



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

TSO-C23f

Effective
Date: 09/21/2012

Technical Standard Order

Subject: Personnel Parachute Assemblies and Components

1. PURPOSE. This technical standard order (TSO) is for manufacturers applying for a TSO authorization (TSOA) or letter of design approval (LODA). In it, we the Federal Aviation Administration (FAA), tell you what minimum performance standards (MPS) your personnel parachute assembly and components must first meet for approval and identification with the applicable TSO marking.

2. APPLICABILITY. This TSO affects new applications submitted after its effective date.

a. All prior revisions to this TSO are no longer effective. Generally, we will not accept applications for the previous revision after the effective date of this TSO. We may do so, however, up to six months after it, if we know that you were working against the prior MPS before the new change became effective.

b. Personnel parachute assemblies and components approved under a previous TSOA may still be manufactured under the provisions of its original approval.

3. REQUIREMENTS. New models of personnel parachute assemblies and components identified and manufactured on or after the effective date of this TSO must meet the MPS qualification and documentation requirements in Parachute Industry Association (PIA) Technical Standard 135 TS-135 Revision 1.4 issued April 22, 2010 “*Performance Standards for Personnel Parachute Assemblies and Components*” as modified by appendix 1 of this TSO.

a. Functionality. This TSO’s standards apply to equipment intended to be used as a reserve or emergency parachute.

b. Failure Condition Classifications.

(1) Lose of the function defined in paragraph **3.a** is a catastrophic failure condition.

c. Functional Qualification. Demonstrate the required performance under the test conditions in Appendix 1 of this TSO.

d. Deviations. We have provisions for using alternate or equivalent means of compliance to the criteria in the MPS of this TSO. If you invoke these provisions, you must show that your equipment maintains an equivalent level of safety. Apply for a deviation under the provision of 14 CFR § 21.618.

4. MARKING.

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

b. Also, mark the following permanently and legibly, with at least the manufacturer's name, subassembly part number, and the TSO number:

- (1) Each component that is easily removable (without hand tools), and
- (2) Each subassembly of the article that you determined may be interchangeable.

5. APPLICATION DATA REQUIREMENTS. You must give the FAA aircraft certification office (ACO) manager responsible for your facility a statement of conformance, as specified in 14 CFR § 21.603(a)(1), and one copy each of the following technical data to support your design and production approval. LODA applicants must submit the same data (excluding paragraph 5.f) through their civil aviation authority.

a. A manual(s) containing the following:

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

(2) Describe in detail any deviations.

(3) Installation procedures and limitations sufficient to ensure that the personnel parachute assembly and component, when installed according to the installation procedures, still meets this TSO's requirements. Limitations must identify any unique aspects of the installation. The limitations must include a note with the following statement:

“This article meets the minimum performance and quality system standards required by a technical standard order (TSO). Installation of this article requires separate approval.”

b. Schematic drawings, wiring diagrams, and any other documentation necessary for assembly, installation, donning, and operation of the personnel parachute assembly and component

c. Instructions covering periodic maintenance, calibration, and repair, for the continued airworthiness of personnel parachute assemblies and components. Include recommended inspection intervals and service life, as appropriate.

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

e. Identify functionality or performance contained in the article not evaluated under paragraph **3** of this TSO (that is, non-TSO functions). Non-TSO functions are accepted in parallel with the TSO authorization. For those non-TSO functions to be accepted, you must declare these functions and include the following information with your TSO application:

(1) Description of the non-TSO function(s), such as performance specifications, failure condition classifications, software, hardware, and environmental qualification levels. Include a statement confirming that the non-TSO function(s) do not interfere with the article's compliance with the requirements of paragraph **3**.

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

(3) Instructions for continued performance applicable to the non-TSO function(s) described in paragraph **5.e.(1)**.

(4) Interface requirements and applicable installation test procedures to ensure compliance with the performance data defined in paragraph **5.e.(1)**.

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

(6) Test plants, analysis and results, as appropriate, to verify the function and performance of the non-TSO functions(s) as described in paragraph **5.e.(1)**.

f. The quality system description required by 14 CFR § 21.608, including functional test specifications. The quality system should ensure that you will detect any change to the approved design that could adversely affect compliance with the TSO MPS, and reject the article accordingly. (Not required for LODA applicants.)

g. Material and process specifications list.

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

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

6. MANUFACTURER DATA REQUIREMENTS. Besides the data given directly to the responsible ACO, have the following technical data available for review by the responsible ACO:

- a. Functional qualification specifications for qualifying each production article to ensure compliance with this TSO.
- b. Equipment calibration procedures.
- c. Schematic drawings.
- d. Wiring diagrams.
- e. Material and process specifications.
- f. If the article contains non-TSO function(s), you must also make available items **6.a** through **6.e** as they pertain to the non-TSO function(s).

7. FURNISHED DATA REQUIREMENTS.

a. If furnishing one or more articles manufactured under this TSO to one entity (such as an individual jumper or a drop zone operator), provide one copy or on-line access to the data in paragraphs **5.a** through **5.c** of this TSO. Add any other data needed for the proper installation, certification, use, or for continued compliance with the TSO, of the personnel parachute assembly and components.

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

8. HOW TO GET REFERENCED DOCUMENTS.

a. You can download a free copy of PIA TS-135 Revision 1.4 issued April 22, 2010 *Performance Standards for Personnel Parachute Assemblies and Components* at:

<http://www.pia.com/piapubs/TSDocuments/TS-135v1.4.pdf>

b. You can find a current list of technical standard orders and advisory circulars on the FAA Internet website Regulatory and Guidance Library at <http://rgl.faa.gov/>. You will also find the TSO Index of Articles at the same site.

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APPENDIX 1. MINIMUM PERFORMANCE STANDARD FOR PERSONNEL PARACHUTE ASSEMBLIES AND COMPONENTS

This appendix prescribes the MPS for a personnel parachute assembly and component. The applicable standard is PIA TS-135 Revision 1.4 issued April 22, 2010 *Performance Standards for Personnel Parachute Assemblies and Components*, as modified for this TSO:

1. Page 2, replace Para, 2.1.i. to read as follows:

“Cognizant Agency” - The Federal Aviation Administration (FAA) or civil aviation authorities recognized in bilateral agreements by the FAA,

2. Page 5, Para. 4.1.2. delete: “generally”.

Stitching should not ravel when broken. “Generally” reduces the requirement for stitch choice, and adversely impacts the current standard.

3. Page 5, Para. 4.1.3. delete: “Ref: Table 2”.

Table 2 is not relevant to this requirement. Testing of a packed assy will show if the main parachute will interfere with the proper function of the reserve parachute.

4. Page 9, Para. 4.3.7. in first sentence delete: “a weight not more than”.

The worst case is the maximum operating weight.

5. Page 11, disregard paragraph 4.3.9.1., Rate of Descent Tests (Method 2).

We omitted the Method (2) testing, for not providing an equivalent level of safety to current standard. This method is directed at high performance and experience parachutists in sport and skydiving activities. Novice or less experienced parachutists in emergency conditions due to incapacitation, panic, etc., may not be able to safely deploy and land.

We have to consider the safety of all jumpers, not just the highly skilled, highly experienced. It is argued that the risks the experienced jumpers are exposing themselves to, are mitigated by their skill and experience.

To allow the increased velocity may improve the safety of highly skilled, highly experienced jumpers, but it erodes the safety for the beginner, incapacitated, panicked, or a jumper who has gotten himself into a treacherous landing area.

We do not agree that a canopy manufacturer can demonstrate that a jumper can safely land with an appropriate control manipulation while performing a flare before touchdown. This approach relies on jumper's experience to meet the MOPS that parachutes have been certified to. This approach does not provide an equivalent level of safety.

6. Page 14, Table 1, under Marking Data Requirements, replace:

Statement of Authorization under TSO-C-23e and/or (J) TSO-C-23e if applicable.

With

Statement of Authorization. Under TSO-C23f and/or ETSO-C23f if applicable.

TSO-C23e has been cancelled