

PIA TS 135 v1.5

Parachute Industry Association (PIA)

TECHNICAL STANDARD 135 v1.5

PERFORMANCE STANDARDS FOR PERSONNEL PARACHUTE ASSEMBLIES AND COMPONENTS

1. SCOPE:

This document defines the performance standards for personnel parachute assemblies (and components thereof) to be carried in aircraft for emergency use by aircrew and those reserve parachutes worn by parachutists for intentional jumping.

This document covers three types of personnel carrying parachute assemblies and the operating limitations for each:

1.1 PARACHUTE TYPES:

1.1.1 Single harness reserve parachute assembly.

1.1.2 Single harness emergency parachute assembly.

1.1.3 Dual harness reserve parachute assembly.

1.2 MAXIMUM OPERATING LIMITS, GENERAL:

1.2.1 A single harness parachute assembly (or components thereof) may be certified for any maximum operating weight and for any maximum pack opening speed equal to or greater than 150 KTAS (277.8 km/h).

1.2.2 A dual harness reserve parachute assembly (or components thereof) may be certified for any maximum operating weight greater than 500 lb (227.3 kg) (with 250 lb (113.6 kg) in each harness) and any maximum pack opening speed equal to or greater than 175 KTAS (324.1 km/h). Note that the maximum operating weight need not be the same for each harness.

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1.3 LIST OF TECHNICAL STANDARDS, TABLES AND FIGURES:

Figure 1	Multiplier Factors for Structural Overload Testing
Figure 2	Functional Direct Drop Tests Required per 4.3.8.1
Table 1	Data Marking Requirements
Table 2	Human Factors and Actuation Force Tests – Primary Actuation Device/Ripcord
Table 3	Performance Test Requirements
Table 4	Performance Test Requirements for Component Qualification

2. DEFINITIONS AND GENERAL REQUIREMENTS

2.1 GENERAL DEFINITIONS:

For the purposes of this document, the following definitions are used:

- a. "Administrator" – The FAA Administrator or equivalent chief executive of the cognizant agency and/or his designated subordinate personnel and/or designated subordinate organization acting on his behalf and with his authority in the matter concerned.
- b. "Airspeed, Calibrated" (KCAS) means the indicated airspeed of an aircraft, corrected for position and instrument error. Calibrated airspeed is equal to true airspeed in standard atmosphere at sea level.
- c. "Airspeed, Equivalent" (KEAS) means the calibrated airspeed of an aircraft corrected for adiabatic compressible flow for the particular altitude. Equivalent airspeed is equal to calibrated airspeed in standard atmosphere at sea level.
- d. "Airspeed, Indicated" (KIAS) means the speed of an aircraft as shown on its pitot static airspeed indicator calibrated to reflect standard atmosphere adiabatic compressible flow at sea level uncorrected for airspeed system errors.
- e. "Airspeed, True" (KTAS) – means the airspeed relative to undisturbed air. True airspeed is equal to equivalent airspeed multiplied by $(\rho_0/\rho)^{1/2}$ where ρ_0 is the air density at standard day conditions and ρ is the air density at the local altitude.
- f. "Approved", unless used with reference to another person, means approved by the Administrator for use within the limits specified by the manufacturer and verified by compliance with the requirements of this standard.
- g. "Canopy"- The part of the parachute that opens up and fills with air and provides the lift and/or drag required to decelerate the payload to the desired value.
- h. "Certified", unless used with reference to another agency, means certified by the cognizant agency as having met the requirements of this standard.
- i. "Cognizant Agency" – The governmental agency or other organization tasked with oversight or regulation of aviation activities within a given geographical area or country. e.g. the Federal Aviation Administration (FAA) within the United States, the Joint Airworthiness Authorities (JAA) within the European Union and similar agencies worldwide. In some cases, the cognizant agency may delegate part or all of its authority to a subordinate agency such as a national aero club.
- j. "Drogue" – A small aerodynamic decelerator towed behind a falling body to slow its velocity.
- k. "Manufacturer" – The person (or business/corporate entity) who controls the design and quality of the article produced including the parts of them, and any processes or services related to them that are procured from an outside source.
- l. "Main Assisted Reserve Deployment (MARD) device" – An automatically releasable connection between the main parachute and the reserve deployment system which uses a malfunctioned main canopy to speed reserve deployment upon breakaway.

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- m. "Parachute" means a device used or intended to be used to retard the fall of a body or object through the air.
- n. "Parachutist in Command" – means the person making a tandem jump who:
 - (1) Has final authority and responsibility for the operation and safety of the jump;
 - (2) Has been designated as parachutist in command before the jump; and
 - (3) Holds the appropriate rating for the conduct of the jump.
- o. "Passenger parachutist" means a person who boards an aircraft, acting as other than the parachutist in command of a tandem parachute operation, with the intent of exiting the aircraft while in-flight using the forward harness of a dual harness tandem parachute system to descend to the surface.

2.1.1 MAJOR COMPONENTS:

For purposes of this document a parachute assembly normally, but not exclusively, consists of the following major components:

- a. Deployment control device such as a sleeve, bag, diaper, or functional equivalent.
- b. Deployment initiation device (pilot chute, drogue, or functional equivalent) and bridle.
- c. Canopy(s) including suspension lines, reefing device, and connector links (if used).
- d. Riser(s), when not integral with harness and/or canopy.
- e. Stowage container(s) or stowage pack(s).
- f. Harness (es).
- g. Primary actuation device (ripcord or functional equivalent).
- h. Reserve static line.
- i. Drogue canopy and bridle (if used with reserve and/or emergency parachutes).
- j. Drogue release device (if used with reserve and/or emergency parachutes).

2.1.2 SINGLE HARNESS RESERVE PARACHUTE ASSEMBLY:

A certified parachute assembly that is worn in conjunction with a main parachute assembly and used by one person for premeditated jumps. This includes, as applicable, the reserve deployment initiation device, deployment control device, canopy, risers, stowage container, harness, primary actuation device, and reserve static line.

2.1.3 DUAL HARNESS RESERVE PARACHUTE ASSEMBLY:

A certified parachute assembly used for premeditated jumps by two people: a parachutist in command and a second parachutist (each in his/her own harness), utilizing one main parachute assembly and one reserve parachute assembly. This assembly includes, as applicable, the reserve deployment initiation device, deployment control device, canopy, risers, stowage container, harness, primary actuation device, and reserve static line.

2.1.4 MAIN PARACHUTE ASSEMBLY:

A non-certified parachute assembly that is worn in conjunction with a certified reserve parachute assembly as the primary parachute (the one intended for use) for premeditated jumps. The main parachute assembly shall consist of the main container and all associated parts of the main parachute that are not permanently attached to the certificated harness assembly.

2.1.5 SINGLE HARNESS EMERGENCY PARACHUTE ASSEMBLY:

A certified parachute assembly that is worn by one person for emergency, (unpremeditated) use only. This assembly includes, as applicable, the deployment initiation device, deployment control device, canopy, risers, stowage container, harness, and primary actuation device.

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2.1.6 FAILURE OF A PARACHUTE ASSEMBLY OR COMPONENT:

The term “failure” in this document shall mean any change in a component or assembly that adversely affects its airworthiness. However, the use of consumable, frangible or single use parts shall be permitted in all assemblies and shall not be considered a failure if they function as designed.

2.1.7 FUNCTIONALLY OPEN:

Functionally open shall mean a parachute sufficiently deployed and inflated to provide a rate of descent of not more than 24 ft/s (7.3m/s). This condition may be demonstrated by video, film or electronic data of the test in a manner determined by the manufacturer.

2.1.8 RESERVE STATIC LINE (RSL):

A device connected to the main parachute assembly that is capable of actuating the reserve parachute assembly following a breakaway from the main canopy.

2.1.9 MAIN PARACHUTE BREAKAWAY DEVICE:

A device used by the parachutist in command to separate the main parachute from the harness of a single or dual-harness reserve parachute assembly. The parachutist in command shall be able to operate the main parachute breakaway device for dual harness reserve parachute assemblies.

2.1.10 MAXIMUM OPERATING WEIGHT (MOW):

The maximum operating weight is the total (gross) weight of all individuals or dummies and their equipment including the parachute assembly itself. MOW is also known as the “placard weight”.

2.1.11 MAXIMUM PACK OPENING SPEED (MPOS):

The maximum pack open speed in KTAS (knots true airspeed) is the maximum speed at which the (reserve/emergency) parachute pack (container) is designed to be opened. This definition specifically allows for the wearing of parachutes in freefall and/or in aircraft at speeds higher than the maximum pack opening speed. MPOS is also known as the “placard speed”.

NOTE: In order to provide an inherently greater margin of safety without requiring that tests be conducted at all possible altitudes, all test conditions in this document are stated in KEAS and that all maximum pack opening speeds are stated in KTAS. In the event that a manufacturer elects to conduct further testing at higher altitudes, the placard limits may be changed to reflect any test conditions successfully conducted.

2.1.12 MINIMUM OPERATING WEIGHT (MinOW)

The minimum operating weight is the lowest allowed total (gross) weight of an individual or dummy (or all individuals or dummies in the case of a tandem) and their equipment including the parachute assembly itself. The **MinOW** shall be specified by the manufacturer and may be any weight demonstrated to be appropriate by the manufacturer for the system.

2.1.13 SERVICE LIFE RESTRICTED ITEMS:

Materials or products that, by design, are service life restricted for any reason (environmental, structural, chemical, etc.) may be used in any manner chosen by the manufacturer. Each such item must be marked in a manner that will allow maintenance personnel to determine the serviceable status of the part.

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3. MATERIALS AND WORKMANSHIP:

Materials and workmanship shall be of a quality that documented experience and/or tests have conclusively demonstrated to be suitable for the manufacture of, and appropriate for the intended use in, personnel parachute assemblies. All materials shall remain functional for storage from -40 to +200°F (-40 to +93.3 °C), and from 0 to 100% relative humidity. All plated ferrous parts shall be treated to minimize hydrogen embrittlement.

4. DETAIL REQUIREMENTS

4.1 DESIGN AND CONSTRUCTION:

4.1.1 MATERIALS:

All materials shall be designed to support the proof loads specified in the applicable specification, drawing, or standard, without failure. In the absence of an applicable specification, drawing, or standard for a particular material, successful completion of the qualification tests listed under section 4.3 shall be considered adequate evidence of suitability.

4.1.2 STITCHING:

Stitching shall generally be of a type that will not ravel when broken. Note that this is not required for consumable or frangible parts.

4.1.3 MAIN PARACHUTE ASSEMBLY:

When installed but not deployed, the main parachute assembly shall not interfere with the proper function of the reserve parachute assembly. Ref: Table 2

4.1.4 PRIMARY ACTUATION DEVICE/RIPCORDER:

The primary actuation device/ripcorder, including all joints, shall withstand the test loads of 4.3.2 without failure. The primary actuation device/ripcorder shall meet the human-factors requirements of 4.3.3., if applicable.

4.1.5 RESERVE STATIC LINE (RSL):

The reserve static line, if used, including all joints shall withstand the test loads of 4.3.2 without failure and shall meet the functional requirements of 4.3.8.2.

4.1.6 HARNESS RELEASE:

The harness shall be so constructed that, after landing, the parachutist can separate himself from the main and reserve canopies and/or harness assembly unaided. On a dual harness, reserve parachute assembly, the parachutist in command must be able to separate himself and the second parachutist from the reserve canopy and/or harness assemblies unaided.

4.1.7 DROGUE PARACHUTE ASSEMBLY & RELEASE:

For reserve or emergency parachute assemblies, incorporating a drogue, the drogue release shall be tested at an equivalent force to the drag force generated at the MOW and MPOS. The human release force shall not be less than 5 lbf (22.2N) and must not exceed 22 lbf (97.9N). The release shall meet the human-factors requirements of 4.3.3.

4.1.8 DATA CARD POCKET; STOWAGE CONTAINER:

The stowage container shall be provided with a parachute data card pocket constructed such that the card will not be easily lost and will be readily accessible, when the parachute is packed in the container.

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4.2 MARKING REQUIREMENTS:

Marking requirements are listed in Table 1.

NOTE: The data items listed in Table 1 need not be marked at the same location on the component as long as all of the pertinent information is permanently marked.

4.2.1 MARKING, STOWAGE CONTAINER - OPERATING LIMITS:

The minimum and maximum operating limits in Table 1 shall be marked/placarded on or attached to the outside of the parachute stowage container (pack). The marking/placard may refer to the owner's manual for the minimum operating weight. The lowest maximum operating weight of any component in the assembly (canopy, harness, etc.) and the lowest maximum pack opening speed of any component (canopy, harness, etc.) shall be marked on the outside of the stowage container (pack) in such a location as to be readily available to the user during donning of the parachute assembly and subject to a minimum of obliteration during use.

This information may alternately be placed in a pocket marked with the legend 'Operating Limitations Inside'; the pocket must be readily available to the user during donning of the parachute assembly and subject to a minimum of obliteration during use.

NOTE: The maximum pack opening speed and minimum and maximum weight markings shall be in a block typeface, in a minimum size of 0.375 inch (9.5 mm) tall (27 point type). The other information required by Table 1 may be marked in another location, if desired.

4.2.2 MARKING, CANOPY - STATEMENT OF USE:

Each certified canopy shall be marked to show its approved use as follows:

- 4.2.2.1 "Single Harness Emergency Parachute Canopy"
- "Single Harness Reserve Parachute Canopy"
- "Single Harness Emergency/Reserve Parachute Canopy"
- "Dual Harness Reserve Parachute Canopy"

- 4.2.2.2 Each canopy (single harness types only) that has not been tested in accordance with the breakaway tests of Section 4.3.8.2 shall be marked as follows:

"**LIMITATION:** May not be used with main parachute breakaway device".

4.3 QUALIFICATION TESTS:

The minimum performance standards listed in Tables 2, 3 and 4 shall be met. There shall be no failure to meet any of the requirements during the qualification tests of this section. In case of a failure, the cause must be found, corrected, and all affected tests repeated.

4.3.1 PACKING METHOD:

The packing method must be specified and the identical packing method must be used for all of the functional and structural tests.

4.3.2 PRIMARY ACTUATION DEVICE/RIPCORD TEST:

- (a) The ripcord, including all joints, shall not fail under a straight tension test load of 300-lbf (1337.7 N) applied for not less than 3 seconds.