

ETSO-C13g

ED Decision 2020/011/R (applicable from 25.7.2020)

LIFE PRESERVERS**1 Applicability**

This ETSO provides the requirements which life preservers that are designed and manufactured on or after the date of this ETSO, must meet in order to be identified with the applicable ETSO marking.

2 Procedures

2.1 General

The applicable procedures are detailed in CS-ETSO, [Subpart A](#).

2.2 Specific

None.

3 Technical Conditions

3.1 Basic

The standards of this ETSO apply to items of equipment that are intended to function as life preservers.

3.1.1 Minimum Performance Standard

The applicable standards are those provided in SAE International's Aerospace Standard AS1354, Individual Inflatable Life Preserver, dated 24 February 2016, as amended by [Appendix 1](#).

3.1.1.1 Functional Qualification

The required functional performance under the test conditions specified in AS1354, Individual Inflatable Life Preserver, dated 24 February 2016, as amended by Appendix 1 and Appendix 2, shall be demonstrated.

3.1.2 Environmental Standard

The required performance under the test conditions specified in AS1354, Individual Inflatable Life Preserver, dated 24 February 2016, as amended by Appendix 1, shall be demonstrated.

3.1.3 Software

See CS-ETSO, Subpart A, paragraph 2.2.

3.1.4 Airborne Electronic Hardware

See CS-ETSO, Subpart A, paragraph 2.3.

3.2 Specific

3.2.1 Failure Condition Classification

Not applicable.

4 Marking

4.1 General

See CS-ETSO, [Subpart A](#), paragraph 1.2.

4.2 Specific

See [Appendix 1](#).

5 Availability of Referenced Documents

See CS-ETSO, [Subpart A](#), paragraph 3.

[Amdt ETSO/16]

Appendix 1 to ETSO-C13g – Functional and Environmental Qualification Requirements

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Appendix 1 modifies the text in SAE International’s Aerospace Standard AS1354, Individual Inflatable Life Preserver, dated 24 February 2016. Compliance with the modified text is required in order to comply with the requirements of this ETSO.

When reading AS1354	Do the following:
Section 1	Disregard
Section 2	Apply all the subsections unless they are disregarded or modified below:
	<p>Page 4, replace Subsection 2.1 with the following text:</p> <p>2.1 Applicable Documents</p> <p>The following publications form a part of this document to the extent specified herein. The applicable issue of cited publications shall be the issue that was in effect on the date of the publication of this document, unless otherwise specified. In the event of conflict between the text of this document and the references cited herein, the text of this document takes precedence. Nothing in this document, however, supersedes the applicable laws and regulations unless a specific exemption has been obtained.</p>
	<p>Page 6, Subsection 2.3 applies as written, except replace the definitions of the following terms with the ones below:</p> <p>APPROVED: The status of equipment that meets EASA standards.</p> <p>CHILLED HANDS TEST METHOD: A technique to simulate the reduced dexterity of chilled, wet hands that may occur during an emergency in a cold and wet environment. A naïve test subject simultaneously submerges their left and right forearms and hands in 50 °F (10 °C) water for 2 minutes and immediately upon removal attempts to open/operate the designated packaging/equipment. The test subject <i>shall</i> be healthy and wear a loose-fitting, sleeveless upper garment that will not inhibit blood flow to the arms and hands. (Alternate: GLOVED HANDS TEST METHOD)</p> <p>SEAT PITCH: The distance from any point on one seat to exactly the same point on the seat in front or behind it.</p> <p>TEST SUBJECTS: Individuals who participate in life preserver tests (e.g. donning, retention, flotation). All such individuals shall be naïve, i.e. they shall have had no experience in using a life preserver or the specific equipment to be tested, and they shall not have viewed or talked with other persons performing the same or similar activities. Note that individuals who have experience in using marine or boating life preservers are considered to be acceptable test subjects.</p>

Section 3	Apply all the subsections unless they are disregarded or modified below:
	<p>Page 7, Section 3, replace the introductory text with the following:</p> <p>3. DESIGN AND PERFORMANCE REQUIREMENTS</p> <p>Tests and measurements performed to demonstrate compliance with this standard shall be conducted with equipment that is calibrated according to the original equipment manufacturer (OEM) specifications, using standards and references that are traceable to a recognised national authority (e.g. the National Institute of Standards and Technology (NIST)). The description of the test results shall include the accuracy and precision of the measurement(s), e.g. measured in 5-pound increments with an accuracy of ± 0.10 pounds.</p> <p>All tests that require timing shall use time-encoded video. In addition, tests that require human subjects or a child test dummy shall use time-encoded video.</p> <p>Demonstration life preservers are not addressed by this ETSO. They are not intended to be functional and should be marked accordingly.</p>
	<p>Page 10, replace Subsection 3.9 with the following text:</p> <p>3.9 Donning</p> <p>Donning tests shall be performed to show compliance with the design requirements and the comprehensibility of markings. The procedure for donning the life preserver shall be simple and obvious such that it can be rapidly donned by an untrained person without any assistance. This shall be demonstrated in accordance with the test criteria and procedures in Subsection 5.3.</p> <p>For the adult and adult-child category, it shall be demonstrated that at least 75 % of the total number of test subjects, and at least 60 % of the test subjects in each age group specified in Subsection 5.3.1, can don the life preserver within 25 seconds, unassisted, starting with the packaged life preserver on the test participant's lap. It must also be demonstrated that an unassisted adult can install an appropriate life preserver on another adult or child within 30 seconds.</p> <p>For the child and infant-small child category, it shall be demonstrated that at least 60 % of five adult test subjects of both sexes between the ages of 20 and 40, unassisted, can install a child life preserver on a child who weighs between 35 and 90 pounds (15.88 and 40.82 kg) and an infant-small child life preserver on a child dummy within 90 seconds, unassisted, starting with the packaged life preserver.</p> <p>The donning-time test does not apply to constant wear life preservers that are intended to be fully donned by the wearer while on board the aircraft. The donning-time test does apply to constant wear life preservers that are intended to be partially donned by the wearer while on board the aircraft and require an additional donning procedure prior to inflating the life preserver or entering the water. For these partially donned life preserver designs, the test shall begin with the life preserver in the partially donned condition.</p>
	<p>Page 10, replace Subsection 3.10 with the following text:</p> <p>3.10 Retention</p> <p>The means of retaining the life preserver on the wearer for an adult, adult-child, and child life preserver shall require the wearer to secure no more than one attachment</p>

	<p>and make only one adjustment for fit. This requirement does not apply to constant wear life preservers. The retention means shall not make use of knots. The means of retaining the life preserver shall not require any action to secure it other than fastening and fit adjustment (e.g. removal of rubber bands, unfastening of attachment points). Partially donned life preservers shall not require the wearer to secure more than one attachment or make more than one adjustment for fit after the life preserver is partially donned.</p> <p>The means of retaining the life preserver shall be shown to be operable within 5 seconds with chilled or gloved hands (e.g. fastening/unfastening buckles, snapping/unsnapping, etc.). This will be demonstrated in accordance with the Chilled Hands or Gloved Hands Test Methods in Subsection 5.4.2. This requirement does not apply to constant wear life preservers that are intended to be fully donned by the wearer while on board the aircraft.</p> <p>The adult, adult-child, and child category life preserver shall remain inflated, secured, and not cause injury to a wearer when it is tested in accordance with 5.4. There shall be no damage to the life preserver as a result of the jump. Chafing of the wearer’s skin shall not be considered to be an injury.</p> <p>The infant-small child category life preserver shall remain inflated and undamaged, and the infant-small child dummy, specified in 5.3.2, shall remain properly secured in the donned life preserver, while being held by an adult and tested in accordance with 5.4.3.</p>
	<p>Page 11, replace Subsection 3.11.2 with the following text:</p> <p>3.11.2 Infant-Small Child</p> <p>The life preserver <i>shall</i> provide insulation for the wearer’s head and upper torso (i.e. from the waist up) with a minimum R-value of 0.25 (equivalent to approximately 2 mm of wetsuit fabric). There shall be a means, other than knots, to restrict the position of the life preserver relative to the wearer, so as to provide proper function and prevent the wearer from releasing the means of restriction. Means shall be provided to prevent the introduction and/or entrapment of water. This shall be demonstrated in accordance with the Flotation Attitude Test procedure in 5.5.2.</p>
	<p>Page 11, replace Subsection 3.13 with the following text:</p> <p>3.13 Tether, Infant-Small Child Category</p> <p>A tether of PIA-C-5040, Type 3 cord or equivalent, at least 72 inches (182.88 mm) long, shall be attached to the infant-small child life preserver. The attachment shall be located such that the flotation attitude specified in 3.11.2 is maintained when the line is held taut in the water. The attachment shall be shown to withstand a 70-pound (31.75 kg) pull for at least 3 seconds without a failure of the line or the attachment.</p> <p>A positive-buoyancy attachment means shall be provided at the free end of the tether. The attachment means shall be shown to be operable with cold, wet hands, using either the Chilled Hands or Gloved Hands Test Method. <i>This must be demonstrated in accordance with Subsection 5.9.</i> There shall be a provision for stowing or securing the tether during use so that it remains readily accessible and does not dangle loosely.</p>

	<p>Page 11, replace Subsection 3.14 with the following text:</p> <p>3.14 Survivor Locator Light</p> <p>The life preserver shall be equipped with a survivor locator light that meets the requirements of ETSO-C85b or TSO-C85b, Survivor Locator Lights. The light shall automatically activate upon initial immersion in the water or by other means that do not require additional action by the wearer once the life preserver is fully donned. The light shall be located so to enhance visibility from a surface vessel or from an aircraft.</p>
	<p>Page 12, replace Subsection 3.17.2 with the following text:</p> <p>3.17.2 Package Opening</p> <p>Opening of the package shall be demonstrated in accordance with the Package Opening test procedures in 5.7.</p>
	<p>Page 12, replace Subsection 3.18.1 with the following text:</p> <p>3.18.1 Instructions</p> <p>The proper donning procedure and other operational instructions shall be simple, obvious, and <i>shall</i> be presented pictorially with a minimum use of words. Instructions that pertain to operations normally accomplished after the life preserver has been donned shall be oriented so that the wearer, or the person assisting a child or an infant-small child wearer, can see them while in the water. Instructions shall be sized, positioned and contrasted with the background to make them easily readable and comprehensible at a viewing distance of 24 inches (60.96 cm) with illumination no greater than 0.05 ft-c (0.54 lux) by a person who has 20/20 vision. Written instructions shall use bold lettering at least 0.22 inches (5.6 mm) high with a stroke width of at least 0.047 inches (1.2 mm). Comprehensibility shall be demonstrated in accordance with the Comprehensibility test procedure in Subsection 5.8.</p>
Section 4	Apply all the subsections unless they are disregarded or modified below:
	<p>Page 13, replace Subsection 4.2.1 with the following text:</p> <p>4.2.1 Permeability</p> <p>The materials used in the construction of the air holding cell shall have a maximum permeability to helium of 5 L/m² in 24 hours at 77 °F (25 °C) when tested in accordance with 5.6.3.</p>
Section 5	Apply all the subsections unless they are disregarded or modified below:
	<p>Page 15, replace Subsection 5.1.2 with the following text:</p> <p>5.1.2 Overpressure</p> <p>The life preserver shall meet the minimum buoyancy requirements defined in 3.4 when it is subjected to overpressure. Inflate each flotation chamber via the oral inflation tube to 1 psig (6.89 kPa), then manually actuate the discharge of the gas reservoir for each chamber. Submerge the life preserver in fresh water at a temperature of 70 °F ± 5 °F (21.1 °C ± 2.8 °C), so that no part of it is less than 24 inches (60.96 cm) below the surface of the water. Measure the buoyancy to show compliance with the applicable requirement in Table 1. Keep the life preserver submerged for at least 8 hours, after which time it shall be shown to meet or exceed the requirement in Table 1.</p>

	<p>Alternatively, the test may be discontinued in less than 8 hours if buoyancy measurements taken at 4 successive 30-minute intervals show that the buoyant force of the life preserver has stabilised at or above the value specified in Table 1.</p>
	<p>Pages 15-16, replace Subsection 5.3.1 with the following text:</p> <p>5.3.1 Test Subjects</p> <p>At least 25 test subjects shall be employed in tests of an adult or adult-child preserver. At least 5 of those test subjects shall be from each of the following age groups: 20 to 29 years; 30 to 39 years; 40 to 49 years; 50 to 59 years; and 60 to 69 years. No more than 60 % of the test subjects in any age group may be of the same sex. The number of test subjects in any age group may not exceed 30 % of the total number of test subjects.</p> <p>Child-donning tests shall be performed by a minimum of 5 adult test subjects of both sexes between the ages of 20 and 40. Tests shall be performed using a child that weighs between 35 and 90 pounds (15.88 and 40.91 kg).</p> <p>Infant-small child donning tests shall be performed by a minimum of 5 adult test subjects of both sexes between the ages of 20 and 40. Tests shall be performed using an articulating infant-small child dummy per Subsection 5.3.2.</p> <p>Adult test subjects shall have no experience with inflatable life preservers or donning tests. Test subjects shall not be familiar with the manufacture, production, or maintenance of inflatable life preservers.</p> <p>Test subjects shall receive no donning instructions other than the general introduction briefing and preflight video briefing on the use of the life preserver per Appendix D — Donning Test Briefings. Instructions for the child and infant-small child category life preserver shall be the typical briefing given by a flight attendant to a parent/guardian that accompanies a child or infant on a flight. Test subjects may be informed (during the pre-test introduction briefing) that this is a timed test, and that their task is to don the life preserver within the applicable time frame specified in Subsection 3.9.</p> <p>Furthermore, the installation, operating and maintenance instructions shall also reflect the requirements of this section. The operating instructions must report the detailed content of the simulated preflight briefing and any special instructions for the unique aspects of operating the design of the life preserver that should be considered for its operational use and continued performance.</p>
	<p>Page 16, replace Subsection 5.3.3 with the following text:</p> <p>5.3.3 Arrangement</p> <p>Subjects in tests of an adult, adult-child, or child life preserver shall be seated in previously approved air carrier coach class seating, with a seat row in front of the test subjects, creating a seat pitch not exceeding 31 inches (78.74 cm). Subjects shall be seated one per row. All subjects shall have their seat belts fastened.</p> <p>Infant-small child life preserver donning tests shall be performed with the adult test subject holding the infant on their lap, seated between two other adult subjects who shall not assist or hamper the test subject who performs the donning test. The adult test subject shall be wearing their own life preserver.</p>

	<p>Page 16, replace Subsection 5.3.4 with the following text:</p> <p>5.3.4 Procedure</p> <p>The donning test shall start on signal with the packaged life preserver held on the test subject's lap, or for a constant wear life preserver, the test shall start in the partially donned configuration. The timing of the test shall end when the life preserver is properly donned, secured, and adjusted for fit (the means of adjustment shall be adjusted for a snug fit on the test subject). Donning tests shall be captured on video; the timing for each individual subject shall be recorded separately.</p>
	<p>Page 16, add two new subsections to 5.4 as follows:</p> <p>5.4.2 Retention Mechanism Test</p> <p>Demonstrate the operability of the life preserver retention mechanism using either the Chilled Hands or Gloved Hands Test Method (see 2.3 Definitions). At least 4 out of 5 test subjects shall secure the life preserver retention mechanism (e.g. fasten and then unfasten it) within 5 seconds. In cases for which additional participants are required, 75 % of the total number of test participants for each demonstration must complete the retention mechanism task within the allowed time.</p> <p>5.4.3 Infant-Small Child Life Preserver</p> <p>The infant-small child category life preserver shall remain inflated and undamaged, and the infant-small child dummy, specified in 5.3.2, shall remain properly secured in the donned life preserver, while being held by an adult who jumps into the water from a height of 5 feet (1.52 m) above the water. The adult shall wear an inflated life preserver for this test.</p>
	<p>Page 17, replace Subsection 5.6.2 with the following text:</p> <p>5.6.2 Flammability</p> <p>The life preserver and package shall be constructed of material that meets the requirements of the latest amendment of CS-25, Appendix F, Part I. The definition and use of parts that are considered to be small parts (e.g. oral inflation tubes, clips, etc.) that would not contribute significantly to the propagation of a fire must be coordinated in advance with EASA.</p>
	<p>Page 17, replace Subsection 5.6.3 with the following text:</p> <p>5.6.3 Permeability</p> <p>The permeability shall be tested in accordance with the permeability test procedure in FTMS 191, Method 5460; or alternatively, ASTM D1434-82, Procedure V may be used. The permeameter shall be calibrated for the gas that is used.</p>
	<p>Page 18, replace Subsection 5.7.1 with the following text:</p> <p>5.7.1 Pull Force</p> <p>The pull force necessary to operate the opening mechanism shall be mechanically demonstrated not to exceed 9 pounds (40 N), or the opening of the mechanism shall be demonstrated in less than 7 seconds by at least 8 of 10 females over the age of 60, without any preview of the instructions. The timing shall start when the test participant has both hands on the package and is ready to open it, and shall end when the package is fully opened (e.g. the pull tab/strip is completely removed). A nick or cut shall not be introduced in the edge of the material at the tear line unless it is</p>

	<p>normally a part of the package design. In cases for which additional participants are required, 75 % of the total number of test participants for each demonstration must complete the opening of the package within the allowed time.</p>
	<p>Page 18, replace Subsection 5.7.2 with the following text:</p> <p>5.7.2 Operation of the Opening Mechanism</p> <p>Operation of the opening mechanism shall be demonstrated within 10 seconds by 8 of 10 females with reduced dexterity simulated by the Chilled Hands or Gloved Hands Test Method, and without a preview of the instructions. The timing shall start when the test participant has both hands on the package and is ready to open it, and end when the life preserver is fully removed from the package. In cases for which additional participants are required, 75 % of the total number of test participants for each demonstration must complete the opening of the package within the allowed time.</p>
	<p>Page 18, replace Subsection 5.8 with the following text:</p> <p>5.8 Comprehensibility</p> <p>Comprehensibility shall be demonstrated by 5 out of 6 test subjects, tested independently, using an open-ended answer format (see examples in ANSI Z535 or ISO 9186:2001) and/or a successful empirical demonstration of the equipment or feature.</p>
	<p>Page 18, add new Subsection 5.9 as follows:</p> <p>5.9 Tether Attachment Test</p> <p>Demonstrate that the means of attachment, on the tether of the infant-small child life preserver, is operable using either the Chilled Hands or Gloved Hands Test Method (see 2.3 Definitions). At least 4 out of 5 test subjects shall secure the means of attachment of the life preserver. In cases for which additional participants are required, 75 % of the total number of test participants for each demonstration must complete the attachment task. This test may be performed on dry land.</p> <p>NOTE: The attachment should be demonstrated in the manner in which it is designed to be used; it should be attached to something as designed.</p>
Appendix A	No change
Appendix B	No change
Appendix C	<p>Page 24, replace Appendix C with Appendix 2 Tests Involving Subjects.</p> <p>See Appendix 2 on the final page.</p>
	<p>Page 25, add a new Appendix D as follows:</p> <p>Appendix D — Donning Test Briefings</p> <p>You must use the following scripts for the donning-test briefing. For the assisted donning tests, substitute the appropriate donning time requirement as specified in Subsection 3.9. The scripts may be modified as applicable for constant wear life preservers that are designed to be partially donned during flight.</p>

General introduction briefing script:

You are participating in a passenger safety study to determine how long it takes to put on an aircraft life preserver. You are seated in a seat that is similar to those found on passenger aeroplanes; please fasten your seatbelt [pause until all seatbelts are fastened].

The test will simulate an actual airline emergency; your goal is to put on the life preserver as quickly as possible within 25 seconds or less. Video cameras will record your actions.

To start the test, your instructor will say: '3, 2, 1, go!' This is your signal to open the package and put on the life preserver.

Following this introduction, a video of a simulated passenger information briefing will be presented. After the video, you will be handed your life preserver package.

[Optional: Before the video, please review the safety information card for additional instructions on putting on the life preserver.]

Preflight video briefing script:

This test will simulate an actual airline emergency; your goal is to put on the life preserver as quickly as possible within 25 seconds or less. To start the test, your instructor will say: '3, 2, 1, go!' This is your signal to open the package and put on the life preserver.

To put on your life preserver:

- Pull the tab and tear open the package.
- Remove the life preserver from the package.
- Pull the life preserver over your head.
- Grab the waist strap and wrap it around your waist.
- Insert the clip into the buckle and pull the end of the waist strap to tighten the belt.
- Raise your arms when you have finished.

[Amdt ETSO/16]

Appendix 2 to ETSO-C13g – Tests Involving Subjects*

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*NOTE: Tests that require human subjects or a child test dummy shall use time-encoded video.

Test name	Paragraph	Number of subjects
Donning Test	5.3	
<ul style="list-style-type: none"> • Adult or Adult-Child 	5.3.1	— 25 adults minimum — Age groups: 20-29, 30-39, 40-49, 50-59, 60-69 yrs (see 5.3.1 for more details)
<ul style="list-style-type: none"> • Child 	5.3.1	— 5 adults: ages: 20-40 years, male and female — 5 children: each child: 35-90 lbs (15.88-40.91 kg)
<ul style="list-style-type: none"> • Infant-Small Child 	5.3.1 5.3.2	— 5 adults: ages: 20-40 years, male and female — 1 anthropometric, infant-small child test dummy or child
Retention Test	5.4	
<ul style="list-style-type: none"> • Adult, Adult-Child, and Child 	5.4.1	— 3 adults minimum, including at least one 5th percentile female and one 95th percentile male (measured by weight and head circumference)
<ul style="list-style-type: none"> • Chilled Hands or Gloved Hands Test Method 	5.4.2	— 5 adults minimum (see 2.3)
<ul style="list-style-type: none"> • Infant-Small Child 	5.4.3	— 1 adult holding child test dummy or child (see 5.3.2)
Flotation Attitude Test	5.5	
<ul style="list-style-type: none"> • Adult, Adult-Child, or Child 	5.5.1	— 3 minimum, including at least one 5th percentile female and one 95th percentile male (measured by weight and head circumference)
Packaging Opening	5.7	
<ul style="list-style-type: none"> • Pull Force (2 methods) 	5.7.1	— Mechanical: not to exceed 9 lbs (40 N) OR — 10 minimum, female, older than 60 yrs

Test name	Paragraph	Number of subjects
<ul style="list-style-type: none">• Operation of the Opening Mechanism	5.7.2	—10 minimum, female with reduced dexterity simulated by chilled or gloved hands (see 2.3)
Comprehensibility	5.8	— 6 adults
Tether Attachment	5.9	— 5 adults minimum

[Amdt ETSO/1]

[Amdt ETSO/16]