CS-ETSO AMENDMENT 8 - CHANGE INFORMATION

The Agency publishes amendments to Certification Specifications-European Technical Standard Orders (CS-ETSO) as consolidated text for each constituent European Technical Standard Order (ETSO) individually.

Consequently, except for the revision indication letter and revised issue date in the header of the ETSO, the consolidated text of each individual ETSO does not allow readers to see the detailed changes introduced by the amendment. To allow readers to see these detailed changes this document has been created. The same format as for publication of Notices of Proposed Amendments has been used to show the changes:

1. deleted text is shown with a strike through: ~~deleted~~
2. new or changed text is highlighted with grey shading: new
3. ... indicates that remaining text is unchanged in front of or following the reflected amendment.

SUBPART A – GENERAL

1. APPLICABILITY

1.1 Requirements for the issue of European Technical Standard Order (ETSO) aAuthorisations are found in Part-21, Section A, Subpart O.

1.2. Marking requirements for the issue of European Technical Standard Order aAuthorisations are found in Part-21, Section A, Subpart Q.

2. ENVIRONMENTAL AND SOFTWARE STANDARDS TO MEET TECHNICAL CONDITIONS

2.1 Environmental standards

Unless otherwise stated in the paragraph 3.1.2 of the specific ETSO, the applicable environmental standards are contained in EUROCAE/RTCA document ED-14D change 3/DO-160D 'Environmental Conditions and Test Procedures for Airborne Equipment', change 3 dated December 2002, or ED-14E/DO-160E dated March 2005 or ED-14F/DO-160F dated March 2008 or ED-14G/RTCA-160G dated December 2010.

It is not permissible to mix versions within a given qualification programme.

2.2 Software standards

~~If~~ When the equipment ~~design implementation~~ includes airborne software ~~a digital computer, the computer software must be verified and validated in an acceptable manner.~~
Unless otherwise stated ~~otherwise~~ in paragraph 3.1.3 of the specific ETSO, one acceptable means of compliance for the ~~verification and validation of the computer~~ development of the airborne software is outlined in the latest revision of AMC 20-115 ~~EUROCAE/RTCA document ED-12B/DO-178B, „S~~ on software considerations in Airborne Systems and Equipment Certification~~", dated December 1992~~.

Software level also called Item Development Assurance Level (IDAL) may be determined by using the guidance proposed in section 2.4. The applicant must declare the software level(s) to which the software has been developed and verified.

~~For those applicants who elect to use EUROCAE/RTCA document ED-12B/DO-178B to demonstrate compliance for the verification and validation of the computer software, the following requirements must be met:~~

~~(i) This document defines five levels of software:~~
~~Level A, Level B, Level C, Level D, and Level E. The applicant must declare the level (or levels) to which the computer software has been verified and validated.~~

~~(ii) If the equipment incorporates more than one software level, appropriate partitioning of different software level is required.~~

2.3 Airborne ~~E~~electronic hardware (AEH)

If the article contains a complex Application-Specific Integrated Circuit (ASIC) or complex programmable logic (e.g. Programmable Array Logic components (PAL), Field-Programmable Gate Array components (FPGA), General Array Logic components (GAL), or Erasable Programmable Logic Devices) summarised as ~~C~~complex electronic hardware

to accomplish the function, develop the component according to EUROCAE/RTCA document ED-80/DO-254 'Design Assurance Guidance for Airborne Electronic Hardware', dated April 2000.

Supplemental guidance material for all other Airborne Electronic hardware (including boards, SEH, use of COTS devices) included in the ETSO article may be found in 'EASA CM-SWCEH-001 Development Assurance of Airborne Electronic Hardware' Issue 01 revision 01, dated March 2012.

Design Assurance Level also called Item Development Assurance Level (IDAL) for Airborne Electronic Hardware (AEH) may be determined by using the guidance proposed in section 2.4. The applicant must declare the Design Assurance level(s) to which the AEH has been developed and verified.

~~All complex hardware included in the article definition must be developed in accordance with EUROCAE/RTCA document ED-80/DO-254.~~

2.4 Failure conditions classification and development assurance

During the development of equipment, consideration should be given to failure conditions, the equipment should then be developed in accordance with their possible effects at system and aircraft level (see AMC CSxx.1309 for further guidance).

Where the effects at system or aircraft level are not known, due to non-availability of aircraft or system design data, assumed failure classifications may be used but at a minimum to the level required in the ETSO.

Classification of failure conditions at equipment level may change as a result of particular aircraft installation architecture and characteristics.
EUROCAE/SAE document ED-79A/ARP 4754A 'Guidelines for development of civil Aircraft and Systems' dated December 2010 may be used to assign the Development Assurance Level of the equipment, software and AEH. The document may be used as well as guidance to ensure a proper development, validation and verification of the ETSO and the functional equipment requirements.

The equipment shall be developed according to, at least, the development assurance level appropriate to the failure condition classifications.

~~Develop the system to, at least, the design assurance level equal to the failure condition classifications provided in the ETSO. Development to a lower Design Assurance Level may be justified for certain cases and accepted during the ETSO process but will lead to installation restrictions.~~

~~When applicable, any failure condition should be classified according to the severity of its effect. For further guidance see AMC 25.1309.~~

~~To~~ For system development ~~system design~~ assurance, including guidance for failure condition classifications, the applicant may use EUROCAE/SAE document ED-79A/ARP 4754A '~~Certification Considerations~~ Guidelines for development of ~~Highly Integrated or Complex~~ civil Aircraft and Systems' dated ~~November 1996~~ December 2010.

3. ADDITIONAL INFORMATION

3.1 In some ETSO's, reference is made to an associated FAA standard. In these cases the corresponding FAA technical standard order (TSO) can be consulted on http://rgl.faa.gov/Regulatory_and_Guidance_Library/rgTSO.nsf/Frameset?OpenPage.

3.2 The following addresses are provided below:

— EUROCAE documents may be purchased from:
European Organisation for Civil Aviation Equipment
102 rue Etienne Dolet, 92240 Malakoff, France
Telephone: +33 1 40 92 79 30; Fax +33 1 46 55 62 65;
(E-mail: eurocae@eurocae.net, website: www.eurocae.net)

— RTCA documents may be purchased from:
Radio Technical Commission for Aeronautics, Inc.
1828 L Street NW, Suite 805, Washington DC 20036, USA
(Website: www.rtca.org)

— SAE documents may be purchased from:
Society of Automotive Engineers, Inc.
400 Commonwealth Drive, WARRENDALE, PA 15096-001, USA
(Website: www.sae.org)

— NAS specifications may be obtained from:
Aerospace Industries Association (AIA)
1327 Jones Drive, Ann Arbor, MI 48105, USA
(Website: www.techstreet.com)

— FAA Standards may be purchased from:
Superintendent of Documents, Government Printing Office
732N Capitol Street NW, Washington DC 20401, USA
(Website: www.gpoaccess.gov)

— MIL Specifications may be obtained from:
DODSSP, Standardization Documents Order Desk
Building 4D, 700 Robbins Avenue, PHILADELPHIA, PA 19111-5094, USA
(Website: http://dodssp.daps.mil/)

— ASTM documents may be purchased from:
American Society for Testing and Materials, ASTM International,
100 Barr Harbor Drive, PO Box C700, West Conshohocken, Pennsylvania 19428-2959, USA
(Website: www.astm.org)

New, revised or deleted ETSOs

Index 1

~~ETSO-C9c~~	~~Automatic Pilot~~
ETS0-C44c A1	Fuel Flowmeters
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~~ETSO-C52b~~	~~Flight Directors~~
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~~ETSO-C60b~~	~~Airborne Area Navigation Equipment Using Loran C Inputs~~
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ETSO-C115~~b~~c	Flight Management Systems (FMS) using Multi-Sensor Inputs
ETSO-C121~~a~~b	Underwater Locating Device
ETSO-C155a	Recorder Independent Power Supply
ETSO-C160a	VDL Mode 2 Communications equipment
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ETS0-C166b A1	Extended Squitter ADS-B and TIS-B Equipment Operating on the RF of 1090 Megahertz (MHz)
ETS0-C174 A1	Battery-Based Emergency Power Unit (BEPU)
ETSO-C178	Single Phase 115 VAC, 400 Hz Arc Fault Circuit Breakers
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~~ETSO-2C87~~	~~Airborne Low-range Radio Altimeter~~
~~ETSO-2C91a~~	~~Emergency Locator Transmitter (ELT) Equipment~~

ETSO-C44c A1
Date: xx.xx.2013

European Aviation Safety Agency

European Technical Standard Order (ETSO)

Subject: FUEL FLOWMETERS

1 — Applicability

This ETSO gives the requirements which fuel flowmeters that are 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
Applicable procedures are detailed in CS-ETSO, Subpart A.

2.2 — Specific
None.

3 — Technical ~~C~~conditions

3.1 — Basic
3.1.1 — Minimum ~~P~~performance ~~S~~standard
Standards set forth in **Appendix 1.**

3.1.2 — Environmental ~~S~~standard
The Fuel Flowmeter must be tested in accordance with SAE AS407C '*Fuel Flowmeters'* from July 1, 2001, unless otherwise specified by Appendix 1 to~~f~~ this ETSO, SAE AS1055D '*Fire Testing of Flexible Hose, Tube Assemblies, Coils, Fittings, and Similar System Components'* (sections 4 and 5) from June 1997, and ~~EUROCAE ED-14E (RTCA DO-160E) '*Environmental Conditions and Test Procedures for Airborne Equipment'* from March 2005~~ the applicable environmental test procedure as specified by paragraph 2.1 of CS-ETSO, Subpart A, unless otherwise specified by A~~a~~ppendix 1 to~~f~~ this ETSO.

3.1.3 — ~~Computer~~ S~~s~~oftware
If the equipment design includes a digital computer, ~~the software must be developed in accordance with EUROCAE ED-12B (RTCA DO-178B) '*Software Considerations in Airborne Systems and Equipment Certification*' from 1992.~~ see CS-ETSO, Subpart A, paragraph 2.2, for software development.

3.1.4 — Airborne Electronic hardware ~~qualification~~
See CS-ETSO, Subpart A, paragraph 2.3.

3.2 — Specific
~~None.~~

3.2.1 Failure condition classification

See CS-ETSO, Subpart A, paragraph 2.4.

4 — Marking

4.1 — General

Marking is detailed in CS-ETSO, Subpart A, paragraph 1.2.

4.2 — Specific

None.

5 — Availability of ~~R~~referenced ~~D~~document

See CS-ETSO, Subpart A, paragraph 3.

APPENDIX 1

MINIMUM PERFORMANCE STANDARD FOR FUEL FLOWMETERS

1. General requirements

The applicable standard is SAE AS407C, *Fuel Flowmeters*, dated July 1, 2001.

Paragraphs 3.1, 3.1.1, 3.1.2, 3.2.b, and 4.2.1 of the SAE AS407C do not apply to this ETSO.

SAE AS407C must be applied as follows (changed text shown framed):

a. Temperature On page 2 of SAE AS407C, replace Table 1 with the following table.

TABLE 1		
INSTRUMENT LOCATION	A	B
Heated Areas (Temp. Controlled)	–30 to 50 ºC	–65 to 70 ºC
Unheated Areas (Temp. Controlled)	–55 to 70 ºC	–65 to 100 ºC
Power Plant Compartment	–55 to 70 ºC	–65 to 100 ºC
Power Plant Accessory Compartment	–55 to 70 ºC	–65 to 100 ºC

b. Altitude In the first sentence of paragraph 3.3.4, Altitude, (page 3), replace '40.000 feet (12.192 m) standard altitude' with '51.000 ft (15.545 m) standard altitude'.

c. Leak test In the second sentence of paragraph 6.3, Leak Test, (page 6), replace 'to an air pressure of 40 psi (275.8 kPa)' with 'to an air pressure in accordance with the manufacturer's recommendations'.

2. Testing your fuel flowmeter

In addition to the qualification test requirements described in SAE AS407C, perform the following tests:

a. Thermal shock test This test applies to any hermetically sealed components. Subject the components to four cycles of exposure to water 85 °C ± 2 °C and 5 °C ± 2 °C. There should be no evidence of moisture damage to coating or enclosure. During each cycle of the test, immerse the component in water at 85 °C ± 2 °C for 30 minutes. Within 5 seconds of removal from the bath, immerse the component for 30 minutes in the other bath maintained at 5 °C ± 2 °C. Repeat this cycle continuously, one cycle following the other until four cycles are completed. After this test, subject the component to the sealing test in paragraph 2b(2) of this appendix. The component must have no leakage resulting from the test.

b. Sealing test Apply this performance test to any hermetically sealed components. Immerse the component in a suitable liquid such as water. Then reduce the absolute pressure of the air above the liquid to about 1 inch of mercury (Hg) (3.4 kPa). Maintain this absolute pressure for 1 minute, or until the

liquid stops giving off air bubbles, whichever is longer. Increase the absolute pressure by 2½ inches Hg (8.5 kPa). If any bubbles come from the component case, consider it leakage and reject the component.

Do not consider bubbles, resulting from entrapped air in the exterior parts of the case, as leakage. If other test methods provide evidence equal to the immersion test, they can be used to test the integrity of the instrument's seals. If the component includes non-hermetically sealed appurtenances such as a case extension, these appurtenances can be removed before the sealing test.

c. Other tests The following table lists where other tests and conditions can be found:

For:	Use the test conditions in:
Fire-resistant or fireproof test	SAE AS 1055, Rev. D, dated June 1997, Sections 4 and 5
	The following sections of the environmental standards mentioned in paragraph 3.1.2 above.
Explosion proofness test	~~EUROCAE ED-14E /RTCA/DO-160E~~ Section 9
Power input test	~~EUROCAE ED-14E /RTCA/DO-160E~~ Section 16
Voltage spike test	~~EUROCAE ED-14E /RTCA/DO-160E~~ Section 17
Audio frequency conducted susceptibility test	~~EUROCAE ED-14E /RTCA/DO-160E~~ Section 18
Induced signal susceptibility test	~~EUROCAE ED-14E /RTCA/DO-160E~~ Section 19
Radio frequency susceptibility test	~~EUROCAE ED-14E /RTCA/DO-160E~~ Section 20

ETSO-C45b A1
Date: xx.xx.2013

European Aviation Safety Agency

European Technical Standard Order (ETSO)

Subject: MANIFOLD PRESSURE INSTRUMENTS

1 — Applicability

This ETSO gives the requirements which manifold pressure instruments that are 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
Applicable procedures are detailed in CS-ETSO, Subpart A.

2.2 — Specific
None.

3 — Technical ~~C~~conditions
3.1 — Basic
3.1.1 — Minimum ~~P~~performance ~~S~~standard
Standard set forth in the SAE Aerospace Standard (AS) document: SAE AS 8042 from December 1, 1985, unless otherwise specified by Appendix 1 to~~f~~ this ETSO.

3.1.2 — Environmental ~~S~~standard
The Manifold Pressure Instruments must be tested according to Section 7 of SAE AS 8042 and ~~EUROCAE ED-14E (RTCA DO-160E) '*Environmental Conditions and Test Procedures for Airborne Equipment*' from March 2005.~~the environmental test procedures as defined in CS-ETSO, Subpart A, paragraph 2.1.

3.1.3 — ~~Computer~~ S~~s~~oftware
If the Manifold Pressure Instruments includes a digital computer, ~~the software must be developed according to EUROCAE ED-12B (RTCA DO-178B), '*Software Considerations in Airborne Systems and Equipment Certification*', dated December 1992.~~see CS-ETSO, Subpart A, paragraph 2.2, for software development.

3.1.4 — Airborne electronic hardware
See CS-ETSO, Subpart A, paragraph 2.3.

3.2 — Specific
~~None.~~

3.2.1 Failure condition classification
See CS-ETSO, Subpart A, paragraph 2.4.
Failure of the function defined in paragraph 3.1.1 of this ETSO has been determined to be a major failure condition. The applicant must develop the

system to at least the design assurance level commensurate with this failure condition.

4 — Marking
4.1 — General
Marking is detailed in CS-ETSO, Subpart A, paragraph 1.2.

4.2 — Specific
None.

5 — Availability of ~~R~~referenced ~~D~~document
See CS-ETSO, Subpart A, paragraph 3.

ETSO-C45b A1
APPENDIX 1
Date: xx.xx.2013

APPENDIX 1

**MINIMUM PERFORMANCE STANDARD
FOR MANIFOLD PRESSURE INSTRUMENTS**

This appendix lists EASA modifications to the MPS for Manifold Pressure Instruments.

The applicable standard is SAE AS 8042, Manifold Pressure Instruments, dated December 1, 1985.

1. Manifold Pressure Instruments are not required to meet the requirements in SAE AS 8042, paragraphs 3.1, 3.2, and 3.3.

2. Replacement of SAE AS 8042, paragraph 3.24.2 (Fire Hazards), by:

'Except for small parts (such as fasteners, grommets, knobs, seals, and small electrical parts) that would not contribute significantly to the propagation of a fire, all material used must be self-extinguishing when tested in accordance with the requirements of CS 25.869(a)(4) and the applicable portions of Part I, Appendix F.'

ETSO-C47a A1
Date: xx.xx./2013

European Aviation Safety Agency

European Technical Standard Order (ETSO)

Subject: PRESSURE INSTRUMENTS — FUEL, OIL, AND HYDRAULIC

1 — Applicability

This ETSO gives the requirements which fuel, oil, and hydraulic pressure instruments that are 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

Applicable procedures are detailed in CS-ETSO, Subpart A.

2.2 — Specific

None.

3 — Technical ~~C~~conditions

3.1 — Basic

3.1.1 — Minimum ~~P~~performance ~~S~~standard

Standards set forth in the SAE Aerospace Standard (AS) document: SAE AS 408C *'Pressure Instruments — Fuel, Oil, and Hydraulic'* from July 1, 2001, unless otherwise specified by Appendix 1 to~~f~~ this ETSO.

3.1.2 — Environmental ~~S~~standard

Testing fuel, oil, and hydraulic pressure instruments must be in accordance with SAE AS408C section 7 and ~~EUROCAE ED-14E (RTCA DO-160E) '*Environmental Conditions and Test Procedures for Airborne Equipment*' from March 2005.~~see CS-ETSO, Subpart A, paragraph 2.1, for environmental test procedures.

3.1.3 — ~~Computer~~ S~~s~~oftware

If fuel, oil, and hydraulic pressure instrument includes a digital computer, ~~the software must be developed according to EUROCAE ED-12B (RTCA DO-178B) '*Software Considerations in Airborne Systems and Equipment Certification'* from 1992~~ see CS-ETSO, Subpart A, paragraph 2.2, for software development.

3.1.4 Airborne ~~E~~electronic ~~H~~hardware ~~Qualification~~

~~If the fuel, oil, and hydraulic pressure instrument includes a complex custom micro-coded component, this must be developed according to EUROCAE ED-80 (RTCA DO-254), '*Design Assurance Guidance for Airborne Electronic Hardware'* from April 2000~~. See CS-ETSO, Subpart A, paragraph 2.4.

3.2 — Specific

~~None.~~

3.2.1 — Failure condition classification

See CS-ETSO, Subpart A, paragraph 2.4.

Failure of the function defined in paragraph 3.1.1 of this ETSO has been determined to be a major failure condition. The applicant must develop the system to at least the design assurance level commensurate with this failure condition.

4 — Marking
4.1 — General
Marking is detailed in CS-ETSO, Subpart A, paragraph 1.2~~;~~.

4.2 — Specific
a) At least one major component of the fuel, oil, and hydraulic pressure instrument shall be marked permanently and legibly with all the information as provided for in SAE AS408C, Section 3.2 (except paragraph 3.2.b).

b) Mark 'Fire-resistant' or 'Fireproof' information legibly and permanently.

5 — Availability of r~~R~~eferenced d~~D~~ocument
See CS-ETSO, Subpart A, paragraph 3.

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APPENDIX 1
Date: xx.xx.2013

APPENDIX 1.

**MINIMUM PERFORMANCE STANDARDS (MPSs)
FOR PRESSURE INSTRUMENTS — FUEL, OIL, AND HYDRAULIC**

1. The MPSs applying to this ETSO are provided in SAE AS408C, Pressure Instruments — Fuel, Oil, and Hydraulic, dated July 1, 2001, except for paragraphs 3.1, 3.1.1, 3.1.2, and 3.2.b.

Here are provided the modifications to be applied to the referenced SAE document:

AS408C	***modification:***
Title	Replace 'Pressure Instruments — Fuel, Oil, and Hydraulic (Reciprocating Engine Powered Aircraft)' Substitute: 'Pressure Instruments — Fuel, Oil, and Hydraulic'.
Section 1.1	Replace '… primarily for use with reciprocating engine powered transport aircraft, …' Substitute: '… for use with civil aircraft, ...'
AS408C section 7	***modification:***
Para 7.13	Use test conditions in SAE AS1055 Rev D, '*Fire Testing of Flexible Hose, Tube Assemblies, Coils, Fittings, and Similar System Components'*, dated June 1, 1997, Sections 4 and 5. The following test conditions from the environmental standards mentioned in paragraph 3.1.2 above are added.
Para 7.14	~~Add test conditions in EUROCAE ED-14E / RTCA DO-160E~~, Section 16, Power Input.
Para 7.15	~~Add test conditions in EUROCAE ED-14E / RTCA DO-160E~~ Section 17, Voltage Spike.
Para 7.16	~~Add test conditions in EUROCAE ED-14E / RTCA DO-160E~~ Section 18, Audio Frequency Conducted Susceptibility — Power Inputs.
Para 7.17	~~Add test conditions in EUROCAE ED-14E / RTCA DO-160E~~ Section 19, Induced Signal Susceptibility
Para 7.18	~~Add test conditions in EUROCAE ED-14E / RTCA DO-160E~~ Section 20, Radio Frequency Susceptibility.

2. The performance of fuel, oil, and hydraulic pressure instruments can be enhanced or made superior to this specification, depending on intended application and configuration.

ETSO-C56b A1
Date: xx.xx.2013

European Aviation Safety Agency

European Technical Standard Order (ETSO)

Subject: ENGINE-DRIVEN DIRECT CURRENT GENERATORS/STARTER GENERATORS

1 — Applicability

This ETSO gives the requirements which eEngine-dDriven dDirect cDurrent generators/starter generators that are 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
Applicable procedures are detailed in CS-ETSO, Subpart A.

2.2 — Specific
None.

3 — Technical cConditions
3.1 — Basic
3.1.1 — Minimum pPerformance sStandard
Standards set forth in the SAE Aerospace Standard (AS) document: AS8020, *'Engine-Driven D.C. Generators/Starter Generators and Associated Voltage Regulators'*, dated January 1980 (and reaffirmed by SAE in August 1991).
3.1.2 — Environmental sStandard
~~EUROCAE ED-14E (RTCA DO160E) 'Environmental Conditions and Test Procedures for Airborne Equipment' from March 2005.~~
See CS-ETSO, Subpart A, paragraph 2.1.

3.1.3 — ~~Computer~~ Ssoftware
If the Engine-Driven Direct Current Generator/Starter Generator and the associated voltage regulators include a digital computer, ~~the software must be developed according to EUROCAE ED-12B (RTCA DO-178B) '*Software Considerations in Airborne Systems and Equipment Certification*' from 1992~~ see CS-ETSO, Subpart A, paragraph 2.2, for software development.

3.1.4 — Airborne ~~E~~electronic ~~H~~hardware ~~Qualification~~
See CS-ETSO, Subpart A, paragraph 2.3.
3.2 — Specific
None.

4 — Marking

4.1 — General

Marking is detailed in CS-ETSO, Subpart A, paragraph 1.2.

4.2 — Specific
In addition to the information specified in §4.1, the following information is required:
(1) Means of indicating if the article is a D.C. generator or a D.C. starter generator;
(2) Nominal power output (electrical voltage and watts);
(3) Mechanical power input requirements (pad requirements).

5 — Availability of rReferenced dDocument
See CS-ETSO, Subpart A, paragraph 3.

ETSO-~~2~~C87a
Date: xx.xx.2013

~~**Date : 24.10.03**~~

European Aviation Safety Agency

European Technical Standard Order (ETSO)

Subject: AIRBORNE LOW-RANGE RADIO ALTIMETER

1 — Applicability
This ETSO gives the requirements which Airborne Low-range Radio Altimeter that are 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
Applicable procedures are detailed in CS-ETSO, Subpart A.
2.2 — Specific
None.

3 — Technical c~~C~~onditions
3.1 — Basic
3.1.1 — Minimum p~~P~~erformance s~~S~~tandard
Standards set forth in the EUROCAE ED-30, Minimum Performance Standards for Airborne Low-Range Radar Altimeter Equipment, dated March 1980 as modified by Appendix 1 to this ETSO.

~~In addition to Chapter 5 of EUROCAE document ED-30, all materials used except small parts (such as knobs, fasteners, seals, grommets and small electrical parts) that would not contribute significantly to the propagation of a fire, must be self-extinguishing when tested in accordance with applicable requirements of CS 25 Appendix F.~~
The applicable Chapter 2 and Chapter 3 requirements are defined in Table 1 for the appropriate functional class.

Table 1

Low-Range Radio Altimeter Functional Class	**Low-Range Radio Altimeter Class Description**	**Applicable requirements in ED-30**
A	Approach and landing	2.1-2.8, ~~3.1,~~ 3.1.1, 3.2.1 (all), ~~3.2.1.1, 3.2.1.2,~~

		~~3.2.1.3, 3.2.1.4~~, 3.3.1
B	Terrain Avoidance (ground proximity warning systems)	2.1-2.8~~, 3.1,~~ 3.1.2, 3.2.3 (all), ~~3.2.3.1, 3.2.3.2, 3.2.3.3, 3.2.3.4~~, 3.3.2

Note: It is possible for a radio altimeter to meet both functional classes.

3.1.2 — Environmental s~~S~~tandard

See CS-ETSO, Subpart A, paragraph 2.1.

3.1.3 —~~Computer~~ S~~s~~oftware

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

~~None.~~

3.2.1 Failure condition classification

There is no standard minimum failure condition classification for this TSO. The failure condition classification appropriate for the equipment will depend on the intended use of the equipment in a specific aircraft.

4 — Marking

4.1 — General

Marking as detailed in CS-ETSO, Subpart A, paragraph 1.2.

4.2 — Specific

None.

5 — Availability of r~~R~~eferenced d~~D~~ocument

See CS-ETSO, Subpart A, paragraph 3.

APPENDIX 1
MODIFICATIONS AND ADDITIONS TO EUROCAE ED-30
FOR MINIMUM PERFORMANCE STANDARDS FOR LOW-RANGE RADIO ALTIMETERS

1.0. ED-30 REQUIREMENT MODIFICATIONS

1.1. ED-30 Paragraph 1.3 (Radio Altimeters with Auto-Surveillance). ETSO-C87a does not include a separate category for monitoring. Design the radio altimeter to support the failure condition classification of the intended installation.

1.2. ED-30 Paragraph 2.2 (Transmitter Operating Frequency). Add the following requirement to ED-30, paragraph 2.2: The radio altimeter shall meet the International Telecommunication Union (ITU) regulations, if applicable.

1.3. ED-30 Paragraph 2.5 (Failure Warning). Add the following sentence to the beginning of ED-30, paragraph 2.5, to clarify that a failure detection system is required: 'A failure detection system must be incorporated in the equipment to indicate to the pilot, and to any systems utilizing the radio altimeter data, of a failure of the radio altimeter to accomplish its intended function because of the following conditions: (1) Loss of power, and (2) Loss of signal or altitude sensing capability when within the manufacturer's stated operating altitude range.'

1.4. ED-30 Paragraph 3.2.2 (Category A2). ETSO-C87a does not include Category A2. If alternate accuracy requirements not meeting the requirements of paragraph 3.2.1 are desired, the applicant should apply for a deviation in accordance with paragraph 3.g. of this ETSO.

1.5. ED-30 Paragraph 3.2.4 (Category C). ETSO-C87a does not include Category C. If the radio altimeter has been designed and tested to tighter accuracy requirements, include the design information, test results, and limitations with the application for ETSO and document the performance in the installation manual.

1.6. ED-30 (Appendix). The ED-30 appendix references TSO-C87 and RTCA/DO-123 for external loop loss standards. As TSO-C87 and DO-123 are no longer current, reference RTCA/DO-155, *Minimum Performance Standards Airborne Low-Range Radar Altimeters,* Appendix B, for external loop loss standards instead.

2.0. REQUIREMENT ADDITIONS to ED-30: Rate Data. The equipment need not provide a rate data output as a condition of compliance with this minimum performance standard. Altimeters with rate outputs must meet the following accuracy requirements for at least 95 percent of all observations for heights from the terrain to the antenna:

RATE DATA

Height (ft)	***Range (ft/sec)***	***Accuracy (ft/sec)***
3–100	0–15	± (1.5 ft.+ 0.01 h + 0.1 /r/)
100–200	0–20	± (2.0 ft.+ 0.01 h + 0.1 /r/)

Where: h = altitude in feet; and /r/ = absolute value of rate (feet/sec.)

ETSO-C106 A1
Date: xx.xx.2013

~~**Date : 24.10.2003**~~

European Aviation Safety Agency

European Technical Standard Order (ETSO)

Subject: AIR DATA COMPUTER

1 — Applicability
This ETSO gives the requirements which air data computers that are 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
Applicable p~~P~~rocedures are detailed in CS-ETSO, Subpart A.
2.2 — Specific
None.

3 — Technical c~~C~~onditions
3.1 — Basic
3.1.1— Minimum p~~P~~erformance s~~S~~tandards set forth in the SAE Aerospace Standard (AS) AS 8002 *'Air Data Computer'*, dated April 1, 1985, as amended by this ETSO:

— Paragraph 4.2 of document AS 8002 shall be deleted and replaced by the following:

— Static source e~~E~~rror c~~C~~orrection (if applicable)
Unless otherwise noted, outputs may be corrected for static source errors of the specific aircraft model in which the computer is intended to be used.

— The tolerance of correction value produced from the correction profile (correction curve) residing in the computer shall be the sum of the following:

A — ~~plus or minus~~ ± 15 % of theoretical value of correction or equivalent of ~~plus or minus~~ ± 8.44 Pa (.0025 inch Hg) static pressure, whichever is greater.

B — Value of correction curve slope times the tolerance of independent variable programming the correction curve.

When testing corrected parameters (altitude, airspeed or M~~m~~ach) the nominal value of the parameter at each test point indicated in Tables 1, 3 or 4 shall be adjusted to include the correction value with tolerance limits set per ~~(~~A~~)~~ and ~~(~~B~~)~~ above.

— Exception TABLE 3, CALIBRATED AIRSPEED: A looser tolerance of ~~plus or minus~~ ± 6.5 km/h
(3.5 knots) may be used at the 148 km/h (80 knots) reference point.

3.1.2 — Environmental standard
See Subpart A, paragraph 2.1.
3.1.3 — ~~Computer~~ S~~s~~oftware

See Subpart A, paragraph 2.2.

3.1.4 — Airborne electronic hardware
See CS-ETSO, Subpart A, paragraph 2.3

3.2 — Specific
None.

4 — Marking
4.1 — General
Marking is detailed in CS-ETSO, Subpart A, paragraph 1.2.
4.2 — Specific
None.

5 — Availability of r~~R~~eferenced d~~D~~ocument
See CS-ETSO, Subpart A, paragraph 3.

ETSO-C112~~c~~d
Date: xx.xx.2013

~~**Date : 21.12.2010**~~

European Aviation Safety Agency

European Technical Standard Order (ETSO)

Subject: SECONDARY SURVEILLANCE RADAR MODE S TRANSPONDER ~~AIR TRAFFIC CONTROL RADAR BEACON SYSTEM/MODE SELECT (ATCRSB/MODE S) AIRBORNE EQUIPMENT~~

1 — Applicability

This ETSO gives the requirements which ~~airborne Mode S air traffic control (ATC) transponder~~ Secondary Surveillance Radar Mode S Transponder Equipment that are 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

Applicable procedures are detailed in CS-ETSO, Subpart A.

2.2 — Specific

None.

3 — Technical conditions

3.1 — Basic

3.1.1 — Minimum p~~P~~erformance s~~S~~tandard

Standards set forth in the EUROCAE ED-73~~C~~E, 'Minimum Operational Performance ~~Standards~~ Specification for Secondary Surveillance Radar Mode S Transponders'~~ dated September 2008~~, dated May 2011.

~~The following correction applies to: EUROCAE ED-73C. The paragraph 3.29 c. is extended as follows: 'In case the optional ACAS interface is not provided the transponder must set Bit 16 of the Data Link Capability Report (BDS 1,0) to zero (0) indicating that no ACAS interface is available.'~~

3.1.2 — Environmental s~~S~~tandard

See CS-ETSO, Subpart A, paragraph 2.1.

3.1.3 — ~~Computer~~ S~~s~~oftware

See CS-ETSO, Subpart A, paragraph 2.2.

3.1.4 — Airborne ~~E~~electronic ~~H~~hardware ~~Qualification~~

See CS-ETSO, Subpart A, paragraph 2.3.

3.2 — Specific

3.2.1 Failure c~~C~~ondition c~~C~~lassification

Failure of the function defined in paragraph 3.1.1 of this ETSO has been determined to be a major failure condition. The applicant must develop the system to at least the design assurance level commensurate with this failure condition.

4 — Marking

4.1 — General

Marking as detailed in CS-ETSO, Subpart A, paragraph 1.2.

4.2 — Specific

~~None.~~

The marking must also include the transponder's functional level and optional additional features as provided in ED-73E section 1.4.2.2, as well as minimum peak output power identified by the transponder class as defined in ED-73E section 1.4.2.4.

5 — Availability of r~~R~~eferenced d~~D~~ocument

See CS-ETSO, Subpart A, paragraph 3.

ETSO-C114 A1
Date: xx.xx.2013

~~**Date: 24.10.03 xx.xx.201x**~~

European Aviation Safety Agency

European Technical Standard Order (ETSO)

Subject: TORSO RESTRAINT SYSTEMS

1 — Applicability
This ETSO gives the requirements which torso restraint systems that are 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
Applicable procedures are detailed in CS-ETSO, Subpart A.
2.2 — Specific
None.

3 — Technical c~~C~~onditions
3.1 — Basic
3.1.1 — Minimum p~~P~~erformance s~~S~~tandard
Standards set forth in the SAE Aerospace Standard (AS) document: AS 8043 *'Aircraft Torso Restraint System'*, dated March 1986.
3.1.2 — Environmental s~~S~~tandards
(i) American Society for Testing Materials (ASTM) G23-81, Standard Practice for Operating Light-Exposure Apparatus (Carbon-Arc Type) With and Without Water for Exposure of Nonmetallic Materials.
(ii) ASTM ~~D~~B117-73, Standard Method of Salt Spray (Fog) Testing.
(iii) ASTM D756-78, Standard Practice for Determination of Weight and Shape Changes of Plastics Under Accelerated Service Conditions.
3.1.3 — Tests m~~M~~ethods
(i) American Association of Textile Chemists and Colorists (AATCC) Standard Test Method 8-1981, Colorfastness to Crocking.
(ii) AATCC Standard Test Method 107-l 981, Colorfastness to Water.
(iii) Federal Test Method Standard 191 Method 5906.
(iv) AATCC Chart for Measuring Transference of Color.
3.1.4 — ~~Computer~~ S~~s~~oftware
None.
3.2 — Specific
None.

4 — Marking

4.1 — General

Marking is detailed in CS-ETSO, Subpart A, paragraph 1.2.

4.2 — Specific

None.

5 — Availability of r~~R~~eferenced d~~D~~ocument

— See CS-ETSO, Subpart A, paragraph 3.

— AATCC Chart for Measuring Transference of Color and Standard Test Materials 8-1981 and 1071981 may be purchased from the American Association of Textile Chemists and Colorists, P.O. Box 12215, Research Triangle Park, NC 27709.

— Federal Test Method Standard 191 Method 5906 may be purchased from the Commanding Officer, Naval Publications and Forms Center, 5801 Tabor Avenue, Philadelphia, PA 19120.

ETSO-C115~~b~~c
Date: xx.xx.2013

~~**Date : 24.10.03**~~

European Aviation Safety Agency

European Technical Standard Order (ETSO)

Subject: AIRBORNE AREA NAVIGATION EQUIPMENT FLIGHT MANAGEMENT SYSTEMS (FMS) USING MULTI-SENSOR INPUTS

1 — Applicability

This ETSO gives the requirements which ~~Airborne Area Navigation Equipment~~ Flight Management Systems (FMS) using Multi-Sensor Inputs that are 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

Applicable procedures are detailed in CS-ETSO, Subpart A.

2.2 — Specific

None.

3 — Technical c~~C~~onditions

3.1 — Basic

3.1.1 — Minimum p~~P~~erformance s~~S~~tandard

~~Standards set forth in EUROCAE document ED-58 (June 1988) (RTCA DO-187 (1984)).~~

Standards set forth in the RTCA DO-283A, Minimum Operational Performance Standards for Required Navigation Performance for Area Navigation, dated 28/10/2003.

~~3.1.2 - Use of Global Positioning System Sensors~~

~~EUROCAE document ED-72A, „Minimum Operational Performance Standards for Airborne Supplemental Navigation Equipment Using Global Positioning System (GPS),' dated April 1997, and ETSO-C129a, Airborne Supplemental Navigation Equipment Using Global Positioning System (GPS), provide standards for the use of GPS sensors. These standards provide additional and, in some cases, contradictory requirements to the requirements of this ETSO. Additional operational capabilities have been authorized for aircraft equipped with ETSO-C129a compliant equipment. If the ETSO applicant wishes to manufacture equipment that is eligible for these additional operational capabilities, then the applicant must certify that the GPS sensor is compliant with ETSO-C129a. In this case the following criteria shall apply:~~

~~(i) All additional standards contained in ETSO-C129a that apply to the appropriate class (B or C) of sensor being incorporated into the multi-sensor system must be complied with in addition to the requirements of this ETSO.~~

~~(ii) The performance requirements of ETSO-C129a take precedence over this ETSO when the GPS sensor is being used for navigation. It is acceptable to revert to the criteria of this ETSO when the~~

~~GPS sensor is not installed or is otherwise not available. Reversion from ETSO-C129a requirements to ETSO-C115b requirements must be continuously in the pilot's primary field of view.~~

~~(iii) If any conflict is encountered between the two ETSOs, ETSO-C129a will always take precedence over ETSO-C115b.~~

~~(iv) The requirements of ETSO-C129a that are applicable to the multi-sensor system must be demonstrated as a part of demonstrating compliance with this ETSO. All testing which would require inputs from a GPS sensor must be conducted with a sensor that has been demonstrated to meet the criteria of ETSO-C129a for the class of sensor required by the multi-sensor system being evaluated. It is acceptable to simultaneously demonstrate compliance with ETSO-C129a for the sensor and ETSO-C115b for the multi-sensor system.~~

3.1.~~3~~2 — Environmental s~~S~~tandard

See CS-ETSO, Subpart A, paragraph 2.1.

3.1.~~4~~3 — ~~Computer~~ S~~s~~oftware

See CS-ETSO, Subpart A, paragraph 2.2.

3.1.4 — Airborne ~~E~~electronic ~~H~~hardware ~~Qualification~~

See CS-ETSO, Subpart A, paragraph 2.3.

3.2 — Specific

~~None.~~

Add the following system performance requirement, consistent with the desired RNP capability, to DO-283A, paragraph 2.2.5.2:

When using GNSS, the aircraft navigation system shall provide an alert when the probability of signal-in-space errors causing a lateral position error greater than two times the desired RNP (2 × RNP) exceeds 1×10^{-7} per hour.

Note: This exception supports international harmonisation of requirements for RNAV and RNP. The exception is comparable to the ETSO-C115b exception that invoked ETSO-C129a system performance requirements when integrating GNSS as part of a multi-sensor navigation solution.

3.2.1 Failure condition classification
See CS-ETSO, Subpart A, paragraph 2.4.

Design the system to the appropriate failure condition classification(s) as detailed in further guidance material dedicated to the different navigation specification (for instance RNP1, LPV, RNPAR…).

4 — Marking

4.1 — General

Marking as detailed in CS-ETSO, Subpart A, paragraph 1.2.

4.2 — Specific

None.

5 — Availability of r~~R~~eferenced d~~D~~ocument

See CS-ETSO, Subpart A, paragraph 3.

ETSO-C121~~a~~b
Date: xx.xx.2013

~~**Date : 28.11.2008**~~

European Aviation Safety Agency

European Technical Standard Order (ETSO)

Subject: UNDERWATER LOCATING DEVICE (ACOUSTIC) (SELF-POWERED)

1 — Applicability

This ETSO gives the requirements which Underwater Locating Device (Acoustic) (Self-Powered) that are 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

Applicable procedures are detailed in CS-ETSO, Subpart A.

2.2 — Specific

None.

3 — Technical c~~C~~onditions

3.1 — Basic

3.1.1 — Minimum p~~P~~erformance s~~S~~tandard

~~Standards set forth in the SAE Aerospace Standard (AS) document: AS8045 '*Minimum Performance Standard for Underwater Locating Devices (Acoustic) (Self-Powered)',* dated May 16, 1988, and from the American Society Testing Materials (ASTM) document D.1141-98 '*Standard Practice for the Preparation of Substitute Ocean Water'*, dated September 2003.~~

Standards set forth in the SAE AS8045A, Minimum Performance Standard for Underwater Locating Devices (Acoustic) (Self-Powered), dated August 2011.

3.1.2 — Environmental s~~S~~tandard

~~The equipment must be tested according to EUROCAE ED-14E (RTCA DO-160E) '*Environmental Conditions and Test Procedures for Airborne Equipment'* from March 2005.~~

See CS-ETSO, Subpart A, paragraph 2.1.

3.1.3 — ~~Computer~~ S~~s~~oftware

~~If the article includes a digital computer, the software must be developed according to EUROCAE ED-12B (RTCA DO-178B), *Software Considerations in Airborne Systems and Equipment Certification*, dated December 1, 1992.~~

See CS-ETSO, Subpart A, paragraph 2.2.

3.1.4 — Airborne ~~E~~electronic ~~H~~hardware ~~Qualification~~

~~If the article includes a complex custom micro-coded component, the component must be developed according to EUROCAE ED-80 (RTCA DO-254), *Design Assurance Guidance for*~~

~~*Airborne Electronic Hardware,* from April 2000.~~

See CS-ETSO, Subpart A, paragraph 2.3.

3.2 — Specific

The battery used in the underwater locating device authorised under this ETSO must be appropriate for the intended operational environment, not pose a hazard to the aircraft and meet the requirements of acceptable battery standards. If non-rechargeable lithium batteries are used to power the underwater locating device, ETSO-C142a *'Lithium Batteries'* provides MPS for such lithium batteries.

Demonstrate the saltwater immersion tests in SAE Document AS8045A, section 5.13, using a seawater solution meeting the requirements of ASTM D1141-98, Standard Practice for the Preparation of Substitute Ocean Water, dated 2008.

3.2.1 — Failure condition classification
See CS-ETSO, Subpart A, paragraph 2.4.

Failure or loss of the function defined in paragraph 3.1.1 of this ETSO has been determined to be a minor failure condition.

4 — Marking

4.1 — General

Marking is detailed in CS-ETSO, Subpart A, paragraph 1.2.

4.2 — Specific

None.

5 — Availability of r~~R~~eferenced d~~D~~ocument
See CS-ETSO, Subpart A, paragraph 3.

ETSO-C155a
Date: xx.xx.2013

~~**Date : 21.12.2010**~~

European Aviation Safety Agency

European Technical Standard Order (ETSO)

Subject: RECORDER INDEPENDENT POWER SUPPLY

1 — Applicability

This ETSO gives the requirements which Recorder Independent Power Supply that are manufactured on or after the date of this ETSO must meet in order to be identified with the applicable ETSO marking.

~~This ETSO applies to equipment intended to provide back-up power to an installed cockpit crash protected recorder, whether it is:~~

~~— Voice,~~
~~— Image,~~
~~— Data~~
~~— Combination voice/data,~~
~~— Combination voice/image, or~~
~~— Combination image/data.~~

ETSOs that may be used in conjunction with this ETSO are those covering:

— rechargeable lithium cells and lithium batteries,

— digital flight data recorder,

— cockpit voice recorder,

— data link recorder,

— cockpit image recorder.

2 — Procedures

2.1 — General

Applicable procedures are detailed in CS-ETSO, Subpart A.

2.2 — Specific

None.

3 — Technical c~~C~~onditions

3.1 — Basic

3.1.1 — Minimum p~~P~~erformance s~~S~~tandard

Standards set forth in ~~Appendix 1 of this ETSO~~ Section 5 of EUROCAE ED-112, Minimum Operational Performance Specification for Crash Protected Airborne Recorder Systems, dated March 2003.

3.1.2 — Environmental s~~S~~tandard

See CS-ETSO, Subpart A, paragraph 2.1~~ and Appendix 2 to this ETSO~~.

3.1.3 — ~~Computer~~ S~~s~~oftware

See CS-ETSO, Subpart A, paragraph 2.2.

3.1.4 — Airborne E~~e~~lectronic H~~h~~ardware ~~Qualification~~

See CS-ETSO, Subpart A, paragraph 2.3.

3.2 — Specific

~~None.~~

Exceptions to ED-112. We make the following first two exceptions to ED-112 to comply with EASA requirements. The third item is an exception to requirements for installation, flight testing, aircraft maintenance, and others that do not pertain to MPS criteria specific to the ETSO equipment.

- RIPS location, Chapter 2-5.3.10: We don't require Chapter 2-5.3.10 as part of this ETSO. RIPS location must comply with applicable EASA requirements.
- Equipment Installation and Installed Performance (RIPS) Chapter 5-6.
- Other ED-112 requirements for installation, flight testing, aircraft maintenance, and others that do not pertain to MPS specific criteria.

3.2.1 — Failure c~~C~~ondition c~~C~~lassification

See CS-ETSO, Subpart A, paragraph 2.4.

Failure of the function defined in paragraph 3.1.1 of this ETSO has been determined to be a minor failure condition.

4 — Marking

4.1 — General

Marking as detailed in CS-ETSO, Subpart A, paragraph 1.2.

4.2 — Specific

None.

5 — Availability of r~~R~~eferenced d~~D~~ocument

See CS-ETSO, Subpart A, paragraph 3.

ETSO-C160a
Date: xx.xx.2013

European Aviation Safety Agency

European Technical Standard Order (ETSO)

Subject: VDL MODE 2 COMMUNICATIONS EQUIPMENT

1 — Applicability

This ETSO gives the requirements which VDL Mode 2 Communications equipment that are 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

Applicable procedures are detailed in CS-ETSO, Subpart A.

2.2 — Specific

None.

3 — Technical conditions

3.1 — Basic

3.1.1 — Minimum performance standard

Standards set forth in the EUROCAE ED-92B, Minimum Operational Performance Standards for Aircraft VDL Mode 2 Physical, Link, and Network Layer, dated 21/03/2012. ED-92B is identical to RTCA DO-281B.

3.1.2 — Environmental standard

See CS-ETSO, Subpart A, paragraph 2.1.

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
See CS-ETSO, Subpart A, paragraph 2.4.

Failure of the function defined in paragraph 3.1.1 of this ETSO has been determined to be a minor failure condition.

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Date: xx.xx.2013

4 — Marking

4.1 — General

Marking as detailed in CS-ETSO, Subpart A, paragraph 1.2.

4.2 — Specific

None.

5 — Availability of referenced document

See CS-ETSO, Subpart A, paragraph 3.

ETSO-C164
Date: xx.xx.2013

European Aviation Safety Agency

European Technical Standard Order (ETSO)

Subject: NIGHT VISION GOGGLES (NVG)

1 — Applicability

This ETSO gives the requirements which Night Vision Goggles (NVG) that are 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

Applicable procedures are detailed in CS-ETSO, Subpart A.

2.2 — Specific

None.

3 — Technical conditions

3.1 — Basic

3.1.1 — Minimum performance standard

Standards set forth in the RTCA DO-275, Minimum Operational Performance Standards for Integrated Night Vision Imaging System Equipment, dated 12/10/2001.

3.1.2 — Environmental standard

See CS-ETSO, Subpart A, paragraph 2.1.

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
See CS-ETSO, Subpart A, paragraph 2.4.

Failure of the function defined in paragraph 3.1.1 of this ETSO has been determined to be a major failure condition.

4 — Marking

4.1 — General

Marking as detailed in CS-ETSO, Subpart A, paragraph 1.2.

4.2 — Specific

If the night vision goggle includes airborne software, then the part number must include hardware and software identification. Or, you can use a separate part number for hardware and software. Either way, you must include a means for showing the modification status.

5 — Availability of referenced document

See CS-ETSO, Subpart A, paragraph 3.

ETSO-C166b A1
Date: xx.xx.2013

~~**Date: 05/07/2012**~~

European Aviation Safety Agency

European Technical Standard Order (ETSO)

Subject: EXTENDED SQUITTER AUTOMATIC DEPENDENT SURVEILLANCE-BROADCAST (ADS-B) AND TRAFFIC INFORMATION SERVICES-BROADCAST (TIS-B) EQUIPMENT OPERATING ON THE RADIO FREQUENCY OF 1090 MEGAHERTZ (MHz)

1 — Applicability

This ETSO gives the requirements which Extended Squitter Automatic Dependent Surveillance-Broadcast (ADS-B) and Traffic Information Services-Broadcast (TIS-B) Equipment Operating on the Radio Frequency of 1090 Megahertz (MHz) that are 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

Applicable procedures are detailed in CS-ETSO, Subpart A.

2.2 — Specific

None.

3 — Technical c~~C~~onditions

3.1 — Basic

3.1.1 — Minimum p~~P~~erformance s~~S~~tandard

Standards set forth in the ~~RTCA DO-260B~~ EUROCAE ED-102A, Minimum Operational Performance Standards for 1090 MHz Extended Squitter Automatic Dependent Surveillance-Broadcast (ADS-B) and Traffic Information Services-Broadcast (TIS-B), dated ~~02/12/~~ December 2009, section 2.

This ETSO supports two major classes of 1090 MHz ADS-B and TIS-B equipment:

(a) Class A equipment, consisting of transmit and receive subsystems; and

(b) Class B equipment, containing a transmit subsystem only.

Class A equipment includes Classes A0, A1, A1S, A2 and A3. This standard requires 1090 MHz airborne Class A equipment to include the capability of receiving both ADS-B and TIS-B messages

and delivering both ADS-B and TIS-B reports, as well as transmitting ADS-B messages. A rReceive-only Class of equipment is allowed.
Class B equipment includes Classes B0, B1, and B1S. Classes B0, B1, and B1S are the same as A0, A1, and A1S, except they do not have receive subsystems. Note that Classes B2 and B3 are not for aircraft use.

3.1.2 — Environmental sStandard

See CS-ETSO, Subpart A, paragraph 2.1. The required performance under test conditions is defined in RTCA/DO-260B, section 2.4.

3.1.3 — ~~Computer~~ Ssoftware

See CS-ETSO, Subpart A, paragraph 2.2.

3.1.4 — Airborne Eelectronic Hhardware ~~Qualification~~

See CS-ETSO, Subpart A, paragraph 2.3.

3.2 — Specific

3.2.1 — Failure cCondition cClassification

See CS-ETSO, Subpart A, paragraph 2.4.

Failure of the function defined in paragraph 3.1.1 of this ETSO has been determined to be a major failure condition.

Note: The major failure condition for transmission of incorrect ADS-B messages is based on use of the data by other aircraft or Air Traffic Control for separation services.

4 — Marking

4.1 — General

Marking as detailed in CS-ETSO, Subpart A, paragraph 1.2.

4.2 — Specific

Transmitting and receiving components must be permanently and legibly marked.

The following table explains how to mark components.

RTCA/DO-260~~A~~B provides the equipment class in Section 2.1.11, and the receiving equipment type in Section 2.2.6.

If component can:	***Mark it with:***	***Sample marking pattern:***
Transmit and receive	Equipment class it supports, and Receiving equipment type	Class A0/Type 1
Transmit, but not receive	Equipment class it supports	Class B1, or Class A3-Transmitting only
Receive, but not transmit	Equipment class it supports, and Receiving equipment type	Class A2/Type 2-Receiving only

5 — Availability of ~~r~~Referenced ~~d~~Document

See CS-ETSO, Subpart A, paragraph 3.

ETSO-C174 A1
Date: xx.xx.2013

European Aviation Safety Agency

~~**Date: 28/11/2008**~~

European Technical Standard Order (ETSO)

Subject: BATTERY-BASED EMERGENCY POWER UNIT (BEPU)

1 — Applicability
This ETSO gives the requirements which Battery-based Emergency Power Units (BEPU) that are manufactured on or after the date of this ETSO must meet in order to be identified with applicable ETSO marking.

2 — Procedures

2.1 — General
Applicable procedures are detailed in CS-ETSO, Subpart A.

2.2 — Specific
None.

3 — Technical c~~C~~onditions
3.1 — Basic
3.1.1 — Minimum p~~P~~erformance s~~S~~tandard
Standards are given in **Appendix 1.**

Note: The battery used in the BEPU must meet the requirements of ETSO-C173 '*Nickel-Cadmium and Lead Acid Batteries'* or any other battery standards acceptable to the Agency.

3.1.2 — Environmental s~~S~~tandard
As stated in **Appendix 1,** chapter 2, of this ETSO.

3.1.3 — ~~Computer~~ S~~s~~oftware
~~If the article includes a digital computer, the software must be developed according to EUROCAE ED-12B (RTCA DO-178B) '*Software Considerations in Airborne Systems and Equipment Certification'* from 1992.~~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
~~None.~~

3.2.1 Failure condition classification
See CS-ETSO, Subpart A, paragraph 2.4.

4 — Marking
4.1 — General
Marking is detailed in CS-ETSO, Subpart A, paragraph 1.2.

4.2 — Specific
Product label shall indicate:

- b~~B~~attery capacity (e.g. 20 Amp-Hour (Ah)),
- n~~N~~ominal voltage,
- b~~B~~attery chemistry.

5 — Availability of r~~R~~eferenced d~~D~~ocuments
See CS-ETSO, Subpart A, paragraph 3.

ETSO-C174 A1
Date: xx.xx.2013

APPENDIX 1

MINIMUM PERFORMANCE STANDARD FOR BATTERY-BASED EMERGENCY POWER UNIT (BEPU)

CHAPTER 1: MINIMUM PERFORMANCE STANDARD UNDER STANDARD CONDITIONS

1 — PURPOSE

These are the requirements under standard conditions for a Battery-b~~B~~ased Emergency Power Units (BEPU) to meet the Minimum Performance Standard for this ETSO. The performance of specific equipment may be enhanced, depending on its intended application and configuration.

2 — GENERAL REQUIREMENTS

The BEPU must meet the power quality requirements of MIL-STD-704F, Aircraft Electrical Power Characteristics, dated March 12, 2004, and maintain the rated values and functionality according to its specification data sheet, unless otherwise specified in this ETSO.

(a) Design the BEPU to minimize the risk of causing or spreading a fire.

(b) Storage batteries must be designed and installed as follows: Safe cell temperatures and pressures must be maintained during any probable charging or discharging condition. No uncontrolled increase in cell temperature may result when the battery is recharged (after previous complete discharge):

- a~~A~~t maximum regulated voltage or power,
- d~~D~~uring a flight of maximum duration, and
- u~~U~~nder the most adverse cooling condition likely to occur in service.

(c) Demonstrate the above conditions by test, unless your experience with similar batteries and installations has shown that maintaining safe cell temperatures and pressures do not present a problem.

(d) Systems like electronic circuits installed in the BEPU must be compatible with the battery chemistry.

(e) During a failure of the normal power source to the emergency electrical bus, the BEPU supplies emergency electrical bus loads without intervention by the flight crew. After re-establishment of the normal power source, the emergency bus loads revert automatically from the BEPU to the normal power source, and the BEPU automatically returns to charging mode. To prevent inadvertent recharging of the BEPU from the aircraft battery when a normal power source is not available, the BEPU shall not enter the recharge mode when the BEPU input (source) voltage is below 24VDC.

(f) Specify the value of voltage spikes occurring when the BEPU is switched on and off and between modes (if applicable).

(g) Any single component failure within the BEPU (either open or short) cannot result in an over voltage condition on the battery.

(h) The BEPU will not have any protection/provision that results in automatic removal of power from the emergency load.

(i) The BEPU will not discharge through the input side of the BEPU.

(j) If the BEPU provides backup power to multiple loads, equip the BEPU with protection provisions that allow for the isolation and removal of excess load on any of its output feeders that draw more than its pre-determined maximum current. This will protect remaining loads in case of a load short circuit.

(k) The BEPU should not drain its battery power when the aircraft power is off.

(l) ~~Fully c~~Charge fully the battery before installation. Charge the battery every time the aircraft is powered up, ~~independent~~regardless of cockpit switch position.

(m) The charging time from 20 % to 80 % capacity will be less than 3 hours.

(n) Specify the nominal current and the short time maximum current.

(o) Design the BEPU in such a way so that separation devices placed between input, output, and battery will enable the current flow from input to output, even when there is a malfunction with other BEPU components. The separation devices will prevent current flow in the direction from output (respectively the battery) to input, and from output to battery. See Figure A-2 at the end of this a~~A~~ppendix. The minimum current rating of the separation devices must be greater than three times the continuous rated output current of the BEPU. Unless provided in the aircraft, design the BEPU to prevent output current greater than 30 milliamperes (mA) from flowing back to battery. The loss (breakdown) of voltage of such separation devices will exceed three times the BEPU rated voltage.

(p) The maximum output voltage ripple cannot exceed the limits stated in MIL-STD-704F. Note that this limit does not include the ripple already on the input line into the BEPU. (See Figure A-3 at the end of this a~~A~~ppendix.)

(q) To preclude catastrophic effects of excess temperature, the BEPU will monitor battery temperature during battery-charging cycles, and remove power when over temperature limits are reached. Applications where excessive battery temperature cannot cause catastrophic events do not require monitoring.

(r) If the BEPU contains a battery heater device, a single-fault failure redundancy protection is required to prevent heater runaway.

3 — CAPACITY AND RELATED PARAMETERS

The parameters listed in this section under environmentally benign and ground benign conditions at 25 °C must be provided. C~~c~~onsidered nominal conditions follow.

(a) BEPU capacity. Specify the value for the nominal capacity in Amp-Hours (Ah) based on a constant discharge current for 1.0 hour. During capacity testing~~,~~ the output voltage cannot degrade below 20VDC.

(b) BEPU output voltage excursions. Provide graphs of output voltage versus time for the following conditions:

- c~~C~~omplete discharge to low voltage dropout point after being fully charged~~.~~;

- cCcomplete discharge to low voltage dropout point after being charged to 72 % capacity. This (72 % capacity) represents a BEPU at the end of its life and 90 % state of charge.

(c) BEPU life. Declare the expected battery life based on the number of 100 % discharge cycles on the battery nameplate. Battery life is expired when 80 % of the capacity stated on the nameplate ~~stated capacity~~ is reached.

(d) BEPU maximum current consumption. Specify the maximum current consumption (excluding external loads) of the BEPU. Maximum current includes charging, heating, and other functionalities performed by electronic circuits.

(e) BEPU output current. Specify the nominal current that can be delivered by the BEPU related to the nominal Ah rating specified in paragraph 3.a of this Chapter 1 'CAPACITY AND RELATED PARAMETERS', and the short time maximum current~~,~~ versus time, if necessary.

4 — MONITOR AND CONTROL

(a) Instrumentation, data read-outs~~,~~ and controls can be provided by support equipment instead of the BEPU.

(b) Design all instrumentation and data read-outs for easy interpretation to avoid misunderstandings.

(c) The BEPU can have (but is not limited to) the following optional controls:

- BEPU Off: Battery power is disconnected from all loads;
- BEPU Arm: Ready to engage power to the loads if aircraft power is lost. The BEPU should be in 'cCharging mMode' unless there is a failure of the emergency bus~~.~~;
- BEPU On/Engage: Causes the battery to be applied to the loads. The BEPU should be in 'cCharging mMode' unless during failure of the emergency bus.

(d) Provide a test function for pre-flight check, showing the system function and battery status. The battery is considered good with 80 % state of charge. We recommend an in-flight low battery warning indication. Perform a lamp test where the checked segments are lighted.

CHAPTER 2: MINIMUM PERFORMANCE STANDARD UNDER ENVIRONMENTAL TEST CONDITIONS

1 — GENERAL

Unless otherwise specified, applicable test procedures are ~~in EUROCAE ED14E / RTCA DO-160E~~ defined in CS-ETSO, Subpart A paragraph 2.1.

2 — PERFORMANCE TESTS

The following environmental tests verify BEPU operations based on manufacturer specifications and requirements under extreme environmental conditions. If the manufacturer's specifications during these tests are different than those recorded under benign environmental conditions as specified in paragraph 3 of Chapter 1 of this Appendix ~~1~~, the manufacturer will specify the modified rating and under what condition such ratings would occur. For the following tests determine compliance of the BEPU with~~to~~ the manufacturer's nominal ratings (unless otherwise specified) as referenced in paragraph 3 of Chapter 1 of this Appendix except when otherwise

noted, charge the batteries to at least 80 % of manufacturer's rated capacity before conducting these tests:

- BEPU capacity using nominal current discharge;
- BEPU output voltage excursion;
- BEPU current consumption.

For the applicable environmental test requirements ~~contained in EUROCAE ED14E / RTCA DO-160E are~~ see ETSO, Subpart A, paragraph 2.1:

(a) ~~EUROCAE ED14E / RTCA DO-160E~~ Section 4, Temperature and Altitude.

- Operating Low Temperature Test. You may use an internal battery heater for this test.
- Operating High Temperature Test.
- Altitude Test.
- Decompression Test.
- Overpressure Test.

(b) ~~EUROCAE ED14E / RTCA DO-160 E~~ Section 5, Temperature Variation. Combine this test with ~~EUROCAE ED14 E / RTCA DO-160 E,~~ Section 4 T~~t~~esting R~~r~~equirements.

(c) ~~EUROCAE ED14 E / RTCA DO-160 E~~ Section 6, Humidity.

(d) ~~EUROCAE ED14 E / RTCA DO-160 E~~ Section 7, Operational Shocks and Crash Safety. After this test, the equipment must remain in its mounting with no part of the equipment or its mounting becoming detached and free on the shock test table. Measure and record the BEPU capacity after completion.

NOTE: These tests may damage the equipment. Therefore, these tests may be conducted last.

(e) ~~EUROCAE ED14 E / RTCA DO-160 E~~ Section 8, Vibration. While the equipment is subjected to this test, ensure that all mechanical devices operate satisfactorily and that the mechanical construction remains undamaged.

(f) ~~EUROCAE ED14 E / RTCA DO-160 E~~ Section 9, Explosion Proofness. Required only if the BEPU contains components that are known to cause inductive arcing.

(g) ~~EUROCAE ED14 E / RTCA DO-160 E~~ Section 10, Water Proofness (if required).

(h) ~~EUROCAE ED14 E / RTCA DO-160 E~~ Section 11 Fluids Susceptibility (if required). Not mandatory for ETSO approval.

(i) ~~EUROCAE ED14 E / RTCA DO-160 E~~ Section 12, Sand and Dust (if required).

(j) ~~EUROCAE ED14 E / RTCA DO-160 E~~ Section 13, Fungus Resistance (if required). Compliance by analysis is acceptable.

(k) ~~EUROCAE ED14 E / RTCA DO-160 E~~ Section 15, Magnetic Effect.

(l) ~~EUROCAE ED14 E / RTCA DO-160 E~~ Section 16, Power Input.

(m) ~~EUROCAE ED14 E / RTCA DO-160 E~~ Section 17, Voltage Spike. During and after this test, no failed parts must exist, including any degradation on component voltage and current ratings. No parasitic or transient mode switching can result from this test.

(n) ~~EUROCAE ED14 E / RTCA DO-160 E~~ Section 18, Audio Frequency Conducted Susceptibility — Power Inputs. Conduct by charging the BEPU when its capacity is between 0 % and 75 %. No parasitic or transient mode switching can result from this test.

(o) ~~EUROCAE ED14 E / RTCA DO-160 E~~ Section 19, Induced Signal Susceptibility. No parasitic or transient mode switching can result from this test.

(p) ~~EUROCAE ED14 E / RTCA DO-160 E~~ Section 20, RF Susceptibility. No parasitic or transient mode switching can result from this test.

(q) ~~EUROCAE ED14 E / RTCA DO-160 E~~ Section 21, Emission of RF Energy. Conduct while BEPU is being charged. Charge must be between 0 % and 75 % of capacity during this test.

(r) ~~EUROCAE ED14 E / RTCA DO-160 E~~ Section 22, Lightning Induced Transient Susceptibility. No parasitic or transient mode switching can result from this test.

(s) ~~EUROCAE ED14 E / RTCA DO-160 E~~ Section 23, Lightning Direct Effects. Not mandatory for this ETSO approval. If you conduct this test, no failed parts may exist during and after the test. Failed parts include any degradation on component voltage and current ratings. No parasitic or transient mode switching should result during this test.

(t) ~~EUROCAE ED14 E / RTCA DO-160 E~~ Section 24, Icing. Not mandatory for this ETSO approval. If you conduct this test, no failed parts may exist during and after the test. Failed parts include any degradation on component voltage and current ratings.

(u) ~~EUROCAE ED14 E / RTCA DO-160 E~~ Section 25, Electrical Discharge.

CHAPTER 3: ELECTRICAL TEST PROCEDURES

1 — GENERAL

Electrical test procedures covered under environmental test conditions in Chapter 2 of this Appendix are conducted according to ~~EUROCAE ED14 E / RTCA DO-160 E. T~~the test procedures ~~that meet specific requirements for the BEPU are~~ outlined below.

2 — GENERAL TEST CONDITIONS

Unless otherwise specified, the following test conditions apply:

(a) Conduct all tests under conditions of ambient room temperature (except ~~EUROCAE ED14 E / RTCA DO-160 E,~~ sections 4, 5 and 6) and ambient pressure and humidity as outlined in ~~EUROCAE ED14 E / RTCA DO-160 E,~~ Section 1, Paragraph 3.

(b) Unless otherwise specified, the input supply voltage will be within 10 % of the nominal value the BEPU is designed to operate.

(c) A reasonable warm-up period for stabilization is permissible. Battery nominal capacity is defined at 25 °C.

3 — SPECIFIC TEST CONDITIONS

(Per paragraph 4 'MONITOR and CONTROL' of Chapter 1 of this document)

(a) Lamp test: All segments lighted.

(b) Check load segment on when load is applied.

4 — ALIGNMENT, ADJUSTMENT AND CALIBRATION PRIOR TO TEST

If necessary, perform alignment, adjustment and calibration before testing.

5 — TEST EQUIPMENT

Calibrate the test equipment you use to verify final test results traceable to the National Bureau of Standards. Test equipment accuracy will be at least 2 %.

CHAPTER 4 : DESCRIPTION OF A BEPU

1 — GENERAL

A BEPU supplies power for a specified time period to an emergency power bus (output) in case of main or emergency bus failure.

2 — PARTS OF A BEPU

The BEPU consists of a remote unit or panel-mounted device containing a rechargeable battery pack (accumulator) and means for providing charging, monitoring of battery temperature, battery state, current, as well as system testing and related functions. The batteries are kept fully charged during normal operation ~~independent from~~ regardless of surrounding temperature.

(a) An indicator/test switch gives information on the battery status of the BEPU before commencing flight.

(b) Figure A-1 block diagram illustrates the description of the BEPU functionality. It does not define a requirement.

(c) Figure A-2 depicts an example BEPU current flow.

(d) Figure A-3 depicts a recommended measurement of BEPU output voltage ripple.

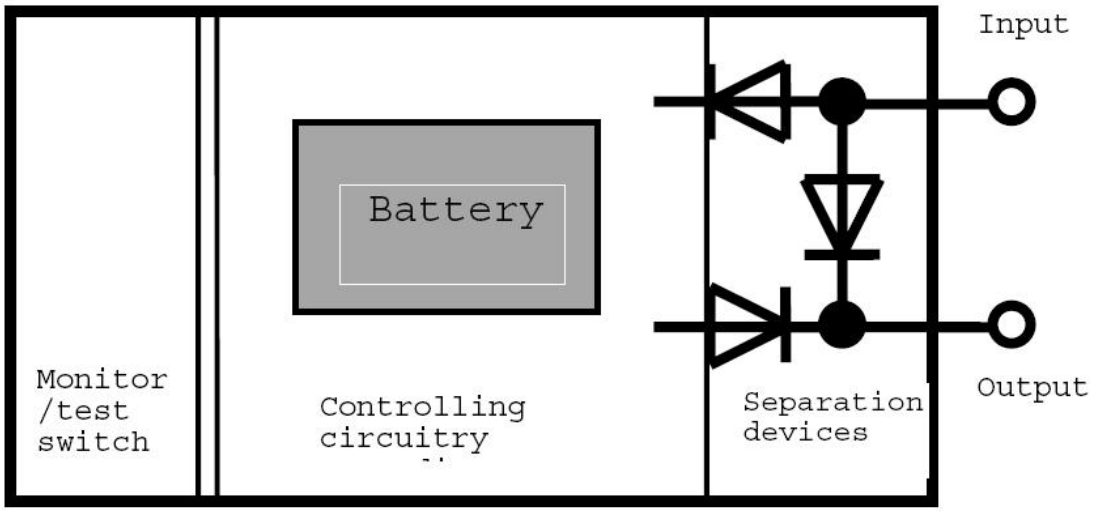

Figure A-1: BEPU Block Diagram

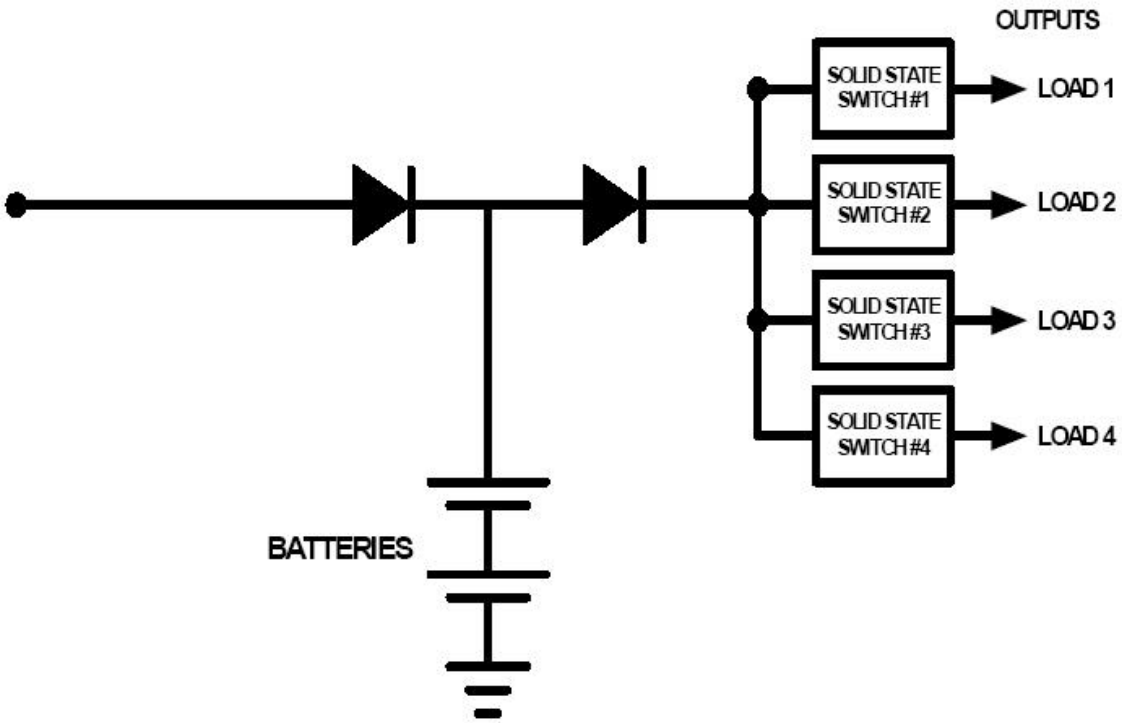

Figure A-2: An example BEPU Current Flow

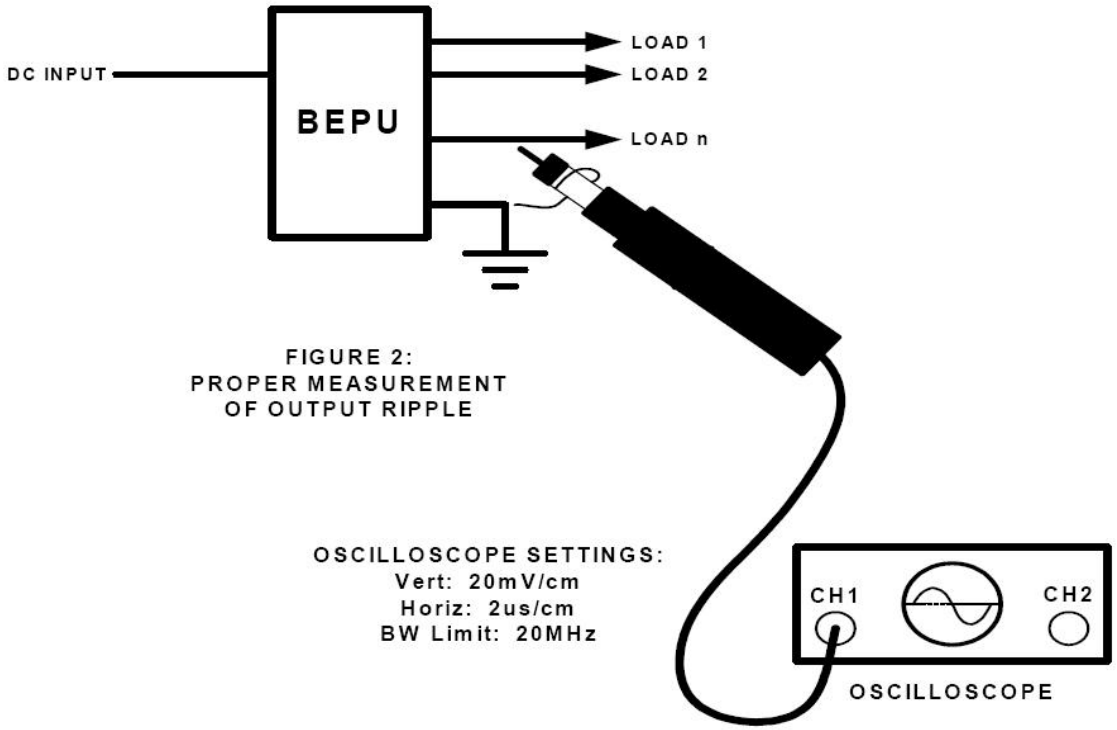

Figure A-3: Recommended Measurement of BEPU Output Voltage Ripple

ETSO-C178
Date: xx.xx.2013

European Aviation Safety Agency

European Technical Standard Order (ETSO)

Subject: SINGLE PHASE 115 VAC, 400 HZ ARC FAULT CIRCUIT BREAKERS

1 — Applicability

This ETSO gives the requirements which Single Phase 115 VAC, 400 Hz Arc Fault Circuit Breakers that are 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

Applicable procedures are detailed in CS-ETSO, Subpart A.

2.2 — Specific

None.

3 — Technical conditions

3.1 — Basic

3.1.1 — Minimum performance standard

Standards set forth in the SAE AS 5692, Arc Fault Circuit Breaker (AFCB), Aircraft, Trip-Free Single Phase 115 Vac, 400 Hz — Constant Frequency, dated October 2004. AFCBs may have separate indication of thermal and arcing faults to assist in fault isolation and performing proper repairs.

3.1.2 — Environmental standard

See CS-ETSO, Subpart A, paragraph 2.1.

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
See CS-ETSO, Subpart A, paragraph 2.4.

Failure of the function defined in paragraph 3.1.1 of this ETSO has been determined to be a major failure condition.

4 — Marking

4.1 — General

Marking is detailed in CS-ETSO, Subpart A, paragraph 1.2.

4.2 — Specific

None.

5 — Availability of referenced document

See CS-ETSO, Subpart A, paragraph 3.

ETSO-C198
Date: xx.xx.2013

European Aviation Safety Agency

European Technical Standard Order (ETSO)

Subject: AUTOMATIC FLIGHT GUIDANCE AND CONTROL SYSTEM (AFGCS) EQUIPMENT

1 — Applicability

This ETSO gives the requirements which Automatic Flight Guidance and Control System (AFGCS) Equipment that are 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

Applicable procedures are detailed in CS-ETSO, Subpart A.

2.2 — Specific

None.

3 — Technical conditions

3.1 — Basic

3.1.1 — Minimum performance standard

Standards set forth in the RTCA DO-325, Automatic Flight Guidance and Control Systems and Equipment, dated 08/12/2010.

3.1.2 — Environmental standard

See CS-ETSO, Subpart A, paragraph 2.1.

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
See CS-ETSO, Subpart A, paragraph 2.4.

There is no standard minimum failure condition classification for this ETSO. The failure condition classification appropriate to the equipment will depend on the intended use of the equipment in a specific aircraft.

4 — Marking

4.1 — General

Marking as detailed in CS-ETSO, Subpart A, paragraph 1.2.

4.2 — Specific

None.

5 — Availability of referenced document

See CS-ETSO, Subpart A, paragraph 3.

ETSO-C200
Date: xx.xx.2013

European Aviation Safety Agency

European Technical Standard Order (ETSO)

Subject: LOW-FREQUENCY UNDERWATER LOCATING DEVICES (ACOUSTIC) (SELF-POWERED)

1 — Applicability

This ETSO gives the requirements which Low-Frequency Underwater Locating Devices (Acoustic) (Self-Powered) that are 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

Applicable procedures are detailed in CS-ETSO, Subpart A.

2.2 — Specific

None.

3 — Technical conditions

3.1 — Basic

3.1.1 — Minimum performance standard

Standards set forth in the SAE document AS6254 Minimum Performance Standard for Low-Frequency Underwater Locating Devices (Acoustic) (Self-Powered), dated February 2012.

3.1.2 — Environmental standard

See CS-ETSO, Subpart A, paragraph 2.1.

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

See CS-ETSO, Subpart A, paragraph 2.4.

Failure or loss of the function defined in paragraph 3.1.1 of this ETSO has been determined to be a minor failure condition.

4 — Marking

4.1 — General

Marking as detailed in CS-ETSO, Subpart A, paragraph 1.2.

4.2 — Specific

None.

5 — Availability of referenced document

See CS-ETSO, Subpart A, paragraph 3.