



Number: CTSO-C167

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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.

Personnel Carrying Device Systems (PCDS), also known as Human Harnesses

1. Purpose.

This China Civil Aviation Technical Standard Order (CTSO) is for manufacturers of personnel carrying device systems (PCDS) applying for a CTSO authorization (CTSOA). This CTSO prescribes the minimum performance standards (MPS) that PCDS must first meet for approval and use the applicable CTSO mark for identification.

2. Applicability

This CTSO affects new application submitted after its effective date. 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 human harness identified and manufactured on or

after the effective date of this CTSO must meet the MPS based on National Fire Protection Association (NFPA) 1983, Standard on Fire Service Life Safety Rope and System Components, dated February 9, 2001, for a life safety harness Class III, and SAE Aerospace Standard (AS) 8043, Revision A, Restraint Systems for Civil Aircraft, dated March 1, 2000, as modified by appendix 1 of this CTSO.

a. **Functionality.** This CTSO's standards apply to equipment intended to transport personnel externally from a helicopter (human external cargo (HEC) operations). This equipment is intended for long-term, work related activities where the user is required to remain in the device for extended periods of time. 14CFR133.45 specifies limitations for external-load operations as rotorcraft-load combination Class D, the certification requirements for HEC operations are found in CCAR 27.865 or 29.865, as applicable.

b. **Functional Qualification.** Demonstrate the required performance under the test conditions in the MPS (see Appendix 1 of this CTSO).

c. **Deviations.** For using alternative or equivalent means of compliance to the criteria in this CTSO, the applicant must show that the equipment maintains an equivalent level of safety. Apply for a deviation under the provision of 21.368(a) in CCAR-21-R4.

4. Marking.

a. Mark at least one major component permanently and legibly with all the information of 21.423(b) in CCAR-21-R4, except for:

(1) Section 21.423(b)(2). Use the name, type, and part number instead of the optional model number.

b. The label also must include the information required in NFPA 1983 Section 3.1.4.2(2) or 3.1.4.2(3), as applicable.

c. In addition, 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 interchangeable element, and

(3) Each sub-assembly of the article that you determined may be interchangeable.

5. Application Data Requirements.

The applicant must furnish the responsible certification personnel with the related data to support design and production approval. The application data include a statement of conformance as specified in section 21.353(a) in CCAR-21-R4 and one copy each of the following technical data:

a. Operating instructions and equipment limitations, sufficient to

describe the equipment's operational capability.

b. Installation procedures and limitations, sufficient to ensure that the human harness, when installed according to the installation procedures, still meets this CTSO's requirements. The limitations must identify any unique aspects of the installation. Finally, the limitations also must include a note with the following statement:

“The conditions and tests for CTSO approval of this article are minimum performance standards. Those installing this article, on or in a specific type or class of aircraft, must determine that the aircraft installation conditions are within the CTSO standards. CTSO articles must have separate approval for installation in an aircraft.”

c. Schematic drawings of the installation procedures.

d. List of the components, by part number, that make up the human harness complying with the standards in this CTSO. You should include vendor part number cross-references, when applicable.

e. Instructions for Continued Airworthiness covering the periodic maintenance, calibration, and repair, for the continued airworthiness of an installed human harness. Instructions should include recommended inspection intervals and service life. Refer to Appendix 1, paragraph 5d.

f. Material and process specifications list.

g. The quality control system description required by 21.358 in CCAR-21-R4, including functional test specifications. These test each

production article to ensure compliance with this CTSO.

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

i. Label drawing giving the information required by paragraph 4 of this CTSO.

j. A list of all drawings and processes, including revision level, to define the article's design. For a minor change, you only need to make revisions to the list available on request.

6. Manufacturer Data Requirements.

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

a. The functional qualification specifications for qualifying each production article to ensure compliance with this CTSO.

b. Equipment calibration procedures.

c. Corrective maintenance procedures within 12 months after CTSO authorization.

d. Schematic drawings.

e. Material and process specifications.

7. Furnished Data Requirements.

With each article manufactured under this CTSO, provide one copy of the technical data and information in paragraph 5.a through 5.j and

paragraph 6 of this CTSO. Add any other data or information necessary for the proper installation, certification, and use, or for continued airworthiness, or both, of the human harness.

8. Availability of Referenced Documents.

- a. Order NFPA documents from:

National Fire Protection Association

1Batterymarch Park, P.O. Box 9101, Quincy, MA, USA.

You may also order them online from www.nfpa.org.

- b. Order SAE documents from:

Society of Automotive Engineers, Inc.

400 Commonwealth Drive, WARRENDALE, PA 15096-001, USA.

You may also order them online from www.sae.org.

Appendix 1 Minimum Performance Standard for A Personnel
Carrying Device System (PCDS), also known as A Human
Harness

1. Purpose.

This appendix prescribes the minimum performance standards (MPS) for a personnel carrying device system (PCDS). Hereon, We refer to a PCDS as a “human harness.”

2. Requirements. The MPS is based on the following standards:

- National Fire Protection Association (NFPA) 1983, Standard on Fire Service Life Safety Rope and System Components, dated February 2001 edition, for a life safety harness Class III
- SAE Aerospace Standard (AS) 8043, Revision A, Restraint Systems for Civil Aircraft, dated March 2000

3. NFPA 1983. The following sections of NFPA 1983 – on life safety harness system components, Class III – apply to this CTSO:

For:	See NFPA 1983:
Definitions	a. Sections 1.3.1 to 1.3.30, except 1.3.8 and 1.3.26. b. Section 1.3.31. Replace section with the following: Life Safety Harness: A system component; materials arranged and secured on the body to support a person during human external cargo (HEC) operations. HEC is a person (or persons), who is ferried, raised, lowered,

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or otherwise transported external to the rotorcraft fuselage. CCAR 27.865 and 29.865 define the certification requirements for external loads, including HEC. 14CFR 133.45(e) defines the operating limitations for HEC operations.

Product Labeling and User Instructions Sections 3.1.4.2(2), 3.1.4.2(3), and 3.2.3.2.

Instruction Requirements

Design and Construction Requirements Sections 4.3.1.3, 4.3.2, 4.3.3, 4.3.4, 4.3.5, and 4.3.6.

Performance Requirements Sections 5.3.4, 5.3.5, 5.3.6, and 5.3.9.

Testing Requirements Sections 6.3.1, 6.3.2, 6.3.3, 6.3.4, 6.3.5, and 6.3.6.

4. SAE AS 8043, Revision A

a. The following sections of SAE AS 8043, Revision A, apply to this CTSO:

For: See SAE AS 8043, Revision A:

Definitions Paragraphs 3.4, 3.4.1, 3.4.2, 3.4.3, 3.5, and 3.8.

General Requirements Paragraphs 4.1, 4.3, 4.6, and 4.9.

Webbing Requirements Paragraph 5.3.

Webbing Test Procedure Paragraphs 8, 8.2, 8.3, and 8.4.

Requirements for Adjusting Hardware Release Paragraph 6.4.2.

Requirements for Assembly Performance Paragraph 7.1.4.

Performance

Test Procedure for Nonmetallic Hardware Paragraph 9.2.2.

Nonmetallic Hardware

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- b. We modified the following SAE AS 8043, Revision A, paragraphs, which also apply to this CTSO:

SAE AS 8043 A:	Replace with:
Paragraph 3.1 (Definitions)	PCDS (also called “Human Harness”): A device or system that has the structural capability and features needed for safely transporting occupants externally during human external cargo (HEC) operations. These systems include, but are not limited to, life safety harnesses.
Paragraph 4.5 (General Requirements)	Adjustment: A harness shall be capable of snug adjustment, by the occupant, by a means easily within the reach of that person and easily operable, or shall be provided with a locking retractor. The harness shall maintain the adjusted position during flight. Non-locking retractors shall not be used. If a harness is designed to fit a range of sizes, it shall be clearly marked to specify the waist size and height or the chest size and height of the occupant for which it is designed.
Paragraph 5.2 (Webbing Requirements)	Breaking Strength: The webbing in a human harness must have a breaking strength not less than 22kN (5,000 lbs), when tested by the procedure in Paragraph 8.2. Breaking strength after the abrasion tests of Paragraph 10.5 must be not less than 16.7 kN (3,750 lbs), when tested by the procedure in Paragraph 8.2.
Paragraph 5.4 (Webbing Requirements)	Resistance to Light: The webbing in a human harness, after testing by the procedure in Paragraph 8.4, must have a breaking strength not less than 13.3 kN (3,000

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	lbs).
Paragraph 6.1 (Metallic Hardware)	Corrosion Resistance: Metallic hardware parts of a human harness must not corrode, after subjected to the conditions in Paragraph 9.1. Metallic adjusting devices must not fail, gall, or wear to an extent that impairs normal adjustment. A buckle must not separate when a force of not more than 0.22 kN (5 lbs) causes it partially to engage.
Paragraph 9 (Test Procedure for Metallic Hardware)	Test Procedure for Hardware: Use three samples of hardware for each test, unless otherwise specified.
Paragraph 9.1 (Test Procedure for Metallic Hardware)	Corrosion Resistance: Test hardware using conditions in ASTM B117-73 ² , Standard Method of Salt Spray (Fog) Testing. The test must consist of 24-hour exposure to salt spray, followed by 1 hour of drying. In a salt spray test chamber, place samples in a position most likely to develop corrosion on the larger areas. At the end of the test, wash the hardware with water to remove the salt. After drying, examine the hardware for corrosion.
Paragraph 6.2.1 (Nonmetallic Hardware)	Temperature Resistance: Nonmetallic hardware parts of a human harness, when subjected to the conditions in Paragraph 9.2.1, must not warp or otherwise deteriorate to cause the assembly to operate improperly.
Paragraph 6.2.2 (Nonmetallic Hardware)	Solvent Resistance: Nonmetallic hardware parts of a human harness, when subjected to the conditions in Paragraph 9.2.2, must not deteriorate to cause the assembly to operate improperly.

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Paragraph 9.2.1 (Test Temperature Resistance: Subject nonmetallic hardware
Procedure for Nonmetallic to the conditions in Procedure D of ASTM D756-78²,
Hardware) Standard Methods of Test for Resistance of Plastics to
Accelerated Service Conditions. Disregard the
measurements in Paragraph 7 of that procedure.

Paragraph 6.4.1 (Adjusting Release Force: Any adjusting release hardware of a
Hardware Release) human harness must release when a force of not more
than 0.13 kN (30 lbs) is applied to a pull or lift release
mechanism. Release mechanisms requiring a twisting
or torsional motion must release with a force equal to
0.13 kN (30 lbs) applied at the appropriate moment arm
relative to the axis of rotation, when tested as
prescribed in Paragraph 9.4.

Paragraph 10.5 (Test PCDS (or Human Harness), Abrasion Conditioning
Procedure for Assembly Procedure: Test the webbing breaking strength on an
Performance) area of webbing conditioned using the procedure in
Paragraph 8.2. Use the adjustment hardware and
webbing combination that best represents the human
harness' hardware and webbing. The combination must
not show wear before conditioning. Use test equipment
that provides the conditions of Figure 4 of SAE AS
8043, Revision A, with a length of stroke of 152-203
mm (6-8 inches) and a cycle rate of 16-18 cycles per
minute. One cycle consists of one lengthening stroke
and one shortening.

NOTE: Condition the webbing for 4 hours at 21 ±1
degree C (70 ±3 degrees F) and 65 ±2 percent relative
humidity. Test samples within 1 hour after

conditioning.

5. Additional Requirements. The following requirements also apply to this CTSO:

a. The maximum operating weight for harnesses approved under this CTSO is 450 pounds. The maximum operating weight is the total weight of the individual and all equipment supported by the harness.

b. Construct the harness with stitching that will not unravel when broken.

c. Load-bearing Hardware.

(1) Construct all load-bearing hardware (D-rings, buckles, links, and so on) using forged, machined, stamped, extruded, or cast metal. Castings must meet Class I, Grade A requirements of SAE-AMS-STD-2175 (formerly MIL-STD-2175A), Classification and inspection of Castings. All hardware parts must lack burrs and sharp edges, and must be designed and installed to minimize injury to the occupant.

(2) The load-bearing hardware must meet the fatigue requirements of CCAR 27.571 or CCAR 29.571 as applicable, and the corrosion resistance requirements of NFPA 1983 Paragraph 6.5.6.

d. The manufacturer must prepare Instructions for Continued Airworthiness (ICA) per CCAR 27.1529 or 29.1529, as applicable. The

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ICA must include at least the information required by NFPA 1983

Paragraph 3.2.3.2.