AEROSPACE STANDARD

AS6254™	REV. A
Issued 2012-02 Revised 2015-12 Superseding AS6254	

Minimum Performance Standard for Low Frequency Underwater Locating Devices (Acoustic) (Self-Powered)

RATIONALE

Technology exists to increase the minimum Low Frequency Underwater Locating Devices (ULD) operating life without changes to the form, fit or general function of an installed ULD. For aircraft search and recovery in extremely remote areas, a Low Frequency ULD operating for 30 days may not be sufficient. This revision includes an increase of the minimum operating life in 4.7 from 30 to 90 days along with an added reference to the recently published ARINC Standard 677 regarding the installation of the ULD on aircraft.

1. SCOPE

This SAE Aerospace Standard (AS) covers ULDs utilized in finding submerged aircraft. Such ULDs are installed within the aircraft in a manner that they are unlikely to become separated during crash conditions. The low frequency ULD should be attached to the airframe in accordance with the manufacturer's recommendations in order to maximize the underwater detection range. ARINC Standard 677 also provides installation guidance for Low Frequency ULDs.

1.1 Purpose

This Aerospace Standard specifies minimum performance standards for low frequency acoustic ULDs which are primarily intended for use with both fixed and rotary wing civil aircraft.

2. REFERENCES

2.1 Applicable Documents

The following publications form a part of this document to the extent specified herein. The latest issue of SAE publications shall apply. The applicable issue of other publications shall be the issue in effect on the date of the purchase order. In the event of conflict between the text of this document and references cited herein, the text of this document takes precedence. Nothing in this document, however, supersedes applicable laws and regulations unless a specific exemption has been obtained.

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http://www.sae.org/technical/standards/AS6254A

2.1.1 SAE Publications

Available from SAE International, 400 Commonwealth Drive, Warrendale, PA 15096-0001, Tel: 877-606-7323 (inside USA and Canada) or +1 724-776-4970 (outside USA), www.sae.org.

AS8045 Minimum Performance Standard for Underwater Locating Devices (Acoustic) (Self-Powered)

2.1.2 ASTM Publications

Available from ASTM International, 100 Barr Harbor Drive, P.O. Box C700, West Conshohocken, PA 19428-2959, Tel: 610-832-9585, www.astm.org.

ASTM D1141-98 Standard Practice for the Preparation of Substitute Ocean Water

2.1.3 RTCA Publications

Available from Radio Technical Commission for Aeronautics Inc., 1150 18th Street, NW, Suite 910, Washington, DC 20036, Tel: 202-833-9339, www.rtca.org.

RTCA/DO-160G Environmental Conditions and Test Procedures for Airborne Equipment

2.1.4 ARINC Publications

Available from ARINC Industry Activities, 16701 Melford Blvd., Suite 120, Bowie, MD 20715, Tel: 240-334-2578, www.aviation-ia.com.

ARINC 677 Installation Standards for Low Frequency Underwater Locator Beacon (LF-ULB)

2.2 Definitions

The word “shall” is used to express an essential requirement where compliance is mandatory.

3. GENERAL STANDARDS

3.1 Material

Material shall be of a quality which experience or tests, or both, have demonstrated to be suitable and dependable for use in aircraft. The correct functioning of the ULD shall not be impaired by any change of material properties arising from the tests defined in Sections 5 and 6.

3.2 Workmanship

Workmanship shall be consistent with high grade aircraft instrument manufacturing practice.

3.3 Compatibility

If components are individually acceptable but require matching for proper operation, they shall be identified in a manner that shall ensure performance to the requirements of this AS.

3.4 Interchangeability

Components or systems which are identified with the same manufacturer’s part or model number shall be physically and functionally interchangeable.

3.5 Flammability and Fire Test

The exposed surfaces of the ULD and mounting shall be non-flammable. The ULD shall be incapable of sustaining or initiating a fire or rupturing, or both, with or without fragmentation, due to a dead short of the power source.

3.6 Power Source

Means shall be provided to enable the ULD power source to be checked for voltage and longevity in its installed position. Such checks shall be defined in the ULD manufacturer's instruction manual.

3.7 Identification

The following information shall be legible and, with the exception of battery replacement date, be indelibly marked on the ULD or on the nameplate attached. Markings on the ULD are to be as large as is practical.

a. Name of instrument.

b. Manufacturer's part number.

c. Manufacturer's serial number.

d. Federal Aviation Administration (FAA) Technical Standard Order (TSO) number, if applicable (or SAE AS number/revision or equivalent approval identification).

e. Manufacturer's name or trademark.

f. Battery replacement information.

4. MINIMUM PERFORMANCE STANDARDS

The manufacturer shall conduct sufficient tests to prove compliance with this Aerospace Standard.

4.1 Actuation

The Low Frequency ULD shall activate automatically when submerged in either fresh or salt water, at a depth no greater than 9 m (29.5 feet) within 4 hours after immersion. The ULD shall remain activated to a depth of at least 6,096 m (20,000 feet).

NOTE: If the ULD is subjected to negligent or accidental contamination with water, either immersed or sprayed, (that is, other than in its operational mode) it shall, on drying out, revert to its original dormant state. If the ULD is intentionally or unintentionally exposed to activation pressure (for example during aircraft pressurization testing), it shall revert to its original dormant state when the pressure is reduced below the activation threshold.

4.2 Operating Temperature

-2 °C (28 °F) to +38 °C (100 °F).

4.3 Radiation Pattern

80% of a spherical pattern (4.8.1 and 4.8.2 apply).

4.4 Operating Frequency

8.8 kHz ± 1 kHz.

4.5 Pulse Length

10.0 ms MINIMUM.

4.6 Repetition Rate

0.1 pulse/s MINIMUM.

4.7 Operating Life

90 days.

4.8 Acoustic Outputs on Activation

4.8.1 Initial Operation

A minimum of 100 N/m^2 (1,000 dyne/cm^2) rms (during the pulse) pressure normalized to 1 m range, that is, at a level of 160 dB versus 1 µPa at 1 m.

4.8.2 Immediately After 90 Days Continuous Operation

A minimum of 70.8 N/m^2 (708 dyne/cm^2) rms (during the pulse) pressure normalized at 1 m range, that is, at a level of 157 dB versus 1 µPa at 1 m.

5. TEST PROCEDURES (ENVIRONMENTAL)

Sequence may be in any order. Instrument with ULD in its inoperative mode at the commencement of each test clause and no ULD activation by test personnel during environmental tests. Operational or functional tests as required shall be conducted before and after each clause to verify the operational condition of the ULD under test.

5.1 Condensation

With the ULD in the most critical position, cold soak at -9 °C ± 3 °C (+16 °F ± 5 °F) for 6 hours and then immediately place in a chamber maintained at +35 °C ± 3 °C (+95 °F ± 5 °F) at a relative humidity of 95% ± 5% for 18 hours. Repeat this environmental cycle for a total of 15 times.

During this test there shall be no activation of the ULD transmitter or corrosion of vital parts.

5.2 Temperature Storage (Temperature)

The ULD shall be subjected to the Ground Survival Low and High Temperature test requirements specified in RTCA/DO-160G, Section 4.5, Category D2.

During this test there shall be no activation of the ULD transmitter.

5.3 Temperature Variation

The ULD shall be subjected to the test requirements specified in RTCA/DO-160G, Section 5, Category A using -55 °C (-67 °F) and +70 °C (+158 °F) for low and high operating temperatures, respectively.

During this test there shall be no activation of the ULD transmitter.

5.4 Vibration

The ULD shall be subjected to the test requirements specified in RTCA/DO-160G, Section 8 using Figure 8-4, Curve C1 (fixed wing) and Table 8-2b, Curve G (rotary wing).

During this test there shall be no activation of the ULD transmitter.

5.5 Altitude, Decompression and Overpressure

5.5.1 Altitude

The ULD shall be subjected to the test requirements specified in RTCA/DO-160G, Section 4.6.1, Category D2.

During this test there shall be no activation of the ULD transmitter.

5.5.2 Decompression

The ULD shall be subjected to the test requirements specified in RTCA/DO-160G, Section 4.6.2 except that the reduction in pressure shall take place within 2 seconds to a pressure equivalent to 13,746.5 m (45,100 feet) altitude.

During this test there shall be no activation of the ULD transmitter.

5.5.3 Overpressure

ULDs that utilize a pressure activation mechanism shall be subjected to the test requirements specified in RTCA/DO-160G, Section 4.6.3, except that the overpressure shall be 200 kPa.

Automatic activation of the ULD is acceptable during this test provided that it reverts to its original dormant state when the pressure is reduced below the activation threshold.

5.6 Fluid Immersion (Fluids Susceptibility)

The ULD shall be subjected to the immersion test requirements specified in RTCA/DO-160G, Section 11, Category F using fluids most likely to cause the ULD to become inoperative.

After drying out, the ULD shall not have deteriorated such that it would not satisfy the requirements of Section 4.

Alternatively, an analysis may be used to demonstrate the ULD's resistance to such fluids.

5.7 Induced Signal Susceptibility

The ULD shall be subjected to the relevant test requirements as specified in RTCA/DO-160G, Section 19, Category ZC.

During this test there shall be no activation of the ULD transmitter.

5.8 Magnetic Effect

The ULD shall be subjected to the test requirements specified in RTCA/DO-160G, Section 15 and shall meet the Category Z requirement.

5.9 Sand and Dust

The ULD shall be subjected to the test requirements specified in RTCA/DO-160G, Section 12, Category S.

During this test there shall be no activation of the ULD transmitter and there shall be no sand/dust lodged in vital parts such that the ULD would not satisfy the requirements of Section 4.

5.10 Salt Spray (Salt Fog)

The ULD shall be subjected to the test requirements specified in RTCA/DO-160G, Section 14, Category S (fixed wing) and Category T (rotary wing).

During this test there shall be no activation of the ULD transmitter and there shall be no corrosion of vital parts such that the ULD would not satisfy the requirements of Section 4.

5.11 Fungus Resistance

The ULD shall be subjected to test requirements as specified in RTCA/DO-160G, Section 13, Category F.

During this test there shall be no activation of the ULD transmitter and there shall be no fungus growth developed in vital parts such that the ULD would not satisfy the requirements of Section 4.

5.12 Performance Verification (Environmental)

On completion of all tests included in 5.1 through 5.11, the ULD shall meet all the requirements of Section 4.

5.13 Salt Water Immersion

This test is performed once only. (Note this is a passive test and does not require continuous monitoring.) The ULD shall be submerged and operating in a standard seawater solution (ASTM D1141-98 or equivalent), at a pressure appropriate for continuous activation, for a period of 90 days. The test tank shall be non-metallic and throughout the test the water shall be maintained between +10 °C (+50 °F) and +21 °C (+70 °F). At the end of 90 days, the ULD shall be operating as specified in Section 4 and there shall be no signs of seepage or leakage into the ULD.

6. TEST PROCEDURES (CRASH SURVIVABILITY)

The ULD shall be subjected to crash survivability testing, performed in the order shown below, without making any repairs or modifications between tests. Operational or functional tests as required shall be conducted before and after each clause to verify the operational condition of the ULD under test.

6.1 Impact Shock

The ULD shall be assembled to a suitable fixture using its recommended mounting arrangement. The assembly shall then be subjected to:

a. A half sine-wave impact shock of at least 5 ms duration and a peak acceleration of 1,000 g applied to each of the three orthogonal axes.

OR

b. A half sine-wave impact shock of at least 6.5 ms duration and a peak acceleration of 1,700 g applied to the axis most vulnerable to damage.

6.2 Impact

When assembled in its recommended mounting arrangement, the ULD shall be placed on an unyielding surface. An impactor, consisting of a steel penetrator (Figure 1) with a rigidly attached mass is required. The penetrator shall have a maximum dimension across the surface of the protrusion of 0.64 cm (0.25 inch) by 2.5 cm (1.0 inch). This protruding surface shall impact the ULD. The total mass of the impactor shall be 25 kg (55 pounds). The impactor shall be dropped on the ULD from a height of 15 cm (6.0 inches) above the surface of the ULD such that at least half of the penetrator impacts within a 2.5 cm (1.0 inch) radius of the most vulnerable point of the ULD.