



Designation: F3408/F3408M – 21

Standard Specification for Aircraft Emergency Parachute Recovery Systems¹

This standard is issued under the fixed designation F3408/F3408M; 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 of emergency parachute recovery systems for aircraft. Airframe emergency parachute systems addressed in this specification refer to parachute systems designed, manufactured, and installed to recover the airframe and its occupants at a survivable rate of descent. This specification is not applicable to deepstall parachutes, spin recovery parachutes, drogue parachutes, or other airframe emergency aerodynamic decelerators not specifically intended for safely lowering the airframe and occupants to the ground. The specification is applicable to these types of parachutes if they are an integral part of an airframe emergency parachute system designed to recover the airframe and occupants at a survivable rate of descent. The material was developed through open consensus of international experts in general aviation. This information was created by focusing on Level 1, 2, 3, and 4 Normal Category aeroplanes. The content may be more broadly applicable; it is the responsibility of the Applicant to substantiate broader applicability as a specific means of compliance. The topics covered within this document are: strength requirements, parachute test method, activation system, deployment system, parachute attachment to the airframe, occupant protection, and system verification.

1.2 An applicant intending to propose this information as Means of Compliance for a design approval must seek guidance from their respective oversight authority (for example, published guidance from applicable CAAs) concerning the acceptable use and application thereof. For information on which oversight authorities have accepted this specification (in whole or in part) as an acceptable Means of Compliance to their regulatory requirements (hereinafter the Rules), refer to the ASTM Committee F44 web page (www.astm.org/COMMITTEE/F44.htm). **Annex A1** maps the Means of Compliance of this ASTM specification to EASA CS-23, amendment 5, or later, and FAA 14 CFR Part 23, amendment 64, or

later, rules applicable to the Aircraft Emergency Parachute Recovery Systems installation.

1.3 Airframe emergency parachute recovery systems have become an acceptable means of greatly reducing the likelihood of serious injury or death in an in-flight emergency. Even though they have saved hundreds of lives in many different types of conditions, inherent danger of failure, even if properly designed remains due to the countless permutations of random variables (attitude, altitude, accelerations, airspeed, weight, geographic location, etc.) that may exist at time of usage. The combination of these variables may negatively influence the lifesaving function of these airframe emergency parachute systems. They are designed to be a safety device and to be used at the discretion of the pilot when deemed to provide the best chance of survivability.

1.4 *Units*—This document may present information in either SI units, English Engineering units, or both; the values stated in each system are not necessarily exact equivalents; therefore, to ensure conformance with the standard, each system shall be used independently of the other, and values from the two systems shall not be combined.

1.5 *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, health, and environmental practices and determine the applicability of regulatory limitations prior to use.*

1.6 *This international standard was developed in accordance with internationally recognized principles on standardization established in the Decision on Principles for the Development of International Standards, Guides and Recommendations issued by the World Trade Organization Technical Barriers to Trade (TBT) Committee.*

2. Referenced Documents

2.1 ASTM Standards:²

F3060 **Terminology for Aircraft**

F3083/F3083M Specification for Emergency Conditions, Occupant Safety and Accommodations

¹ This specification is under the jurisdiction of ASTM Committee F44 on General Aviation Aircraft and is the direct responsibility of Subcommittee F44.30 on Structures.

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² For referenced ASTM standards, visit the ASTM website, www.astm.org, or contact ASTM Customer Service at service@astm.org. For *Annual Book of ASTM Standards* volume information, refer to the standards Document Summary page on the ASTM website.

F3114 Specification for Structures

2.2 Other Standards:

FAA 14 CFR Part 23-Amdt 64 A Performance-Based Approach to Type Certification of Small Airplanes³

EASA CS-23 / Amendment 5 Certification Specifications for Normal-Category Aeroplanes⁴

3. Terminology

3.1 Definitions of Terms Specific to This Standard:

3.1.1 activation system, n—the system to mechanically or electrically activate the extraction/ejection device.

3.1.2 aircraft attachment harness, n—interface between the parachute riser(s) and the airframe structural attachment.

3.1.3 deployment device, n—may include a deployment bag, or sleeve, or any device to contain the packed parachute and stage its deployment in an orderly sequence.

3.1.4 deployment system, n—includes the extraction/ejection device, deployment device and any other components that assist in the parachute deployment.

3.1.5 drop test, n—a structural test of a parachute assembly using an unmanned test vehicle released from a test aircraft in flight.

3.1.6 extraction/ejection device, n—may include rocket motor, mortar, explosive projectile, spring, or other stored energy device.

3.1.7 line stretch, n—when all components of the parachute assembly are pulled taut prior to inflation.

3.1.8 parachute assembly, n—includes the canopy, or reinforced fabric portion, suspension lines, riser(s), connector links, and reefing systems or devices.

3.1.9 parachute container, n—structure to house and protect the packed parachute assembly, extraction/ejection device and related components.

3.1.10 parachute deployment, n—process of parachute system activation, extraction/ejection, inflation, and descent.

3.1.11 parachute system, n—includes the parachute assembly, extraction/ejection device, activation system, deployment device, aircraft attachment harness, parachute container and other supporting components.

4. Significance and Use

4.1 This specification provides one means for substantiating the design of an Airplane Emergency Parachute Recovery System. This specification satisfies the structural and system requirements for Normal Category Aeroplanes. **Annex A1** correlates the paragraphs of this specification with FAA 14 CFR Part 23, amendment 64, or later, and EASA CS-23, amendment 5, or later, rules.

5. Parachute System Performance Requirements

5.1 The system shall not adversely affect aircraft performance during normal operations.

5.2 The deployment system shall extract/eject the parachute assembly to full line stretch without obstructions.

5.3 The parachute assembly, parachute attachment harnesses, parachute airframe attachment structure and all related components shall sustain design ultimate load conditions throughout deployment and descent.

5.4 The parachute deployment shall not result in aircraft dynamics that could seriously injure the occupants when properly restrained.

5.5 The design rate of descent shall provide touchdown and post-touchdown conditions that protect the occupants from serious injury.

5.6 All components of the parachute recovery system shall be protected against deterioration or loss of strength in service because of normal operations, weathering, corrosion, abrasion, temperature, vibration, and aging.

5.7 The system shall be evaluated for operations in temperature conditions of -40°C to 60°C [-40°F to 140°F] as a minimum.

5.8 The installation design and location of the extraction/ejection device shall consider fire hazards associated with the activation of the parachute system and reduce this fire hazard potential without compromising system function.

5.9 Adequate provisions shall be made to prevent contamination of the system compartments and associated structure to ensure the sound condition of the system.

5.10 The hardware used to install the parachute system shall not become loosened or detached because of normal operations.

5.11 The system shall be configured to prevent potential debris from the aircraft from interacting with the parachute during deployment.

5.12 Materials and workmanship and fabrication methods shall comply with requirements of Specification **F3114**.

6. Parachute System Design Requirements

6.1 Strength Requirements:

6.1.1 Strength requirements shall comply with requirements of Specification **F3114**, and **6.2**, Parachute Test Method, of this specification.

6.1.2 Unless otherwise provided, an ultimate load factor of safety shall comply with requirements of Specification **F3114**.

6.1.3 System evaluation shall be by analysis or testing, or both, and comply with requirements of Specification **F3114**.

6.2 Parachute Test Method—A minimum of three successful drop tests of the parachute assembly shall be conducted under ultimate load conditions to demonstrate the parachute's strength. A new parachute assembly shall be used for each test. The weight of the parachute assembly is included in the test weight. Data shall be acquired for each test and shall include recordings of inflation loads, altitude and rate of descent as a function of time.

6.2.1 For a successful drop test the parachute system shall be able to support the ultimate loads demonstrated during the drop test. No deformations or damage may occur that prevent

³ Available from Federal Aviation Administration (FAA), 800 Independence Ave., SW, Washington, DC 20591, <http://www.faa.gov>.

⁴ Available from European Union Aviation Safety Agency (EASA), KonradAdenauer-Ufer 3, D-50668 Cologne, Germany, <https://www.easa.europa.eu>.