e. For under seat pan storage on passenger seats (excluding center console storage): 1) A pull strap must be connected to the life preserver, or a pull strap or latch must be on the compartment opening, such that when the strap or latch is pulled, the preserver is presented on the strap or the occupant can reach into the compartment to retrieve the preserver (i.e., one or two motions of the occupant result in

When reading ARP5526D	Do the following:
	retrieval of the life preserver). 2) The life preserver must be located no more than 3 inches aft of the front edge of the seat bottom, (i.e., the seat frame or cushion), whichever is further forward. 3) Unless limited by seat cushions or structure (e.g. seat leg, floor, etc.), designs utilizing a pull strap must permit life preserver retrieval when pulled from any angle between a) 45 degrees up and 50 degrees down from the horizontal. b) 45 degrees left and 45 degrees right from the container centerline. 4) For designs utilizing a pull strap, normal seat operation or under seat baggage storage activities must not sweep the pull strap into an unreachable location. 5) The life preserver container, or compartment, as installed on the seat must protect the life preserver from inadvertent damage from normal passenger movement such as the stowage and removal of underseat baggage. f. Demonstrate that the life preserver must be within easy reach of, and must be readily removed by a seated and belted occupant (shoulder strap(s) may be removed prior to demonstration), for all seat orientations and installations that are intended for use during taxi, takeoff and landing. In lieu of an actual life preserver, a representative object (e.g. size and weight) may be utilized for testing. The evaluation to quickly retrieve the preserver is to begin with the occupant in the seated position, hands in their lap. Timing begins with the moving of their hand(s) from their lap to reach for the preserver and to end with the occupant having the preserver in their hand(s) and fully removed from the stowage container. It does not include the time for the occupant to return to the upright position, to remove a pull strap from the preserver (if used) or to open the preserver package provided by the preserver manufacturer. Test the critical configuration(s) (including the minimum approved seat pitch for passenger seats, and the most confined surrounding area for the F/A and cockpit seats) to demonstrate retrieval in less than 10 seconds by a minimum of 5 test subjects with a success rate of no less than 75 percent. The test must evaluate three anticipated occupant test subject size categories: 5^{th}, 50^{th} and 95^{th} percentile. At least one occupant from each size category must demonstrate successful retrieval within 10 seconds. Test subjects for either the 5^{th} or 95^{th} percentile occupant category must not exceed 40%

When reading ARP5526D	Do the following:
	of the overall test subject population. 1) For passenger seats the test subjects must be naïve. For the purpose of this test naïve test subjects must be defined as: they must have had no experience within the prior 24 months in retrieving a life preserver. Subjects must receive no retrieval information other than a typical preflight briefing. The occupant size categories to be evaluated must be defined as: a. A 5th percentile is no more than1.5 m (60 in) tall. b. A 50th percentile is at least 1.6m (63 in) tall but no more than 1.8 m (70 in) tall. c. A 95th percentile weighs at least 110.7 kg (244 lb). 2) For flight attendant and observer seats the test subjects do not need to be naïve. The occupant size categories to be evaluated must be defined as: a. A 5th percentile is no more than 1.5 m (60 in) tall. b. A 50th percentile is at least 1.6m (63 in) tall but no more than 1.8 m (70 in) tall. c. A 95th percentile weighs at least 110.7 kg (244 lb). 3) For pilot/copilot seats the test subjects do not need to be naïve. The occupant size categories to be evaluated must be defined as: a. A 5th percentile is no more than 1.57 m (62 in) tall. b. A 50th percentile is at least 1.6 m (63 in) tall but no more than 1.8 m (70 in) tall. c. A 95th percentile weighs at least 110.7 kg (244 lb). --- On Page 14, Replace subsection 3.3.3 by the following: 3.3.3 Recommended Practice for Life Vests in Legrests All requirements under 3.3.2 are applicable to life vests in legrests, with the following additions: • Retrieval of life vest Footbars must not impact pull strap or life vest accessibility, and must be evaluated in all positions to ensure the footrest can be readily moved out of the way. • Inadvertent opening

When reading ARP5526D	Do the following:
	The life vest container must not be susceptible to inadvertent opening by a seated occupant's foot or feet. • Effect of static and dynamic deformations on life vest retrievability The distance between the life vest container post deformation (plastic deformation only) and airplane floor should be such that the retrieval of the life vest will not be obstructed. Seat tracks and track covers should be considered. --- 3.6.2 For Type A-T seats, apply as written 3.7.2 For Type A-T seats, apply as written --- On Page 20, Replace subsection 3.8.2 by the following: 3.8.2 Recommended Practice: 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.) --- 3.10.2 Apply as written 3.11.2 Apply as written --- On Page 29, Replace subsection 3.12.2 by the following: 3.12.2 Recommended Practice: Edges that could cut skin during normal use (including edges on electrical equipment) should be eliminated and for maintenance should be minimized. To be considered non-injurious, edges that are accessible (as defined in subsection 3.11.2.1) and could cut skin during normal use must meet either of the standards listed below: 1. NASA Standard 3000 Volume I (NASA–STD-3000 Vol I), Man-Systems Integration Standards, Revision B, July 1995, Section 6.3.3, or 2. UL 1439, Standard for Tests for Sharpness of Edges on Equipment, Edition 4, February 26, 1998, with revisions through 6/1/2004. In addition, the seat should not have any feature whose edges or corners are exposed when deployed, that presents an impediment to an occupant's egress (e.g., cocktail table, seat back and in-arm video, flip-out PCU, ashtray, etc.) ---

<table>
<tr><td>When reading ARP5526D</td><td>Do the following:</td></tr>
<tr><td></td><td>
On Page 30, Replace subsection 3.13.2 by the following:
This section recommends test method that demonstrates items on seats located within the striking radius of the head are not injurious to the occupant of a seat or nearby seat. The component tests are defined in FAA Policy Memo ANM-03-115-31 and in this context the striking radius of the head is defined in AC 25-17A, Change 1, section 25.785.88.b.(8), see Figure 88-2.
3.14.2 Apply as written
3.15.2 Apply as written
3.17.2 Apply as written for Type A-T passenger seats

On Page 46, Replace subsection 3.19.2 by the following:
3.19.2 Recommended Practice
Flight crew seats (cockpit) and restraints should accommodate adult occupants ranging in stature (standing height) from 1.57 m (5 feet 2 inches) to 1.9 m (6 feet 3 inches).
Flight attendant seats and restraints should accommodate adult occupants ranging in stature (standing height) from 5th percentile female to 95th percentile male according to Table 7. Additional anthropometric measurements can be obtained from the CAESAR study (reference 2.1.2) if required.
<table>
<tr><th></th><th>Size</th></tr>
<tr><td>Sitting 5% Female</td><td>80.9cm (31.86 inches)</td></tr>
<tr><td>Sitting 95% Male</td><td>98.5cm (38.78 inches)</td></tr>
<tr><td>Standing 5% Female</td><td>152.6cm (60.08 inches)</td></tr>
<tr><td>Standing 95% Male</td><td>190.1cm (74.83 inches)</td></tr>
</table>
Table 7 - Anthropometric database sitting and standing height
Crew restraint systems, while fastened, should neither significantly impede access to controls nor prevent crews from performing their duties.

3.20.2 Apply as written
3.21.2 Apply as written
3.24.2 Apply as written

On Page 50, Replace subsection 3.25.2 by the following:
3.25.2 Recommended Practice
Where seat recline could adversely affect emergency evacuation, passenger seat recline and control mechanisms should have an override feature so that the reclined seat back may be moved to the upright position without releasing the recline control button.

</td></tr>
</table>

When reading ARP5526D	Do the following:
	3.32.2 Apply as written. In addition, the selected SRP method must be documented, and must be used consistently when evaluating all variations of the seat CTSOA model and subsequent changes to the seat CTSOA model design. --- 3.39.2 Apply as written --- Add 3.41.2 Recommended Practice The passenger should not have ready access to the internal contents or electrical connections of any electrical components on the seat.

3.0. Side facing seats must meet the requirements of Table 3 of this appendix. Table 3 of this appendix prescribes MPS for SAE AS8049/1B, *Performance Standards for Side-Facing Seats in Civil Rotorcraft, Transport Aircraft, and General Aviation Aircraft,* dated December 2016. When SAE section recommends (or suggests, advises, etc.) something, and it is part of the MPS, the recommendation becomes a requirement. For the purpose of meeting the side facing seat requirements of Table 3 of this appendix, all references to "AS8049C" must be replaced with "AS8049C as modified by Table 1 of this appendix". In addition, we have also modified AS8049/1B as follows:

Table 3- SAE AS8049/1B

When reading AS8049/1B	Do the following:
Section 1	Apply all subsections unless disregarded or modified below: --- On Page 3, Replace subsection 1.1 by the following: 1.1 Purpose This SAE Aerospace Standard (AS) defines Minimum Performance Standards (MPS), qualification requirements, and minimum documentation requirements for side facing seats in civil rotorcraft, transport aircraft, and general aviation aircraft. The goal is to achieve comfort, durability, and occupant protection under normal operational loads and to define test and evaluation criteria to demonstrate occupant protection when a side facing seat/occupant/restraint system is subjected to statically applied ultimate loads and to dynamic test conditions. --- On Page 3, Replace subsection 1.3 by the following: 1.3 Seat Types This document covers all passenger and crew seats except pilot and copilot seats. Additionally, flight attendant seats are excluded for A-T seat types.
Section 2	Apply all subsections unless disregarded or modified below: --- On Page 4, Replace subsection 2.1 by the following: 2.1 Applicable Documents This document is explicitly linked with and cannot be used without AS8049C. Requirements of each section of AS8049C apply to this document unless specifically modified by this document. Sections 3 through 7 of this document note only differences between the standards of this document and the standards of AS8049C. Sections 8 and 9 are reserved for future use and content specific to side facing seats begins with Section 10. Test pulse evaluation must use the method defined in AS8049C Appendix A.
Section 3	Apply as written

When reading AS8049/1B	Do the following:
Section 4	Apply as written
Section 5	Apply all subsections unless disregarded or modified below: --- On Page 8, subsection 5.3 is modified by adding subsection 5.3.1.5 as follows: If smaller occupants are permitted to occupy the seat, the range of occupants must include a two-year-old child up to a 95th percentile male (see 10.8 for further discussion on range of occupants). This requirement applies whether the sensor-driven restraint system is designed to manage injury parameters (HIC, neck rotation, etc.) or occupant motion. Side facing seating systems, including sensor-driven restraint systems, must be shown to meet the occupant injury criteria of subsection 10.7, as modified by this appendix, throughout the entire range of yaw that encompasses the installation angle ±10 degrees relative to the aircraft longitudinal axis. If a shoulder belt incorporating an airbag is used, care must be taken when placing the webbing load cell to ensure that an accurate measurement is made and that the load cell does not affect the performance of the airbag.
Section 6	Apply all subsections unless disregarded or modified below: --- On Page 12, Replace section 6 by the following: 6. Markings Requirements prescribed in paragraph 4 of the TSO are applicable to all side facing seats, except side facing seats must also be identified with applicable occupant limitations prescribed by subsection 10.8.
Section 7	Disregard
Section 10	Apply all subsections unless disregarded or modified below: --- On Page 12, Add subsection 10.1.2.1 10.1.2.1 When a contactable item that is not part of the seat design (e.g. interior furnishing, bulkhead) and is evaluated per subsection 10.1.2, then the detailed design definition of the contactable item evaluated in subsection10.1.2, and any other information required for installation (e.g. stiffness) must be included as part of the installation instructions and limitations as defined in paragraph 5.a.(3) of this CTSO. --- On Page 13, Add subsection 10.2.2.1 10.2.2.1 When a contactable item that is not part of the seat design (e.g. interior furnishing, bulkhead) and is evaluated per subsection 10.2.2, then the detailed design definition of the contactable item evaluated in subsection

When reading AS8049/1B	Do the following:
	10.2.2, and any other information required for installation (e.g. stiffness) must be included as part of the installation instructions and limitations as defined in paragraph 5.a.(3) of this CTSO. --- On Page 13, Replace subsection 10.3.1 by the following: 10.3.1 Occupant Simulation Injury assessments must be evaluated for all seat places of a multiple occupant seat structure. Injury assessments must be accomplished by performing one test with ES-2re ATD (49 CFR part 572 subpart U) at all seat places. Alternatively, these assessments must be accomplished by multiple tests that use an ES-2re at the seat place being evaluated, and a Hybrid II ATD (49 CFR part 572, subpart B) or equivalent used in all seat places forward of the one being assessed, to evaluate occupant interaction. In this case, seat places aft of the one being assessed may be unoccupied. --- On Page 14, Add subsection 10.3.2.1 10.3.2.1 When a contactable item that is not part of the seat design (e.g. interior furnishing, bulkhead) and is evaluated per subsection 10.3.2, then the detailed design definition of the contactable item evaluated in 10.3.2, and any other information required for installation (e.g. stiffness) must be included as part of the installation instructions and limitations as defined in paragraph 5.a.(3) of this CTSO. --- On Page 14, Add subsection 10.3.3.1 10.3.3.1 When a contactable item that is not part of the seat design (e.g. interior furnishing, bulkhead) and is evaluated per subsection 10.3.3, then the detailed design definition of the contactable item evaluated in 10.3.3, and any other information required for installation (e.g. stiffness) must be included as part of the installation instructions and limitations as defined in paragraph 5.a.(3) of this CTSO. --- On Page 17, Replace subsection 10.7, item 5. By the following: 5. Leg: Axial rotation of the upper-leg (femur) is limited to 35 degrees in either direction from the nominal (pre-test) ATD seated position. This limit only applies to femur axial rotations caused by the lateral (relative to the ATD) swinging action of the lower legs, and not to any rotations caused by other leg articulations or rebound motion. For the purposes of this criteria, rebound begins when the forward motion of the lower leg has stopped. Rotation can be measured by using video evidence or femur axial rotation sensors on the ATD. For threshold tests only, if the pulse used for the threshold test has a lower energy than the research pulse used to develop the criteria (see FAA Report

When reading AS8049/1B	Do the following:
	DOT/FAA/AM-17/2, Supplemental Injury Risk Considerations for Aircraft Side-Facing Seat Certification, dated January 2017), it is not necessary to meet the leg axial rotation requirement of AS8049/1B, subsection 10.7, item 5., as modified by this appendix.

4.0. Oblique facing seats must meet the requirements of Table 4 of this appendix. Table 4 of this appendix prescribes MPS for SAE SAE AS6316, *Performance Standards for Oblique Facing Passenger Seats in Transport Aircraft*, dated June 2017. When SAE section recommends (or suggests, advises, etc.) something, and it is part of the MPS, the recommendation becomes a requirement. For the purpose of meeting the oblique facing seat requirements of Table 4 of this appendix, all references to "AS8049C" must be replaced with "AS8049C as modified by Table 1 of this appendix". In addition, we have also modified AS6316 as follows:

Table 4- SAE AS6316

When reading AS6316	Do the following:
Section 1	Apply all subsections unless disregarded or modified below: --- On Page 3, Replace subsection 1.1 by the following: 1.1 Purpose This SAE Aerospace Standard (AS) defines Minimum Performance Standards (MPS), qualification requirements, and minimum documentation requirements for oblique facing seats in transport aircraft. The goal is to achieve comfort, durability, and occupant protection under normal operational loads and to define test and evaluation criteria to demonstrate occupant protection when an oblique facing seat/occupant/restraint system is subjected to statically applied ultimate loads and to dynamic test conditions. These criteria are limited to seats with an occupant facing direction greater than 18° and no greater than 45° relative to the aircraft longitudinal axis. Seats installed at angles greater than 30° relative to the aircraft longitudinal axis must have an energy absorbing rest or shoulder harness and must satisfy the criteria listed in Table 2 as modified by this appendix. --- On Page 3, Replace subsection 1.2 by the following: 1.2 Seat Types This document covers only passenger A-T seats.
Section 2	Apply all subsections unless disregarded or modified below: --- On Page 3, Replace subsection 2.1 by the following: 2.1 Applicable Documents This document is explicitly linked with and cannot be used without AS8049C. Requirements of each section of AS8049C apply to this document unless specifically modified by this document. Sections 3 through 7 of this document note only differences between the standards of this document and the standards of AS8049C. Sections 8 and 9 are reserved for

When reading AS6316	Do the following:
	future use and content specific to oblique facing seats begins with Section 10. Test pulse evaluation must use the method defined in AS8049C Appendix A. --- On Page 3, Disregard section 2.1.1
Section 3	Apply all subsections unless disregarded or modified below: --- On Page 7, Disregard modification to subsection 3.4.1
Section 4	Apply as written
Section 5	Apply all subsections unless disregarded or modified below: --- On Page 7, subsection 5.3.4.1 is modified by adding: g. ATD neck forces shall be measured in accordance with the requirements of Channel Class 1000. h. ATD neck forces used for calculating N_{ij} shall be measured in accordance with the requirements of Channel Class 600. i. ATD neck moments shall be measured in accordance with the requirements of Channel Class 600. j. ATD spine accelerations shall be measured in accordance with the requirements of Channel Class 180. k. Leg axial rotation obtained from the measured leg angular velocity by integration shall require angular velocity data measured in accordance with the requirements of Channel Class 180. --- On Page 7, subsection 5.3.1.5 is modified by adding Oblique facing seating systems including sensor-driven restraint systems must be shown to meet the occupant injury criteria of Table 2 as modified by this appendix throughout the entire range of yaw that encompasses the installations +/-10 relative to the aircraft longitudinal axis.
Section 6	Disregard
Section 7	Disregard
Section 10	Apply all subsections unless disregarded or modified below: --- On Page 12, Add subsection 10.1.2.1 10.1.2.1 When a contactable item that is not part of the seat design (e.g. interior furnishing, bulkhead) and is evaluated per subsection 10.1.2, then the detailed design definition of the contactable item evaluated in subsection10.1.2, and any other information required for installation (e.g. stiffness) must be included as part of the installation instructions and limitations as defined in paragraph 5.a.(3) of this CTSO.

When reading AS6316	Do the following:
	On Page 10, Add subsection 10.2.2.1 10.2.2.1 When a contactable item that is not part of the seat design (e.g. interior furnishing, bulkhead) and is evaluated per subsection 10.2.2, then the detailed design definition of the contactable item evaluated in subsection10.2.2, and any other information required for installation (e.g. stiffness) must be included as part of the installation instructions and limitations as defined in paragraph 5.a.(3) of this CTSO. --- On Page 10, Add subsection 10.3.2.1 10.3.2.1 When a contactable item that is not part of the seat design (e.g. interior furnishing, bulkhead) and is evaluated per subsection 10.2.2, then the detailed design definition of the contactable item evaluated in subsection 10.2.2, and any other information required for installation (e.g. stiffness) must be included as part of the installation instructions and limitations as defined in paragraph 5.a.(3) of this CTSO. --- On Page 11, Replace Table 2, Neck, Item (4) to read as follows: The neck must not impact any surface that would produce significant concentrated loading on the neck. --- On Page 12, Add to Table 2, Femur, Item (1) **NOTE:** If contact occurs with other structure that is not part of the seat design (e.g. interior furnishing, bulkhead) and is evaluated during the axial compressive load, then the detailed design definition of the item must be included as part of the installation instructions and limitations as defined in paragraph 5.a.(3) of this CTSO. --- On Page 12, Add to Table 2, Femur, Item (2) **NOTE:** For threshold tests only, if the pulse used for the threshold test has a lower energy than the research pulse used to develop the criteria (see FAA Report DOT/FAA/AM-17/2, Supplemental Injury Risk Considerations for Aircraft Side-Facing Seat Certification, dated January 2017), it is not necessary to meet the leg axial rotation requirement of Table 2 as modified by this appendix, Femur, item (2).

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 CTSO. Per CTSO paragraph 5.a.(6), document and report which elective MPS subparagraphs you complied with so that you receive credit under this CTSO. In addition, see CTSO paragraph 4.a.(1) for marking requirements, as well as 5.a, 5.h, and 5.i 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 ARP5526D subsection 3.7.2. The testing must not degrade either the basic forward or side load carrying capabilities noted in AS8049C Table 4A, or result in deformation, posing a tripping hazard.

b. Electrically Actuated Features: For seats with electrically actuated moving parts, which could potentially entrap and cause injury to passengers, apply ARP5526D, subsection 3.18.2.

c. Secondary Structure Abuse Loads: For seats that include features listed in ARP5526D, section 3.26.2, Table 9, apply the loads within the table to qualify the design.

d. Testing to Higher Static Loads: To substantiate the seat to load factors higher than those specified in Table 4A of AS8049C or to combined load factors, you must report the higher load factors along with paragraphs 5.a, 5.h and 5.i requirements. You must mark the higher load factors on the CTSO placard.

e. Hand Holds: For seats designed to provide a handhold for passengers moving about the aircraft, apply ARP5526D, subsection 3.1.2.

f. Lithium Containing Batteries: Seats with batteries containing lithium in their design, test and meet the requirements defined in CTSO-C142b (or later CAAC approved CTSO for non-rechargeable lithium batteries) or CTSO-C179b (or later CAAC approved CTSO for rechargeable lithium batteries). A CTSO approval does not include installation approval in an aircraft and special conditions may be required to gain installation approval if the design includes lithium batteries.

g. Flammability –Non-Traditional, Large, Non-metallic Parts: For Type A seats incorporating non-traditional, 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 CCAR-25-R4. You may demonstrate the materials' fire protection properties using the methods provided in the FAA policy statement, PS-ANM-25.853-01-R2, *Flammability Testing of Interior Materials*, which may permit substantiation based on previously tested materials and SAE ARP 6199A, *Method to Evaluate Aircraft Passenger Seats for the Test Requirements of 14CFR Part 25 Appendix F, Parts IV and V*. Though ARP6199A provides an acceptable compliance method for determining which panels on the seat must be evaluated and substantiated to comply with certain special conditions (e.g., 25-367-SC), the intent is to limit the quantities of materials that do not comply with smoke emission and heat release test requirements.

In addition, you must report which parts meet the requirements of CCAR-25-R4 Appendix F, parts IV and part V as part of your Furnished Data Requirements in paragraph 7 of this CTSO.

(The English version is for reference only. In case of any discrepancy or ambiguity of meaning between this English translation and the Chinese version, the latter shall prevail.)