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Standard Specification for Airframe Emergency Parachutes for Light Sport Aircraft[1]

This standard is issued under the fixed designation F 2316; the number immediately following the designation indicates the year of original adoption or, in the case of revision, the year of last revision. A number in parentheses indicates the year of last reapproval. A superscript epsilon (ε) indicates an editorial change since the last revision or reapproval.

1. Scope

1.1 This specification covers minimum requirements for the design, manufacture, and installation of parachutes for light sport aircraft.

1.2 The values stated in inch-pound units are to be regarded as the standard. The values in parentheses are for information only.

1.3 *This standard does not purport to address all of the safety concerns, if any, associated with its use. It is the responsibility of the user of this standard to establish appropriate safety and health practices and determine the applicability of regulatory requirements prior to use.*

2. Referenced Documents

2.1 *Referenced Document:*

FAA Special Conditions 23-ACE-76 (Docket No. 118C), Ballistic Recovery Systems, Modified for Small General Aviation Aircraft[2]

3. Terminology

3.1 *Definitions of Terms Specific to This Standard:*

3.1.1 *armed or arming, v*—the next action activates the system.

3.1.1.1 *Discussion*—Armed or arming is not simply removing a safety pin.

4. Materials and Manufacture

4.1 *Materials*—Materials used for parts and assemblies, the failure of which could adversely affect safety, must meet the following conditions:

4.1.1 The suitability and durability must be established by experience or tests.

4.1.2 The strength and other properties assumed in the design data must meet approved specifications.

4.1.3 The effects of environmental conditions, such as temperature and humidity, expected in service must be taken into account.

5. Parachute Model Designations

5.1 *Parachute System Parts List*—A parts list is required for each parachute system for each airframe model in accordance with this specification.

5.2 *New Parachute Model Designations*—Each new parachute system model must be qualified in accordance with this specification.

5.3 *Design Changes*—Design or configuration changes that impact the parachute installation, performance, or operability require a new parachute model designation. Each design change of a part or component of a parachute system qualified by this specification must be evaluated relative to the requirements of this specification.

5.4 *Installation Design Changes*—Any airframe manufacturer, builder, or owner changing the design of their aircraft under this specification shall, as soon as possible, inform the parachute manufacturer about changes that may affect the mounting, attaching, deployment, egress, or specifications of the parachute system.

6. Parachute System Design Requirements

6.1 *Strength Requirements*:

6.1.1 Strength requirements are specified in terms of limits loads (the maximum loads to be expected in service) and ultimate loads (limit loads multiplied by prescribed factors of safety). The minimum factor of safety, or ultimate load factor, shall be 1.5. Compliance with strength requirements for components other than the parachute assembly may be demonstrated by analysis or testing.

6.1.2 System evaluation by analysis must use an accepted computational method that has been verified through testing. In other cases, load testing must be conducted.

6.1.3 System evaluation by testing must be supported with instrument calibration verified by an applicable weights and measures regulatory body, for example, state and federal governments.

6.2 *System Design*—The following minimum performance standards for the basic parachute system shall be met.

[1] This specification is under the jurisdiction of ASTM Committee F37 on Light Sport Aircraft and is the direct responsibility of Subcommittee F37.70 on Cross Cutting.

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[2] Available from Ballistic Recovery Systems, Inc., 300 Airport Rd., South St. Paul, MN 55075.

6.2.1 *Parachute Strength Test*—A minimum of three successful drop tests of the parachute assembly shall be conducted to demonstrate the ultimate load factor defined below. A new parachute assembly may be used for each test. Data acquisition shall include recordings of inflation loads as a function of time. The ultimate load factor shall be achieved by using the following test parameters:

$$\text{Ultimate Load Factor} = (\text{Test Weight}) \times (\text{Test Speed})^2 = 1.5$$
$$\text{Test Weight} = (\text{Maximum Operating Weight Limit}) \times (\text{S.F.})w$$
$$\text{Test Speed} = (\text{Maximum Operating Speed Limit}) \times (\text{S.F.})s$$

(S.F.)w = Safety Factor for Weight
(S.F.)s = Safety Factor for Speed

The aircraft's gross takeoff weight must be used as the maximum operating weight. However, the parachute's ultimate load factor may be used to determine the maximum speed.

6.2.2 *Rate of Descent*—Rate of descent data shall be recorded for all tests in 6.2.1. This data may be corrected for the increase in test vehicle weight to determine the rate of descent at the gross weight of the specific aircraft. Descent rate data from parachute canopies shall be corrected to 5000-ft (1500-m) density altitude and standard temperature.

6.2.3 *Component Strength Test*—All critical components (such as bridles, lanyards, harnesses, activation cables, and so forth) shall be designed to meet the ultimate load factor defined in 6.1.

6.2.4 *Staged Deployment*—The parachute assembly shall be designed to stage the deployment sequence in an orderly manner to reduce the chances of entanglements or similar malfunctions.

6.2.5 *Environmental Conditions*—The system must be evaluated for operations in temperature conditions of –40 to +120°F (40 to 48.9°C).

6.3 *Installation Design*—Each manufacturer of an emergency parachute system shall provide a general Parachute Installation Manual (PIM) with the documentation described in S2. The PIM shall be used for all installations with parties referenced in 6.3.1.

6.3.1 *Coordination*—Airframe and parachute manufacturers must coordinate to ensure proper installation. Airframe manufacturers of light sport aircraft–special (fully built) must not alter the installation without consulting the parachute system manufacturer. For light sport aircraft–experimental (kit built), the parachute manufacturer shall work with a new original equipment manufacturer, the aircraft builder, or the aircraft owner to create a proper installation design.

6.3.2 *Weight and Balance*—The installation of the parachute system must not adversely affect the center of gravity of the subject aircraft.

6.3.3 *System Mounting*—The hardware used to install the parachute system shall not become loosened or detached as a result of normal wear and tear.

6.3.4 *Extraction Performance*—It must be shown that the extraction device will cleanly penetrate any covering or remove the parachute system's cover, if any, and extract the parachute assembly to full line stretch without inhibiting or damaging the parachute upon egress. Airframe and parachute manufacturers must coordinate to ensure that the extraction device and those components extracted by it have an unobstructed trajectory away from the aircraft. While it is recognized that the aircraft configuration is unpredictable in an emergency situation (for example, broken parts creating debris), all due care must be taken to provide a path of least resistance assuming an extremely rapid rate of departure.

6.3.5 *Parachute Attachment to the Airframe*—The parachute assembly must be attached to the primary structure of the aircraft with an airframe attachment harness that may be composed of a single harness section or a series of harness sections. The airframe and parachute manufacturers must coordinate to ensure that the parachute attachment to the subject airframe complies with the following conditions:

6.3.5.1 Parachute deployments induce unique load distributions to the airframe. The airframe attachment points and airframe attachment harness must be shown to comply with the ultimate loads determined in the parachute strength test described in 6.2.1. Limit load factors at each attachment point must be determined for each specific aircraft design and aircraft attachment harness geometry at critical flight conditions.

6.3.5.2 The harness system and attach points must be configured in a manner that presents the aircraft in a descent and landing altitude that maximizes the ability of the aircraft structure to absorb the anticipated landing loads and minimizes the probability of injury to the occupants.

6.3.5.3 The airframe attachment harness must be routed from the installed parachute to the airframe attachment points and secured in a manner that will prevent it from impacting normal operations. It must also be shown that the harness will be satisfactorily stripped free upon extraction and inflation of the parachute.

6.3.5.4 The airframe attachment harness design must minimize the potential for conflict with the propeller. If conflict with the propeller is unavoidable by installation design or operator instructions such as shutting down the engine, the aircraft attachment harness must be manufactured from materials that yield a reasonable likelihood of surviving a conflict with the propeller.

6.3.6 *Activating Housing Routing*—The parachute system must be designed for activation without difficulty. The airframe and parachute manufacturers must coordinate to insure that the installation of the activation system in the subject airframe complies with the following conditions:

6.3.6.1 The routing of the activation system shall not create friction points or other interruptions that may reduce the occupant's ability to activate the system.

6.3.6.2 The activating system shall be secured along its path such that it will not change during the normal operating life of the parachute system.

6.3.6.3 The activating handle or trigger shall be located such that both occupants of a two-place aircraft can reach and operate the activating mechanism. This may require dual activating assemblies. If dual activating handles are used, they