COMMENT RESPONSE DOCUMENT (CRD) TO NOTICE OF PROPOSED AMENDMENT (NPA) 2011-12

DRAFT DECISION OF THE EXECUTIVE DIRECTOR OF THE EUROPEAN AVIATION SAFETY AGENCY

amending Decision No 2003/10/RM of the Executive Director of the European Aviation Safety Agency of 24 October 2003 on certification specifications, including airworthiness codes and acceptable means of compliance, for European Technical Standard Orders ('CS-ETSO')

'Systematic review and transposition of existing FAA TSO standards for parts and appliances into EASA ETSO'

EXECUTIVE SUMMARY

The scope of this rulemaking activity, aiming at a systematic review and transposition of existing FAA TSO standards for parts and appliances into EASA ETSO is outlined in the Terms of Reference (ToR) ETSO.008, Issue 2, of 24 May 2011. In the Rulemaking Programme 2012-15 the task has been renumbered as RMT.0186.

The purpose of the Notice of Proposed Amendment (NPA) 2011-12, dated 15 July 2011, was to envisage amending Decision 2003/10/RM of the Executive Director of 24 October 2003 on certification specifications, including airworthiness codes and acceptable means of compliance, for European Technical Standard Orders (currently published as CS-ETSO).

In particular it was proposed to:

- amend CS-ETSO Subpart A (Environmental standards);
- update 7 ETSOs in Index 1 in order to align with latest FAA amendment;
- introduce in Index 1 12 new ETSO identical to the equivalent FAA TSOs; and
- introduce a new ETSO, still based on the FAA equivalent, in Index 2 since some differences were introduced.

95 comments were received from 17 commentators. This CRD replies individually to each comment.

In principle stakeholders agreed to transpose all the FAA TSO included in the NPA.

Therefore, the Agency intends to adopt the proposed amendments to CS-ETSO in the revised text attached to this CRD.

In addition, the Agency intends:

- to make the ETSOs accessible individually on the EASA website in order to facilitate consultation; and
- to publish the second NPA under the same RMT.0186 (former ETSO.008) for a second batch of transposed TSOs, as listed in Issue 3 of the ToR.

Explanatory Note

I. General

1. The purpose of the Notice of Proposed Amendment (NPA) 2011-12, dated 15 July 2011, was to envisage amending Decision 2003/10/RM of the Executive Director of 24 October 2003 on certification specifications, including airworthiness codes and acceptable means of compliance, for European Technical Standard Orders (currently published as CS-ETSO)[1].

II. Consultation

2. The draft of the proposed ETSOs was attached to NPA 2011-12 published on the website (http://www.easa.europa.eu) on 18 July 2011.

   By the closing date of 18 October 2011, the European Aviation Safety Agency (hereafter referred to as the 'Agency') received 95 comments from 17 National Aviation Authorities, professional organisations and private companies.

III. Publication of the CRD

3. All comments received have been acknowledged and incorporated into this Comment-Response Document (CRD) with the responses of the Agency.

4. In responding to comments, a standard terminology has been applied to attest the Agency's acceptance of the comment. This terminology is as follows:

   - **Accepted** – The comment is agreed by the Agency and any proposed amendment is wholly transferred to the revised text;
   - **Partially Accepted** – Either the comment is only agreed in part by the Agency, or the comment is agreed by the Agency but any proposed amendment is partially transferred to the revised text;
   - **Noted** – The comment is acknowledged by the Agency but no change to the existing text is considered necessary;
   - **Not Accepted** - The comment or proposed amendment is not shared by the Agency.

   The resulting text highlights the changes as compared to the current rule.

5. The Decision amending Decision 2003/10/RM of the Executive Director of 24 October 2003 on certification specifications, including airworthiness codes and acceptable means of compliance, for European Technical Standard Orders, will be issued at least two months after the publication of this CRD to allow for any possible reactions of stakeholders regarding possible misunderstanding of the comments received and answers provided.

   Such reactions should be received by the Agency not later than 4 June 2012 and should be submitted using the Comment-Response Tool at http://hub.easa.europa.eu/crt.

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1 Decision 2003/10/RM of the Executive Director of the Agency of 24 October 2003 on certification specifications, including airworthiness codes and acceptable means of compliance, for European Technical Standard Orders ("CS-ETSO"). Decision as last amended by Decision 2010/010/R of the Executive Director of the Agency of 21 December 2010, http://www.easa.europa.eu/agency-measures/certification-specifications.php#CS-ETSO.

IV. CRD table of comments, responses and resulting text

(General Comments)	-

comment	*10* comment by: *UK CAA* Please be advised that the UK CAA to not have any comments on NPA 2011-12, Systematic review and transposition of existing FAA TSO standards for parts and appliances into EASA ETSO.
response	*Noted* Noted.

comment	*32* comment by: *THALES-Avionics* THALES Avionics fully support the harmonisation with FAA TSO
response	*Noted* Noted.

comment	*37* comment by: *Luftfahrt-Bundesamt* 1) It is not recommended to adopt TSO-C154c (UAT ADS-B) because the related radio frequencies are not available in Europe. At least a note concerning frequency allocation should be added. 2) Many new ETSOs prescribe a failure condition classification. This is misleading because a failure condition classification MUST be determined basing on a hazard assessment on AIRCRAFT level. This is impossible on equipment level. Defining a failure condition classification in an ETSO cannot be more than a recommendation and needs to be verified on aircraft level.
response	*Noted* 1) Rejected. The ETSO gives the possibility to the industry to obtain an ETSO Authorisation. On that basis the industry can release equipment accompanied by EASA "Form 1" (i.e. declaration of conformity with the relevant ETSO). The latter is widely accepted in the worldwide market. Releasing such a "Form 1" does not imply anything on the technologies implemented in the European Union (EU). Furthermore, today the 978 MHz frequency band is allocated to DME replies from ground transponders collocated with VHF Omni-Range (VOR) operating in the frequency range of 108.00 MHz. EUROCONTROL has performed a study:

'Deliverable C2: Compatibility criteria a test specification for UAT' http://www.eurocontrol.int/communications/gallery/content/public/documents/LCIS_C2_UAT_v10.pdf. It shows the compatibility of UAT and DME or similar services. As the SESAR master plan still considers UAT as an option, this is a second reason to reject the proposal.

2) Noted.

In those cases where the failure classification can be determined on the aircraft level, a reference to CS-ETSO subpart A2.4 is included and provides the requested clarification. That specific reference is missing in those cases where the classification cannot be determined on the pure aircraft assessment but needs to consider the ATM system as well in the "total system" perspective mentioned in recital (1) of the Basic Regulation 1108/2009[2].

comment 42 comment by: *Cessna Aircraft Company*

Cessna has no comment at this time.

response *Noted*

Noted.

A. Explanatory Note - I. General p. 3-4

comment 3 comment by: *Pascal DELROT*

Agree with goals and impact analysis chapters I and V.

response *Noted*

Noted.

comment 9 comment by: *Joseph Contino*

Specific FAA TSOs and EASA ETSOs were identified to be harmonized between EASA and the FAA. I suggest that additional TSOs be considered for this harmonization. Specifically those related to oxygen systems and equipment; FAA TSO-C64b, TSO-C78a, TSO-C89a, TSO-C99a and TSO-

[2] Regulation (EC) No 1108/2009 of the European Parliament and of the Council of 21 October 2009 amending Regulation (EC) No 216/2008 in the field of aerodromes, air traffic management and air navigation services and repealing Directive 2006/23/EC (OJ L 309, 24.11.2009, p. 51–70).

	C116a. The corresponding ETSOs are at different revision levels and refer to different requirements. ETSO-C64a, ETSO-C78, ETSO-C89, ETSO-C99 and TSO-C116
response	*Noted* The observation is correct but it has to be recognised that some of the related SAE standards have only been editorially amended. Therefore, there is no need for an update, since the technical requirements are still similar. In particular, TSO-C64b refers to SAE AS 8025A, the latter showing only format/editorial changes compared to the former edition SAE AS 8025. ETSO-2C78, being in Index 2, has already been identified as technically different from the FAA standard. The Agency will consider TSO-C89a, TSO-C99a and TSO-C116a for possible inclusion in the planned Rulemaking Task RMT.0206 (former ETSO.011). In the interim period, the industry may use the provisions for deviations permitted by rule 21A.610 in Part-21[3] when this is the case in relation to new applications for ETSO Authorisations.

comment	*35* comment by: *GITA AVIATION* We appreciate and welcome EASAs quick response to new or amended TSOs to allow for equal treatment of competing US and EU companies.
response	*Noted* Noted.

resulting text

CONCLUSION ON GENERAL COMMENTS:

Stakeholders welcomed in principle the transposition of FAA TSOs into EASA ETSOs. A stakeholder, however, suggested deleting one of them, which is rejected. The Agency concludes that Rulemaking Task RMT.0186 (ETS0.008) can be progressed.

Furthermore, one stakeholder proposed further TSOs to be transposed. The Agency plans to consider TSO-C89a, TSO-C99a and TSO-C116a for possible inclusion in the planned Rulemaking Task RMT.0206 (former ETSO.011).

[3] Commission Regulation (EC) No 1702/2003 of 24 September 2003 laying down implementing rules for the airworthiness and environmental certification of aircraft and related products, parts and appliances, as well as for the certification of design and production organisations (OJ L 243, 27.9.2003, p. 6–79) as last amended by Commission Regulation (EC) No 1194/2009 of 30 November 2009 amending Regulation (EC) No 1702/2003 laying down implementing rules for the airworthiness and environmental certification of aircraft and related products, parts and appliances as well as for certification of design and production organisations (OJ L 321, 8.12.2009, p. 5–35).

A. Explanatory Note - IV. Content of the draft decision p. 4-9

comment	*17* comment by: *Andreas Lipp* Editorial: ETSO-C161a is based on FAA TSO-C161a, not TSO-C159a.
response	*Noted* Noted. Correct. Apologies for the editorial mistake in the Explanatory Note. This, however, does not affect the content of the proposed ETSO C-161a, while the Explanatory Note will not be reissued.

comment	*33* comment by: *GITA AVIATION* ETSO C90d: We believe there is a typo in para 4 of this text. It should read....date of this **ETSO,** instead of TSO.
response	*Noted* Correct. Apologies for the editorial mistake in the Explanatory Note. This, however, does not affect the content of the proposed ETSO C-90d.

resulting text

CONCLUSION ON COMMENTS ON PART IV (PAGES 4-9) OF THE EXPLANATORY NOTE:

In general, stakeholders shared the summary information provided in NPA 2011-14, having only spotted several editorial mistakes.

CONCLUSION ON COMMENTS ON PART V OF THE NPA (RIA):

No comments were received on the RIA, which means that option 3, as proposed by the Agency, is accepted by the stakeholders.

Nevertheless, the Agency deems it appropriate to provide some additional clarifications and some information on the way forward.

Currently the ETSOs are published on the EASA website as Annexes to the Decisions of the Executive Director[4]. While this process is correct, since it gives transparent visibility

[4] http://www.easa.europa.eu/agency-measures/certification-specifications.php#CS-ETSO.

to documents which have legal value, it makes a bit difficult for the readers to consult a specific ETSO. In fact, there is no guidance on the Decision to which individual ETSOs are attached without opening the related files. Each of those files may contain several ETSOs in a single document to scroll or search.

This is illustrated in Figures 1 and 2:

Current screen vision

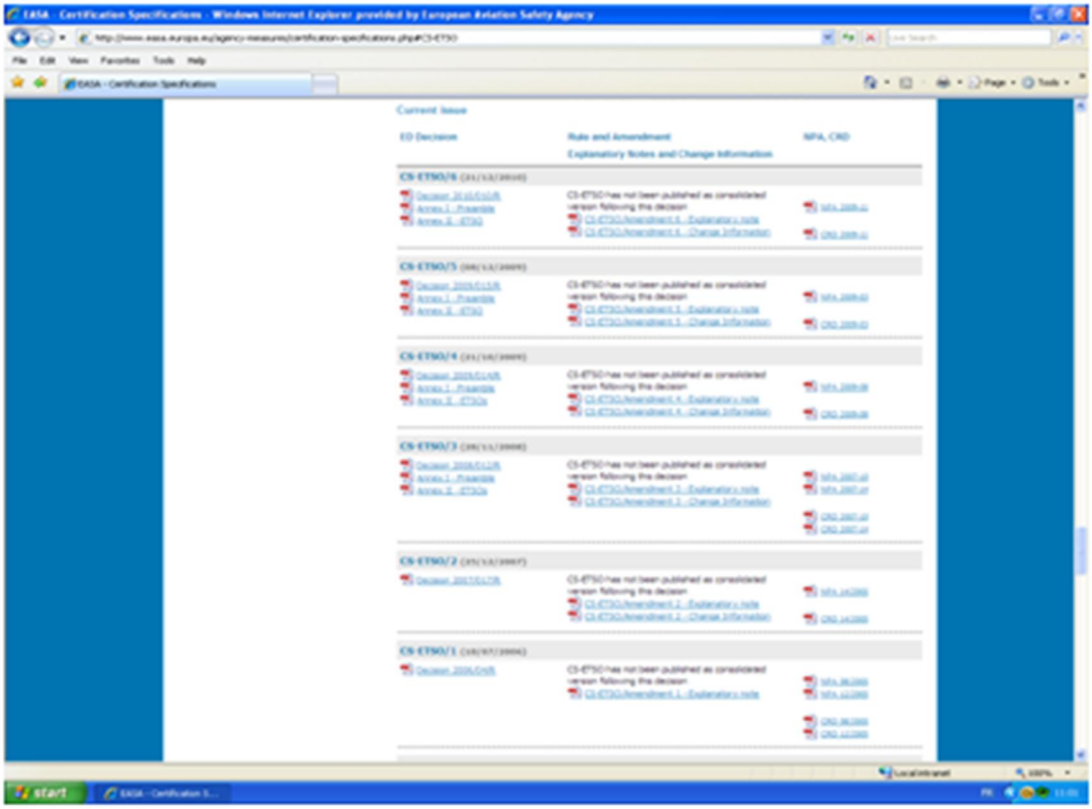


Figure 1: current EASA CS-ETSO portal

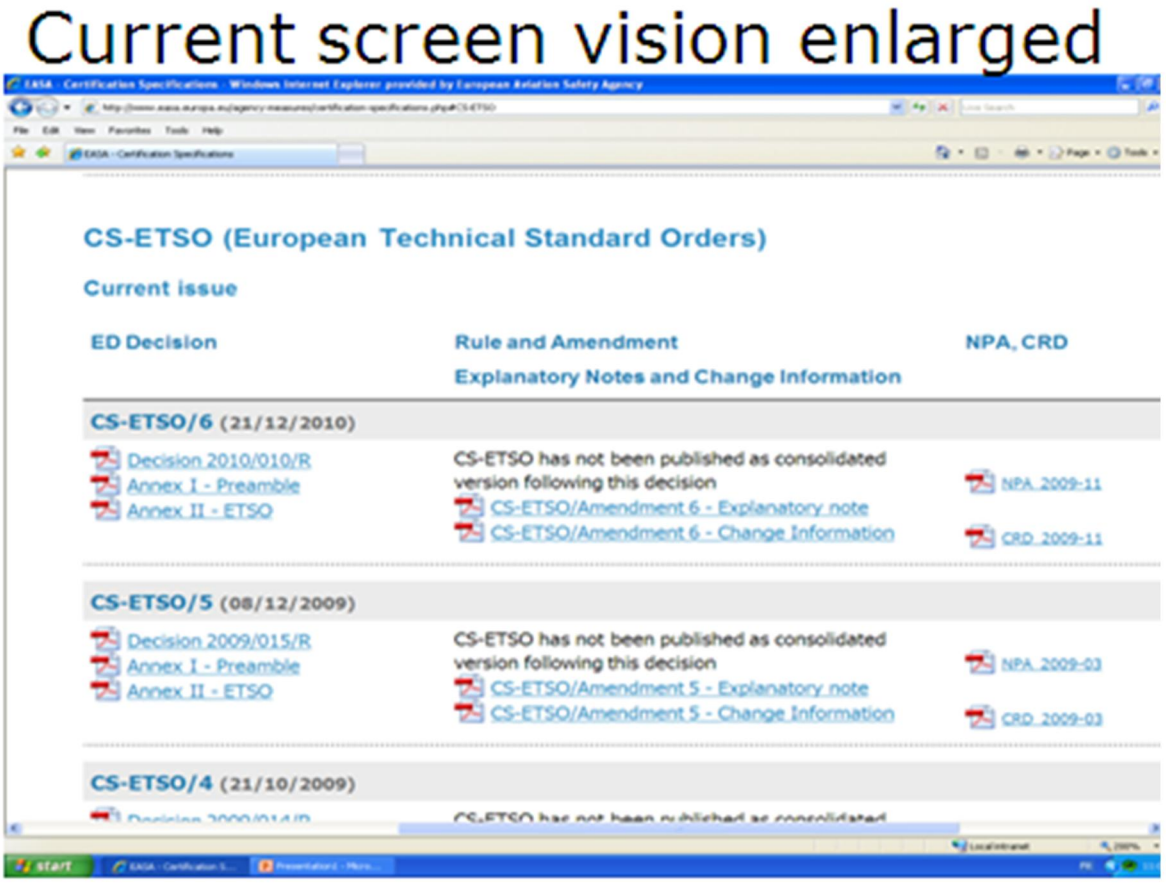


Figure 2: current EASA CS-ETSO portal enlarged

The current Agency's practice summarised above is different from the FAA web practice[5], which allows to access individual TSOs directly (current and past ones), as depicted in Figure 3:

[5] http://rgl.faa.gov/Regulatory_and_Guidance_Library/rgTSO.nsf/Frameset?OpenPage.

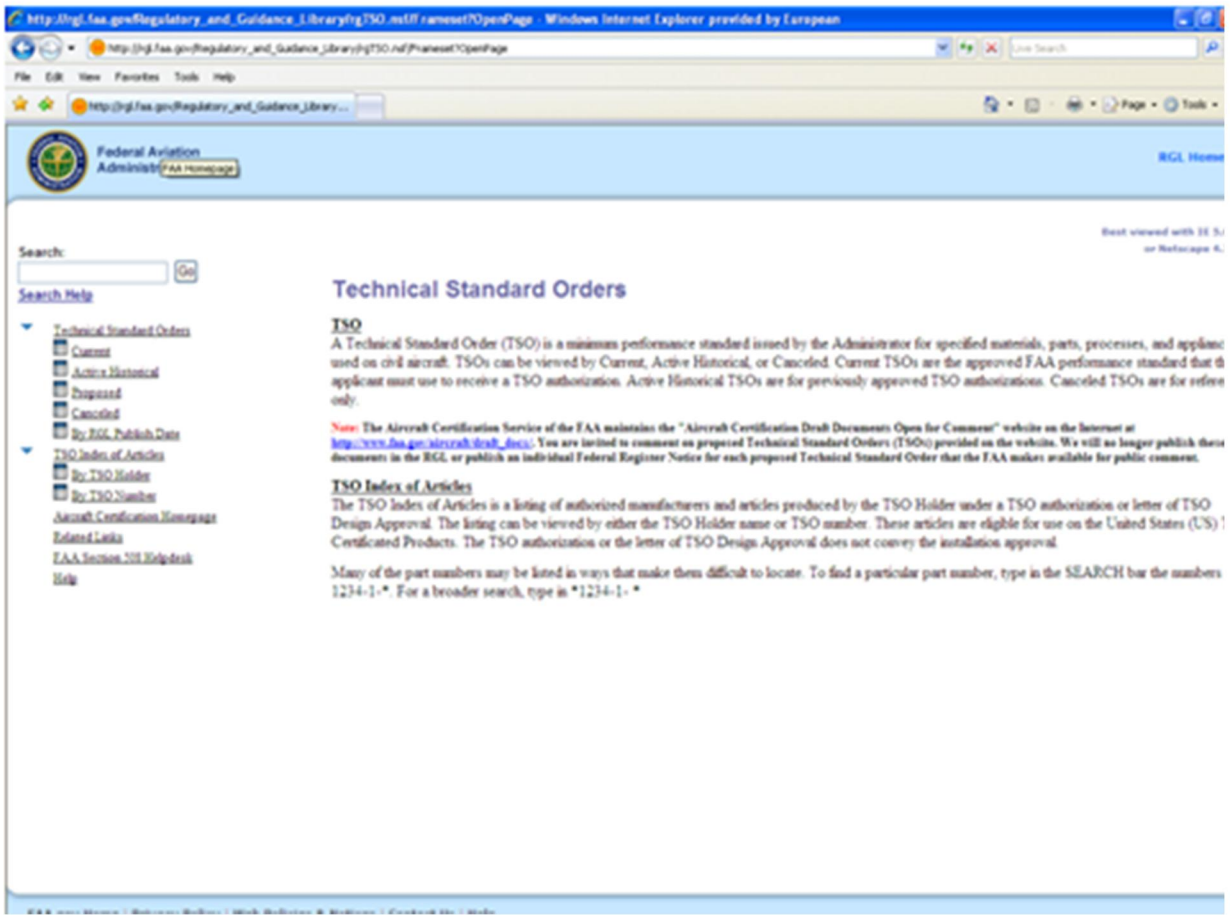


Figure 3: FAA TSO portal

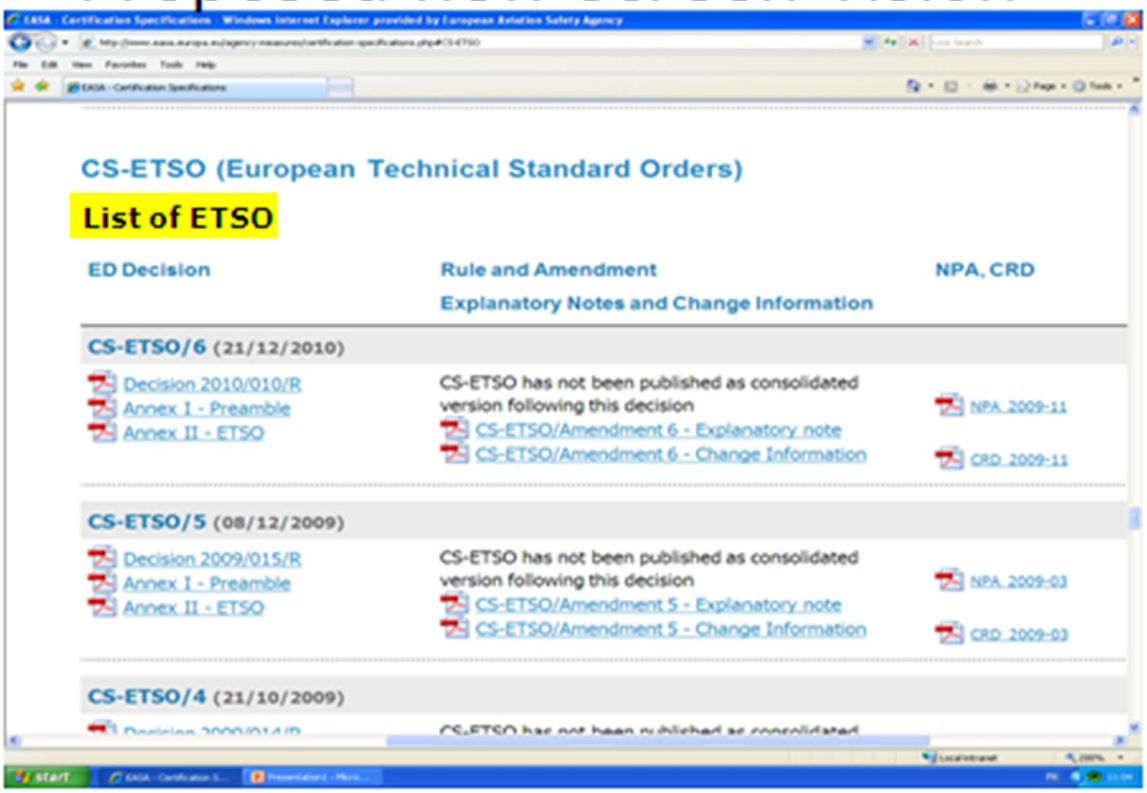
In part V (i.e. RIA) of the NPA, the Agency had therefore expressed its preference for option 3 (similar to the FAA approach):

> *Introduction of new ETSO(s) and transposition of selected TSO specifications into technically similar ETSO(s), published as* ***individual documents directly accessible through a numerically ordered list on the EASA website****.*

The absence of comments from stakeholders is interpreted as support in principle.

Therefore, the Agency will now progress on this road. This could be implemented by basically leaving the CS-ETSO portal in the appearance depicted in Figures 1 and 2 above with the connected legal implications. But on the screen a new field could be added, for instance labelled 'List of ETSOs', as depicted in Figure 4:

Proposed new screen vision



Clicking on the proposed new field will open a table containing No, title, date of adoption and possibly other details of individual ETSOs. The said table will also contain a link leading immediately to the individual ETSO.

B. Draft Decision - I. Draft Decision ETSO - SUBPART A – GENERAL p. 15-16

comment	*13* comment by: *Andreas Lipp* ETSO-C161 must be cancelled, as referring to documents (notably DO-246B without the changes in Appendix A of C161a) that will lead to non-ICAO compliant systems, if not corrected. Refer to section 2 of FAA TSO-C161a, which has not been correctly transposed into ETSO. For details, please see comments on ETSO-C161a.
response	*Noted* ETSO-C161a is automatically superseding ETSO-C161 as soon as the updated CS-ETSO is published, which is considered today as one document containing all ETSO standards as well as subpart A. No new applications will be accepted to

ETSO-C161 once ETSO-C161a is effective.

Other than the FAA, the Agency is not able to prohibit manufacturing once the ETSO authorisation is granted only because an updated ETSO has been published. Consequently, the Agency is not able to transpose the section 2 of the FAA TSO-C161a in the same way, since the US and EU regulatory system are legally different. However, as all approvals granted today by EASA are validations of US TSO approvals, there is no need to implement specific measures, as the US system has already taken care of the issue.

comment *28* comment by: *Jean-Jacques MACHON*

In accordance with the comments expressed on ETSO-C90d paragraph 3.1, MPS and ETSO-C172 paragraph 3.1, MPS (see these), request adding the procurement address for ISO International Standards :

" ISO documents may be purchased from:
- each national Standards Institute, or
- International Standards Organization (ISO), 1, rue de Varembé, Case postale 56, CH-1211 Geneva 20, Switzerland (web site: www.iso.org). "

Submitted by:
Jean-Jacques Machon
V.Chair ISO TC20 SC9

response *Not accepted*

See comment to the requested change. As the change is not accepted, there is no need to add the reference.

comment *29* comment by: *THALES-Avionics*

Reference RTCA is missing for issues E and F, and reference to EUROCAE is missing for issue G.

Text already published in CS-ETSO (Amendment 6 – 21/12/2010): *Unless otherwise stated in paragraph 3.1.2 of the specific ETSO, the applicable environmental standards are contained in EUROCAE/RTCA document ED-14D change 3/DO-160D change 3 "Environmental Conditions and Test Procedures for Airborne Equipment", dated December 2002, or ED-14E/DO-160E dated March 2005 or ED-14F/DO-160F dated March 2008.*

Proposition: to take already published text though CS-ETSO Amdt6 (21/12/10) and add "or *or ED-14G/DO-160G dated December 2010."*

response *Accepted*

Resulting text presented in Appendix A.

comment	*58* comment by: *Garmin* The paragraph is missing text from the existing Subpart A released in ED Decision 2010/010/R (dated 14/12/2010). From existing: Unless otherwise stated in paragraph 3.1.2 of the specific ETSO, the applicable environmental standards are contained in EUROCAE/RTCA document ED-14D change 3/DO-160D change 3 "Environmental Conditions and Test Procedures for Airborne Equipment", dated December 2002, or ED-14E/DO-160E dated March 2005 or ED-14F/DO-160F dated March 2008. The highlighted text should be added back to the proposed text to allow DO-160 Revision E and F to be used for project development.
response	*Accepted* EASA thanks Garmin for having spotted this editorial error. Resulting text presented in Appendix A.

resulting text

CONCLUSION ON COMMENTS ON PART I OF THE DRAFT DECISION:

In general, stakeholders accepted the list of proposed ETSOs for both Index 1 and Index 2. In addition, they suggested editorial improvements to Subpart A which have been accepted and are presented in the resulting text in Appendix A.

B. Draft Decision - I. Draft Decision ETSO - ETSO C55a p. 17-18

comment	*59* comment by: *Garmin* Segment 3.2 Pg 17 Remove "None" under Specific. There is an entry under this section so None is incorrect.
response	*Accepted* EASA thanks Garmin for spotting this editorial error. Resulting text is in daft ETSO C55a in Appendix A.
comment	*60* comment by: *Garmin* Segment 3.2.1

Pg. 18

Incorrect terminology for DAL assignment: "Develop each fuel and oil quantity instrument to at least the design assurance level equal to the failure condition classification of the system on which the fuel and oil quantity instrument is installed."

DALs aren't equivalent to failure condition classifications (reference SAE ARP 4754A). DALs are assigned using an analysis of the aircraft, system, and failure condition. Therefore a CAT condition doesn't always require an item's DAL to be A, a HAZ condition doesn't always require an item's DAL to be B, etc.

Suggest text to state "Develop each fuel and oil quantity instrument to at least the design assurance level assigned from a safety analysis of the failure condition classification for the system on which the fuel and oil quantity instrument is installed."

response *Accepted*

Resulting text in daft ETSO-C55a in Appendix A:

The failure condition classification will depend on the system on which the fuel and oil quantity instrument is installed. The classification must be determined by the safety assessment conducted as part of the installation approval. Develop each fuel and oil quantity instrument to at least the design assurance level assigned to the system on which the fuel and oil quantity instrument is installed.

comment *61* comment by: *Garmin*

Segment 4.2.a.(2)
Pg. 18

Suggest removal of this item. The Environmental Qualification Form (or equivalent) for the unit identifies this and other environmental qualifications, of which this section doesn't appear to be more important than other qualifications (e.g. temperature, vibration, waterproofness, HIRF/Lightning). Also, many units are too small to include this and all other information that is required to be included on the unit.

response *Not accepted*

The marking is kept for harmonisation with the corresponding TSO and there is a potential risk in mixing fluids. Consequently, it makes sense to mark the instrument including identification of the fluid for which it is designed.

Should the marking be not practical, e.g. in case of implementation of only the instrument part of the system, the industry can apply for an appropriate "deviation".

comment *62* comment by: *Garmin*

4.2.b.(3)
Pg. 18

This section contains the text:

"3) Each subassembly of the fuel and oil quantity instrument that you determined may be interchangeable."

The language for this requirement is confusing. This could mean that a stuffed printed circuit board needs the ETSO number.

Suggest removing the statement or if removing causes problems work with industry to establish wording that is better understood.

response *Accepted*

Even though the newest FAA TSO template still uses that wording, the resulting text of ETSO C55a, as presented in Appendix A, removes the whole (b) section of that paragraph. In fact, there is already a reference to the high-level marking requirement rule 21A.807 (section 4.1) in Part-21 mentioned above.

comment *63* comment by: *Garmin*

4.2.c
Pg. 18

This section contains the text:

"Either way, you must include a means to show the modification status."

This should be about configuration. Suggest rewording:

"Either way, you must include a means to show the hardware and software configuration, where applicable."

response *Not accepted*

The wording is in line with the wording used in the corresponding TSO. The requirement has more the character of a reminder and leaves it open to the industry how the configuration identification is done. The proposed way is through a modification status identifier, added to the part number and used widely in the industry, but the requirement is open enough to allow other methods to meet the intent.

comment *64* comment by: *Garmin*

Segment: General
Pgs. 17-18

Suggest reviewing Deviations previously approved for ETSO-C55 and incorporating deviations as allowances in updated ETSO. Specifically

ETSO-C55#2 (Allow indicating means to use ETSO-C113/SAE AS8034 Section 4.2), ETSO-C55#3 (Allow FUEL QTY to be substituted for "Fuel Quantity", and ETSO-C55#4 (Use DO-160 instead of AS 405C, as-is it looks like both or only 405C is required)

response | *Not accepted*

The approach from the industry to avoid deviations is understood. However, the Agency considers the technical differences not severe enough to justify a regulatory difference from the corresponding FAA TSO. Without the requested provision the manufacturer has to consult with EASA and the FAA to have the deviations granted. In respect of the environmental test criteria, the Agency clarifies that SAE AS 405C makes no reference to EUROCAE ED-14() or RTCA DO-160() in the environmental test criteria but defines its own, specific test procedures. The Agency recommends to the industry working with SAE to update AS 405C to allow the use of e.g. RTCA/DO-160G as the environmental test procedure.

resulting text

CONCLUSION ON COMMENTS ON DRAFT ETSO-C55a:

A few comments have been received to improve the text of the proposed ETSO-C55a. About 50% of them were accepted. Regarding the other comments, the reason of rejection was explained above.

The resulting text of ETSO-C55a is contained in Appendix A.

B. Draft Decision - I. Draft Decision ETSO – ETSO-C62e p. 19-36

CONCLUSION ON COMMENTS ON DRAFT ETSO-C62e:

No comments were received on the proposed ETSO-C62e (Aircraft tyres). The proposed text therefore remains as drafted in the NPA 2011-12 and will not be published again in this CRD.

B. Draft Decision - I. Draft Decision ETSO - ETSO C90d p. 37-38

comment | *1* comment by: *Nordisk Aviation Products*

Para. 3.1.1

Comment
Reference should be made to the corresponding ISO version of NAS 3610.

Rationale for Comment
Some countries may have problems referencing SAE documents, and would prefer reference to ISO documents instead for LODA applications.

Recommendation
At the end of first section, add "For LODA applications, ISO 8097 is technically equivalent to NAS 3610 Rev.10."

Para. 3.1.1

Comment
Reference should be made to the corresponding ISO version of AS 36100.

Rationale for Comment
Some countries may have problems referencing SAE documents, and would prefer reference to ISO documents instead for LODA applications.

Recommendation
At the end of second section, add "For LODA applications, publicly available specification ISO 21100 is equivalent to AS 36100 Rev. A."

Para. 3.1.1

Comment
Reference should be made to the corresponding ISO version of AS 36102.

Rationale for Comment
Some countries may have problems referencing SAE documents, and would prefer reference to ISO documents instead for LODA applications.

Recommendation
At the end of third section, add "For LODA applications, ISO technical report TR 8647 is equivalent to AIR1490B."

Para. 3.2

Comment
Environmental degradation of Textiles should also reference other non-metallic structural ULD materials

Rationale for Comment
Although AIR1490B is referencing materials primarily used for nets only, authorities (primarily FAA and EASA) already require some substantiation of Environmental degradation of other non-metallic structural ULD materials as required by AS 36100 paragraph 4.11. However, paragraph 3.2. may be interpreted as this requirement only being relevant for nets the way it is currently written.

Recommendation
At the end, add "Also note that AS 36100 Rev. A paragraph 4.11. requires that environmental effects shall be taken into account for all ULD non-metallic materials, not only nets.

Para. 4.1 / 4.2

Comment

Marking of serial number should be required (FAA TSO specifies this in TSO C90d, EASA in Part 21A.807)

Rationale for Comment
The majority, maybe all, of OEM's already mark all ULD's with serial number, which is a great advantage for traceability reasons.

Recommendation
Assuming Part 21A.807 cannot be changed, in ETSO C90d add under 4.2: "The serial number of the article, with option to add date of manufacture"

Para. 4.2.2

Comment

Requirements for marking of weight of article should be removed

Rationale for Comment

1. The need for marking of article weight has been discussed between airlines, OEM's, handlers and authorities, and nobody see any need for this requirement since the need is to know weight of the loaded container for aircraft balance – weight of empty container has no impact on this.

2. Very few ULDs in service are actually marked to the nearest pound weight, both due to production variation of materials causing much larger variation from unit to unit than one pound, weight will also be affected during repair. OEM weight marking is usually based on a statistical average.

3. Actual weight varies with climate. Just a little water moisture or dew/condensation can add several pounds of weight to an empty container.

4. Requirement for marking of article weight in AS36100 was only added due to already existing as requirement TSO C90c. SAE will look into removing this requirement from future revisions of AS36100 if it is removed as requirement for TSO C90 marking.

5. This requirement is not part of ETSO C90c, and will presumable be removed from TSO C90d based on the above arguments presented to FAA. It will also cause confusion whether nearest kilo or pound should be used.

Recommendation
Remove 4.2.2.

response

Noted

Response to 3.1: Noted

Agency has not reviewed ISO or any other documents, beyond what is already included in the ETSO, for acceptable use. This prevents them from being included in the ETSO. An applicant, whether European or international, may request permission to use another standard by applying for a deviation per already mentioned Part-21 Subpart O.

Response to 3.2: Accepted

In paragraph 3.2 the following is added:

"Environmental degradation due to ageing, ultra-violet (UV)-exposure, weathering, etc. for any materials used in the construction of pallets, nets and containers must be considered."

Response to 4.1/4.2: Accepted

In paragraph 4.2 the following is added:

"The manufacturer's serial number of the article, with the option to add the date of manufacture."

Response to 4.2.2: Partially accepted

For practicality reasons the wording in paragraph 4.2 will be changed to read:

"The nominal weight of the article in kilogramme and pound in the format:

Weight: …kg (…lb)"

Resulting text of proposed ETS-C90d is contained in Appendix A.

comment 4 comment by: *Amsafe Bridport*

ETSO C90d

Note: The same comments were submitted to FAA for TSO C90d

Comment 1 (Ref: Para 3.2)

Environmental degradation of textiles aspect should be applicable to all structural non-metallic materials - not just pallet nets.

Due to the wording used in ETSO C90d where nets are specifically mentioned, the paragraph may be misinterpreted as applicable to nets only - but AS36100 Rev A paragraph 4.11 requires environmental effects shall be taken account for all ULD non-metallic materials.

Suggestion: Amendment of wording to the effect that: This aspect is applicable to nets and all structural non-metallic materials used in a ULDs construction. For example; fabric container doors, composite panels etc.

Comment 2 (Ref: Para 3.2 and 4.2)

Life limitations on nets, textiles and all ULD made from structural non-metallic materials that degrade should be mandatory for operational adherence - not subject to interpretation of acceptable condition by visual inspection.

There is currently no clear requirement to life limit the parts or equipment that is known to degrade, nor to mark this life limit on the equipment.

Suggestions: Amendment of wording to the effect that for nets and ULD constructed from non-metallic materials, or the non-metallic replaceable components thereof, a life limit shall be specified and marked on the equipment.

In Para 4.2. Suggest life limit is added to marking requirements. This limit can either be an expiry date or as years/months from a date provided (date of manufacture or delivery to operator) e.g. 'Expiry Date:06 May 2014' or 'Life Limit: 3 yrs from 06 May 2011'.

Comments 3 (Ref: Para 4.1)

The ETSO requires marking as detailed in CT-ETSO Subpart A Paragraph 1.2 (which leads to Part 21 Section A Subpart Q, which then leads to 21A.807…). One of the specific requirements (which have been same for a long time) is that the article must be marked with 'Serial Number or Date of Manufacture of the article or both'.

ULD are necessarily moving from aircraft to aircraft, between operators, from airport to airport. ULD are also made in large volumes – with hundreds of thousands, if not millions of articles in service globally. Strong and precise traceability is essential for ULD. Date of manufacture is not sufficiently precise or strong – the same date can be shared by 1000s of units, all with the same PN, scattered across the globe. A unique serial number on each article helps identify and prevent 'bogus/copied' equipment. It also identifies specific units. The majority of the industry are using serial numbers.

Suggestion: Marking a serial number should be mandatory. This ensures identification and traceability of each article. The date of manufacture can still form part of the serial number if desired (and is essential for life limited parts), but it should be mandatory each article has a unique identification code.

Comments 4 (Ref: Para 4.2.2)

The ETSO requires the marking of the weight of the article to the nearest

kilogram or pound, with the applicable unit.

In service the weight of the ULD varies due to climate (water), damage, repair etc. The weight variance is greater than the one pound tolerance.

The weight of the ULD is of no consequence to the aircraft W&B or loading. Weight marking serves no airworthiness or certification role. In practice, each ULD inclusive of its cargo must be weighed prior to aircraft installation.

Suggestion: Remove requirement to mark the weight of the article, whilst ensuring this is harmonized with requirements in FAA TSO C90d.

response

Accepted

Response to comment 1: Accepted

In paragraph 3.2 the following is added:

"Environmental degradation due to ageing, ultra-violet (UV)-exposure, weathering, etc. for any materials used in the construction of pallets, nets and containers must be considered."

Response to comment 2: Accepted

In paragraph 4.2 the following is added: "If applicable, the expiration date in the format "EXP YYYY-MM" must be marked on the ULD."

Response to comment 3: Accepted

In paragraph 4.2 the following is added: "The manufacturer's serial number of the article, with the option to add the date of manufacture."

Response to comment 4: Accepted

For practicality reasons, the wording in paragraph 4.2 is changed to read:

"The nominal weight of the article in kilogramme and pound in the format:

Weight: …kg (…lb)"

Resulting text of proposed ETS-C90d is contained in Appendix A.

comment

11 comment by: *GPI*

Comments ETSO C90d

Parag. 3.2 Specific
Comment:
This paragraph does not give a clear PASS/FAIL technical criteria for evaluation of textile performance when expose to environmental factors.

It widely opens evaluation of conformity to interpretations by both applicants and authorities.

In this respect it could not guarantee a common minimum performance for products proposed by different applicants and evaluated by different EASA PM.

Rationale for comment
SAE AIR 1490B data demonstrates that textile performance when exposed to environmental factors is highly depending on fiber (Polyester, Nylon,…), with possibly difference between similar fiber of different performance (dtex value) or different fiber supplier.

But tests results also clearly show that weaving design, webbing/rope breaking

strength, width, thickness, color, type of dying agent, and also coating, have an extreme influence on UV resistance.

Problem is that SAE AIR 1490B does not give the detailed technical specifications of the different products tested.

In these conditions, how could the applicant take into account partial and highly variable technical data to substantiate performance of its own unique textile material?

Recommendation
a) Long term solution

Consider revising paragraph 3.2 to propose uniform PASS/FAIL criteria which is the only way to guarantee a common minimum performance for all products. A simple, clear and unquestionable PASS/FAIL criteria could be to load test the textile material before and after defined artificial weathering.

(b) Interim action:

The above, though more appropriate, is not readily available today, and should be set as a research goal. Yet, the wording of the current § also is inappropriate, for the reasons stated. Recommend considering a wording amendment such as:

Textile performance: See SAE Aerospace Information report (AIR) 1490B, Environmental Degradation of Textiles dated December 2007 for available data for textile performance when expose to environmental factors. These data may *(not "shall")*, be taken into account for expected storage and service life to satisfy SAE AS 36100 revA paragraph 4.11. NOTE: Environmental degradation data others than that documented in AIR1490B may be used, if substantiated by the applicant and approved by EASA."

Parag. 4.2 Specific
Comment:
"In addition, the following information shall be legibly and permanently marked on the major components"

Wording " the major components" is extremely confusing. What part/subpart of the material should be marked???

Rationale for comment
What is (are ??) the major components of a container, a pallet or a net ??

Container, pallet and nets are delivered as one piece products: this may lead to conclude that one label/marking is required.

But container, pallets and nets are reparable and some components are supplied as spare. Are these "major components" which need to be marked ?? .

Requirement in para 4.2.1 to 4.1.4 is marking according to NAS 3610 or SAE AS 36100 and CS-ETSO subpart A para 1.2. These require one marking by material.

Recommendation
Considering a wording amendment such as:

"In addition, the following information shall be legibly and permanently marked on the major part of the material"

response

Noted

Response to comment to para 3.2: Noted

a) Long-term solution:

The criteria for degradation of cargo net material (or any other material) are that at the life limit declared by the manufacturer the net (or material) must still meet the minimum performance requirements of ETSO-C90d.

The SAE AGE-2A committee has set up a dedicated working group addressing material degradation as well as testing of cargo nets.

b) Interim solution:

A deviation, based on already mentioned rule 21A.610 in Part-21, may be applied for using an alternate means of compliance.

Response to comment to para 4.2: Accepted

Wording of 4.2 will be revised to read:

"In addition, the following information shall be legibly and permanently marked on the ULD: …"

Resulting text of proposed ETS-C90d is contained in Appendix A.

comment *18* comment by: *Jean-Jacques MACHON*

Attachment #1

3.1.1 MPS

It appears inappropriate for the European authorities and certain third party governments to exclusively refer to U.S. (AIA and SAE) standards. As is already the case with e.g. EUROCAE ED-14/RTCA DO-160 in CS-ETSO Subpart A paragraph 2.1, where two identical standards are published in the U.S. and internationally they should both be referred to as acceptable equivalents, as follows:

"... Aerospace Industries Association ... NAS 3610, Revision 10, dated November 1, 1990 / International Organization for Standardization ISO 8097 "Aircraft - Minimum airworthiness requirements and test conditions for certified air cargo unit load devices", 4th edition, dated August, 2001.

... (SAE) Aerospace Standard (AS) 36100, ... , Revision A, dated April, 2006 / International Organization for Standardization ISO 21100 "Air cargo unit load devices - Performance requirements and test parameters, 1st edition, dated October, 2011."

Note 1:

As regards NAS 3610 Revision 10, there are also technical reasons for referring in parallel to its ISO 8097 equivalent: as published, it contains significant printing errors, that are corrected in ISO 8097 4th edition. Should EASA, regrettably, elect to exclusively refer to NAS 3610 Revision 10, then it would be a must to explicitly list the necessary corrections, as follows (comment also expressed to the FAA as to TSO-C90D):

"When using NAS 3610 Revision 10, the following errors must be corrected:

- in lieu of Figure 31, sheet 87, substitute Figure 31, sheet 88;

- in lieu of Figure 31, sheet 88, substitute Figure 32, sheet 87 of NAS 3610 Revision 8 dated April 1987, referred to in previous ETSO-C90c."

Note 2:

Being the author of both AS 36100A and ISO 21100, which had been developed together as intended NAS 3610 replacement under an ISO TC20/SC9 mandate, I confirm that both documents are technically absolutely identical. See attached copy of ISO 21100.

3.2

In accordance with the comment on 3.1.1, it is requested to add:

"In lieu of NAS 3610 Rev. 10, paragraph 3.7 / ISO 8097 4th edition, paragraph 3.7 and SAE AS 36100 Rev. A, paragraph 4.7 / ISO 21100 paragraph 4.7, use the following paragraph ..."

Textile Performance:

Environmental degradation must also be taken into account for all non-metallic materials, other than textiles solely addressed by SAE AIR 1490B, specially insofar as new composite materials are increasingly used. Recommend adding :

" Environmental degradation:

The effect of environmental degradation on all non-metallic materials shall be taken into account.

Textile performance: see SAE AIR 1490B, Environmental Degradation of Textiles, dated December 2007 ... to satisfy SAE AS 36100 Rev.A, paragraph 4.11 / ISO 21100 paragraph 4.11.

(comment also expressed to the FAA as to TSO-C90D)

4 - Marking

4.2-1. Recommend adding :

"In addition, the word "ETSO-C90d", followed by the identification of the article ..."

This is in accordance with FAA TSO-C90D paragraph 4.a (4), as well as to conform with long established industry usage to clearly differentiate any non-TSO containers and avoid overlooking or misunderstanding the 4 characters identification code.

4.2-2. "Weight of the article" does not specify whether individual unit weight or production average. Request adding "The production average weight of the article ..."

Also, a European regulation should not call for "or pounds", both legally and because one of the constant industry problems has always been mistakes at airports between kg and lb markings notwithstanding all efforts. Request deleting "or pound, with the applicable unit".

Should however EASA, regrettably, elect to keep "kilogramme or pound", then 1 lb accuracy is quite difficult to achieve, and would recommend to harmonize accuracy by stating "... to the nearest kilogramme or even figure in pounds, with the applicable unit" (comment also expressed to the FAA as to TSO-C90D).

4.2

The ETSO contains no mention of possible deviations at approval. Though infrequent, such deviations happen, and often include restrictive conditions of use. It is impossible in operations to identify such a unit load device and therefore any applicable restrictions unless it is clearly marked as such. Accordingly, recommend adding:

"If the article includes a deviation in accordance with Part 21 Subpart O paragraph 21A.610, the abbreviation "DEV" shall be marked after the ETSO number and the article's identification code per 4.2-1."

This is in accordance with FAA TSO C-90D paragraph 4.c.

Submitted by:
Jean-Jacques Machon
V.Chair ISO TC20 SC9

response

Noted

Response to MPS: Noted

The Agency has not reviewed ISO or any other documents, beyond what is already included in the ETSO, for acceptable use. This prevents them from being included in the ETSO. An applicant, whether European or international, may request permission to use another standard by applying for a deviation per Part 21 Subpart O.

Response to Note 1: Accepted

Under 3.1.1 the following wording is added for Type I ULDs:

"When using NAS 3610 Revision 10, the following errors must be corrected:

- in lieu of Figure 31, sheet 87, substitute Figure 31, sheet 88;

- in lieu of Figure 31, sheet 88, substitute Figure 32, sheet 87 of NAS 3610 Revision 8 dated April 1987"

Response to Note 1: Noted

Refer to above comment.

Response to Note 3.2: Accepted

In paragraph 3.2 the following is added:

"Environmental degradation due to ageing, ultra-violet (UV)-exposure, weathering, etc. for any materials used in the construction of pallets, nets and containers must be considered."

Response to Note 4.2: Partially accepted

§ 4.2.1: The requirement to mark the ULD with "ETSO-C90d" is already expressed by 4.1 (CS-ETSO Subpart A para. 1.2).

§ 4.2.2: For practicality reasons the wording in paragraph 4.2 is changed to read:

"The nominal weight of the article in kilogramme and pound in the format: Weight: …kg (…lb)"

§ 4.2: The marking of deviations is not required. Deviations are addressed in the manufacturers design documentation to be considered for installation of the articles as well as their operation. In the official published version of TSO-C90d the FAA has changed the deviation marking to become an optional requirement (deviations should be marked …).

Resulting text of proposed ETS-C90d is contained in Appendix A.

comment	*34* comment by: *GITA AVIATION* 3.1.1: FOR NETS: We believe that the introduction of AS 36102 as the universal agreed testing methode is not appropriate at that time. SAE WG AGE-2A is working on a proposal for a revised AS 36102 with special application of cargo nets. This task may be closed in due time and should then be introduced as the standard. The introduction of AS 36102 in the current version is undue burden for new developed cargo restraint nets. The standard focusses mostly on container and pallets but not on nets. For example: the standard in 3.1.2. calls for 3 second stabilisation between each step of test load: We believe the paragraph could be fully be compliant using different methods such as continuing with the load application and identifying the load 3 seconds prior to the failure of the net. 3.2.: We do not agree with the proposal that SAE AIR 1490B is an appropriate document to substantiate the lifetime (degradation) of the material a cargo net is manufactured of. Reason for our comment: The report does not identify the testing standards, the conditions under which this material is being stored/handled etc. and last not least it does not provide detailed information on the specification of the individual materials tested, or are not used anymore for current approved nets. We would propose following text instead: **"The applicant has to provide substantiation of the effects of environmental degradation on nets commensurate with the expected storage and service life to satisfy SAE AS 36100 Rev. A, paragraph 4.11.** **Note: In absents of experience or analytical data the document AIR 1490B may be used to substantiate the environmental degradation"** 4.1.: Type I: For type I ULD it might be necessary to have in addition the wording previously used in 3.1.1.: ..."In Lieu of NAS 3610...." since the NAS document is very specific and slightly different from the ETSO marking standards. 4.2.: 1b) Both space as well as rational would allow to reduce the marking to the type of Net or pallet only. The addition of the SAE reference is conclusive if it is a C90d ULD! We would appreciate the removal of the AS 36100 reference and limit to the model only. Given the example in 3.5 of the SAE standard to reduce it to: "2A7P" only. 2) since a number of years [kg] is the European standard. I would appreciate a clarification that "KG" must be present while any other standards may be used in addition - but not alternatively.
response	*Noted* *Response to 3.1: Noted* At the time of publication of ETSO-C90d the only acceptable and available testing method for ULD is described in AS 36102. However, SAE WG AGE-2A is tasked to work on a new standard specifically addressing qualification testing as well as degradation substantiation for cargo nets. This task may be positively terminated in due time. The Agency plans to possibly introduce it in a future revision of ETSO-C90, e.g. in the context of RMT.0206 (former ETSO.011) or later, depending on the progress made by SAE.

In the short term, if an applicant chooses alternative means for qualification testing of cargo nets, the deviation process per rule 21A.610 in Part-21 allows to manage those cases.

Response to 3.2: Noted

a) Long-term solution:

The criteria for degradation of cargo net material (or any other material) are that at the life limit declared by the manufacturer the net (or material) must still meet the minimum performance requirements of ETSO-C90d.

The SAE AGE-2A committee has set up a dedicated working group addressing material degradation as well as testing of cargo nets.

b) Interim solution:

Deviations approved on the basis of mentioned rule 21A.610 allow the use of alternate means of compliance.

Response to 4.1: Noted

Specific marking for type I ULD in addition to the marking required in para. 4.1 is addressed in para. 4.2.1.a.

Response to 4.2: Partially accepted

Marking of the related code (NAS 3610 for type I ULD, AS36100 for type II ULD) and "ETSO-C90d" (required by CS-ETSO subpart A para. 1.2) would sufficiently address the requirement. It was not the intention to explicitly require "NAS 3610" or "AS36100" to be marked on the article. The related code does sufficiently indicate if the article would be a type I or type II ULD.

§ 4.2.2: For practicality reasons, the wording in paragraph 4.2 will be changed to read:

"The nominal weight of the article in kilogramme and pound in the format:

Weight: …kg (…lb)"

The resulting text of the proposed ETS-C90d is contained in Appendix A.

resulting text

CONCLUSION ON COMMENTS ON DRAFT ETSO-C90d:

Some comments have been received to improve the content of the proposed ETSO-C90d. Most comments were accepted. Regarding the other comments, the reason for rejection was explained above.

The resulting text of ETSO-C90d is contained in Appendix A.

Furthermore, the Agency plans to consider amending once more ETSO-C90 (i.e. from 'd' to 'e') with a view to possible inclusion in the planned Rulemaking Task RMT.0206 (former ETSO.011) or through a later RMT task, depending on the progress made by SAE.

B. Draft Decision - I. Draft Decision ETSO - ETSO C95a p. 39-40

comment *65* comment by: *Garmin*

Segment 3.2
Pg. 39

Remove "None" under Specific. There is an entry under this section so None is incorrect.

response *Accepted*

The resulting text of ETSO-C95a is contained in Appendix A.

resulting text

CONCLUSION ON COMMENTS ON DRAFT ETSO-C95a:

A stakeholder suggested a minor change to ETSO-C95a which was accepted.

The resulting text of ETSO-C95a is contained in Appendix A.

B. Draft Decision - I. Draft Decision ETSO - ETSO C126a p. 41-42

comment *2* comment by: *Pascal DELROT*

Currently have product certification paused for ETSO-C126 and a similar product certification pending for TSO-C126a.

Upgrade of paused certification from ETSO-C126 to ETSO-C126a will require some additional work, which I prefer to avoid, but no reason to not update the ETSO-C126 to C126a.

What about DO-254/ED-80 certification ? Present in TSO-C126a, not un ETSO-C126a/CS-ETSO. For other TSO as ETSO-C119 it is written explicitly.

response *Not accepted*

In paragraph 3.1.4 a reference to CS-ETSO Subpart A, paragraph 2.3 is included which makes applicable the certification requirements for complex hardware; in turn, referencing DO-254/ED-80. ETSO-C119c had been developed and published before the mentioned text of Subpart was introduced.

comment *66* comment by: *Garmin*

Segment 3.1.1
Pg. 41

Incomplete spelling. "Februar" needs to be February.

response | *Accepted*

Thanks. The resulting text of ETSO-C126a is contained in Appendix A.

resulting text

CONCLUSION ON COMMENTS ON DRAFT ETSO-C126a:

A stakeholder suggested a minor change to ETSO-C126a which was accepted. A different comment was rejected with the explanation that the technical content proposed is already accommodated in CS-ETSO.

The resulting text of ETSO-C126a is contained in Appendix A.

B. Draft Decision - I. Draft Decision ETSO - ETSO C154c p. 43-44

comment | *67* comment by: *Garmin*

3.1.1
Pg. 43

Editorial "RTCA DO-282B", add a "/" after RTCA.

response | *Partially accepted*

Text changed to: 'Radio Technical Commission for Aeronautics (RTCA) Document DO-282B'. The resulting text of ETSO-C154c is contained in Appendix A.

comment | *68* comment by: *Garmin*

4.2
44

The table under section 4.2 is incomplete. "Sample marking pattern:" for the last row should contain the follow text:

UAT Diplexer
A/U -0.x dB
A/T -0.x dB

Above text came from TSO-C154c

response | *Accepted*

Thanks. The resulting text of ETSO-C154c is contained in Appendix A.

resulting text

CONCLUSION ON COMMENTS ON DRAFT ETSO-C154c:

Two stakeholders suggested changes to the proposed ETSO-C154c. Both comments were at least partially accepted.

The resulting text of ETSO-C154c is contained in Appendix A.

B. Draft Decision - I. Draft Decision ETSO - ETSO C157 p. 45-46

comment *8* comment by: *FAA*

We propose that EASA incorporates TSO C157a. TSO C157 is being revised to C157a, and is currently out for public comment.

response *Accepted*

The proposed ESTO has been changed to ETSO-157 revision 'a', since corresponding FAA TSO-157a is now published.

The resulting text of ETSO-C157a is contained in Appendix A.

comment *69* comment by: *Garmin*

3.1.1
Pg. 45

Editorial: The MASPS should be referenced as RTCA/DO-267A

response *Accepted*

See responses to comment 67 (to ETSO C154c) and comment 8 above.

The resulting text of ETSO-C157a is contained in Appendix A.

comment *70* comment by: *Garmin*

3.1.1
Pg. 45

RTCA/DO-267A is dated 29 April 2004

response *Accepted*

The resulting text of ETSO-C157a is contained in Appendix A.

comment	*71* comment by: *Garmin* 3.2.1 Pg. 45 Failure Condition Classification is airframe dependent. Suggest removing text specifying failure of the function is a minor failure condition.
response	*Not accepted* Reference to CS-ETSO Subpart A, and in particular to paragraph 2.4 therein, is included in the proposed ETSO C157. That paragraph explains further options. However, when defining a function in an ETSO, the Agency sees it not appropriate to establishing in the ETSO that a failure of that system will produce "no effect". On one side such a severity classification would demand 'no requirement' and therefore neither tracking nor verification during the software or complex hardware design. On the other side, the actual effect of a failure condition of a part has to be assessed against a defined scenario and for parts installed on aircraft. In conclusion, systems certified against the proposed ETSO-C157 should be developed at least for a failure classification of 'minor'. Nevertheless, the requirement leaves the industry free to select a more stringent severity classification, if deemed appropriate, while safety assessment at aircraft level, will remain necessary.

comment	*72* comment by: *Garmin* 3.2 Pg. 45 Remove "None" under Specific. There is an entry in the subheading.
response	*Accepted* The resulting text of ETSO-C157a is contained in Appendix A.

comment	*73* comment by: *Garmin* Segment N/A Pg. 45 The equivalent TSO-C157 has clarifications and exemptions to the MASPS listed in section 3. Recommend the ETSO include similar modifications to the MASPS.
response	*Partially accepted* The issue has been addressed by adopting the updated TSO-C157a, which encapsulates the reference to the amended RTCA/DO-267A. The resulting text of ETSO-C157a is contained in Appendix A.

resulting text

CONCLUSION ON COMMENTS ON DRAFT ETSO-C157a:

A number of comments suggested changes to the proposed ETSO-C157 (including increasing the revision indicator to 'a'). Most of them were at least partially accepted. In the opposite case an explanation was given.

The resulting text of ETSO-C157, upgraded to version 'a' (i.e. C157a) is contained in Appendix A.

B. Draft Decision - I. Draft Decision ETSO - ETSO C158 p. 47-48

comment *74* comment by: *Garmin*

3.1.1
Pg. 47

Editorial: The MOPS should be referenced as RTCA/DO-265

response *Partially accepted*

Wording harmonised with other ETSOs.

The resulting text of ETSO-C158 is contained in Appendix A.

comment *75* comment by: *Garmin*

3.2.1
Pg. 47

Failure Condition Classification is airframe dependent.

Suggest removing text specifying failure of the function is a minor failure condition.

response *Not accepted*

See answer to comment 71 (to ETSO-C157) above.

comment *76* comment by: *Garmin*

3.2
Pg. 47

Remove "None" under Specific. There is an entry in the subheading.

response *Accepted*

The resulting text of ETSO-C158 is contained in Appendix A.

comment	*77* comment by: *Garmin* 3.1.1 Pg. 47 In RTCA/DO-265, section 2.2.7 places a power interrupt requirement on the equipment. This type of requirement should be imposed at the aircraft level due to power system variations and Garmin does not believe the burden should be required at the box level. Alternatively Garmin suggests making this a recommendation in the ETSO but not a requirement for the avionics.
response	*Not accepted* The requirement is linked directly to the power interruption test as defined in the environmental test procedures EUROCAE ED14()/RTCA-DO/160() section 16 –power interruption test. Such requirement defines, as foreseen by the test procedure, the expected system reaction, which is equipment-specific and not linked to the aircraft. In fact, that test is a typical 'box' test to demonstrate equipment compliance to the power system environment, which can be expected on the aircraft, where power interruptions are possible. The Agency cannot therefore accept the suggestion.

resulting text

CONCLUSION ON COMMENTS ON DRAFT ETSO-C158:

A few comments suggested changes to the proposed ETSO-C158. When possible, they were at least partially accepted. In the opposite case, an explanation was given.

The resulting text of ETSO-C158 is contained in Appendix A.

B. Draft Decision - I. Draft Decision ETSO - ETSO C159a p. 49-50

comment	*78* comment by: *Garmin* Subject Pg. 49 Recommend removing "=Iridium Phone". The MOPS referenced by this ETSO cover more than typical phone functions. Recommend leaving this additional wording out but it could be replaced by "Iridium Satellite Transceiver" which encompasses the full scope of the ETSO.
response	*Partially accepted* The title used in the document RTCA/DO-262A does not describe the system function well enough. The Agency considers it useful to have a more descriptive title such as 'Airborne Iridium Satellite Transceiver for Voice or Data'. The resulting text of ETSO-C159a is contained in Appendix A.

comment	*79* comment by: *Garmin* Segment 1 Pg. 49 Recommend removing "=Iridium Phone". The MOPS referenced by this ETSO cover more than typical phone functions. Recommend leaving this additional wording out but it could be replaced by "Iridium Satellite Transceiver" which encompasses the full scope of the ETSO.
response	*Partially accepted* See response to comment 78 above.

comment	*80* comment by: *Garmin* 3.1.1 Pg. 49 Editorial: The MOPS should be referenced as RTCA/DO-262A
response	*Partially accepted* Wording adopted to ETSO style: 'Radio Technical Commission for Aeronautics (RTCA) Document DO-262A'. The resulting text of ETSO-C159a is contained in Appendix A.

comment	*81* comment by: *Garmin* 3.2.1 Pg. 49 Failure Condition Classification is airframe dependent. Suggest removing text specifying failure of the function is a minor failure condition.
response	*Not accepted* For the same reasons in response to comment 71 to ETSO-C157a.

comment	*82* comment by: *Garmin* 3.2 Pg. 49 Remove "None" under Specific. There is an entry in the subheading.

response	*Accepted* The resulting text of ETSO-C159a is contained in Appendix A.

comment	*83* comment by: *Garmin* 3.1.1 Pg. 49 The portion of RTCA/DO-262A which deals with the Iridium requirements is found in the Iridium Satellite Normative Appendix on page 125.
response	*Noted* See response to comment 84 below which contains more specific proposals.

comment	*84* comment by: *Garmin* 3.1.1 Pg. 49 In the Iridium Satellite Normative Appendix of RTCA/DO-262A, section 2.2.3.8 places a power interrupt requirement on the equipment. This type of requirement should be imposed at the aircraft level due to power system variations and Garmin does not believe the burden should be required at the box level. Maybe this should be a recommendation in the ETSO but not a requirement for the avionics.
response	*Accepted* The manufacturer of Iridium transceivers can take responsibility only for what it produces. The rest (e.g. quality and continuity of electrical power) shall be assessed at aircraft level. However, power interruption testing is part of the normal power interface testing as defined in the environmental test conditions ED-14( )/DO-160( ) section 16. In our interpretation, the DO-262A 2.2.3.8 requirement is specifying the system reaction in case of specific power interruptions. This is foreseen e.g. in ED-14E/DO-160E 16.5.1.4/16.6.1.3: After exposure determine compliance with the applicable equipment performance standard. For us it is quite normal that the equipment standard is defining requirements for the system behaviour in presence and after a power interruption. Such requirement exists in other standards as well e.g. the GNSS standards to allow continuous operation within a certain time frame. Recovery from power outages is a box level requirement. The resulting text of ETSO-C159a, containing the above clarification, is in Appendix A.

resulting text

CONCLUSION ON COMMENTS ON DRAFT ETSO-C159a:

Seven comments were filed on the proposed ETSO-C159a. The majority of comments were at least partially accepted.

In rejecting the two remaining comments, the Agency took the opportunity to clarify the different roles, which, in the processes of verification and validation in the 'total system' context, belong to the aircraft manufacturer and to the holder of an ETSO Authorisation, respectively.

The resulting text of ETSO-C159a is contained in Appendix A.

B. Draft Decision - I. Draft Decision ETSO - ETSO C161a p. 51-52

comment

85 comment by: *Garmin*

3.2.1
Pg. 52

Failure Condition Classification is airframe dependent.

-Suggest removing text specifying failure of the function.

response

Not accepted

See above the responses to comments 71 to C157a, 77 to ETSO-C158 and 84 to C159a, which explain the rationale for rejection.

comment

86 comment by: *Garmin*

3.2
Pg. 52

"None" noted under Specific. There is an entry (Sect. 3.2.1) under this section so "None" is incorrect.

This appears to be a global issue in this new batch of ETSOs when there is no specific technical conditions required of the ETSO (Sect. 3.2). Suggest that the new Failure Condition Classification be given a different outline heading, allowing "None" to be used when there actually are no specific technical conditions required of the ETSO.

response

Accepted

The resulting text of ETSO-C161a is contained in Appendix A.

resulting text

CONCLUSION ON COMMENTS ON DRAFT ETSO-C161a:

Only two comments were filed on the proposed ETSO-C161a. One comment was accepted.

In rejecting the second one, the Agency made reference to three responses above, clarifying the failure classification and risk assessment in 'total system' context.

The resulting text of ETSO-C161a is contained in Appendix A.

B. Draft Decision - I. Draft Decision ETSO - ETSO C161a - Appendix 1 p. 53-54

comment	*30* comment by: *THALES-Avionics* Appendix 1 title: typo error -> replace Naviagation by Navigation Appendix 1, item 2: typo error -> replace page 35 by page 34 Appendix 1, item 7, req LAAS-281 is not "changed" but "added" (req LAAS-281 does exist in DO-253B but is deleted in 253C).
response	*Noted* 1. *Accepted* 2. *Not accepted* The table to be changed is located on page 35. It is a correct observation that the section starts on page 34, but the change is to be implemented on page 35. 3. *Accepted* The resulting text of ETSO-C161a is contained in Appendix A.

resulting text

CONCLUSION ON COMMENTS ON DRAFT ETSO-C161a Appendix 1:

Only one comment related to editorial amendments was filed on the proposed Appendix 1 to ETSO-C161a. The suggestions were partially accepted.

The resulting text of Appendix 1 to ETSO-C161a is contained in Appendix A.

B. Draft Decision - I. Draft Decision ETSO - ETSO C161a - Appendix 2 p. 55

comment	*14* comment by: *Andreas Lipp* Item 5 (Page B-7): An ICAO SARPS change in processing (State letter AN 7/1.3.98-11/25, Item 1c), for application by Nov. 2012) prohibits using runway number 0. This change should be anticipated, at least in a note.
response	*Not accepted* In the understanding of the Agency this amendment to Annex 14 of the Chicago Convention is addressed, after legal transposition applicable at national level, to aerodrome operators. Consequently, it is not directly related to the equipment performance. Even though the runway number 0 is not used, or will not be used in future, the equipment should still be able to handle such data input, until the change is implemented by 100% of the almost 200 ICAO contracting States. However, according to Article 38 of the Chicago Convention, any State may notify to ICAO a 'difference' and so continue to use the said number 0. Furthermore, the related RTCA Document has not yet been amended in this respect. The Agency may consider a possible change once a revision of the applicable RTCA/DO-246B, GNSS-Based Precision Approach Local Area Augmentation System (LAAS) Signal-in-Space Interface Control Document, dated 28 November 2001, is published.

comment	*87* comment by: *Garmin* Appendix 2 #7. Pg. 55 Editorial "the following paragraphs from RTCA DO-246D" add a "/" after RTCA.
response	*Accepted* The resulting text of Appendix 2 to ETSO-C161a is contained in Appendix A.

comment	*88* comment by: *Garmin* Appendix 2 #7.b. Pg. 55 Editorial "*Format of Message Type 3* in DO246D" should have a "-" to state "DO-246D"
response	*Accepted* The resulting text of ETSO-C161a is contained in Appendix A.

resulting text	**CONCLUSION ON COMMENTS ON DRAFT ETSO-C161a Appendix 2:** Two comments proposing editorial changes to Appendix 2 to ETSO-C161a have

been accepted. A third comment was rejected and the reason was explained.

The resulting text of Appendix 2 to ETSO-C161a is contained in Appendix A.

B. Draft Decision - I. Draft Decision ETSO - ETSO C162a p. 56-57

comment	*15* comment by: *Andreas Lipp* Item 3.1.1: The note in FAA TSO-C162a, section 3, has not been correctly transposed into ETSO-C162a. This may lead to the use of non-applicable parts of DO-246D being used or non-ICAO-compliant systems, if DO-246B is used.
response	*Accepted* The resulting text of ETSO-C162a is contained in Appendix A.

comment	*16* comment by: *Andreas Lipp* Item 3.2.1: The classification of loss of function, present in FAA TSO, has not been described in ETSO.
response	*Accepted* The resulting text of ETSO-C162a is contained in Appendix A.

comment	*31* comment by: *THALES-Avionics* Remark: §3.1.4 "Electronic Hardware Qualification" is not required by the equivalent TSO C162a.
response	*Noted* 'Electronic Hardware Qualification' is part of the current Agency's ETSO template and could be used in such a device. The requirement is considered reasonable.

comment	*89* comment by: *Garmin* 3.1.1 Pg. 56 When RTCA/DO-253C makes references to RTCA/DO-246(), GNSS-Based Precision Approach Local Area Augmentation System (LAAS) Signal-In-Space Interface Control Document (ICD), a note needs to be included in ETSO-C162a

to specify what version to follow with all appropriate changes. The following note is stated in the equivalent FAA TSO-C162a:

"**NOTE:** All RTCA/DO-253C references to RTCA/DO 246() apply to RTCA/DO-246B, *GNSS-Based Precision Approach Local Area Augmentation System (LAAS) Signal-In-Space Interface Control Document (ICD)*, dated November 28, 2001. Modifications to these references are noted in appendix 2 of TSO-C161a."

Since ETSO-C161a has the equivalent Appendix 2, to that of FAA TSO-C161a, this note should be modified to Specify ETSO-C161a and added to section 3.1.1, Minimum Performance Standard.

response *Accepted*

The resulting text of ETSO-C162a is contained in Appendix A.

resulting text

CONCLUSION ON COMMENTS ON DRAFT ETSO-C162a:

Few comments have been received on proposed ETSO-C162a. They have been mostly accepted.

The resulting text of ETSO-C162a is contained in Appendix A.

B. Draft Decision - I. Draft Decision ETSO - ETSO C166b p. 58-60

comment *90* comment by: *Garmin*

3.1.1.(a)
Pg. 59

The proposed update to TSO-C166a does not include an update (implemented in DO-260B) to the equipment classes. Suggested correction:

(a) 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 TISB messages and delivering both ADS-B and TIS-B reports, as well as transmitting ADS-B messages. A Receive-only Class of equipment is allowed.

(b) Class B equipment includes Classes B0, ~~and~~ B1 and B1S. Classes B0, ~~and~~ B1 and B1S are the same as A0, ~~and~~ A1 and A1S, except they do not have receive subsystems. Note that Classes B2 and B3 are not for aircraft use.

response *Accepted*

The resulting text of ETSO-C166b is contained in Appendix A.

resulting text

CONCLUSION ON COMMENTS ON DRAFT ETSO-C166b:

Only one comment has been received on the proposed ETSO-C166b. It was accepted.

The resulting text of ETSO-C166b is contained in Appendix A.

B. Draft Decision - I. Draft Decision ETSO - ETSO C170 p. 61-62

comment

91 comment by: *Garmin*

3.2
Pg. 61

"None" noted under Specific. There is an entry (Sect. 3.2.1) under this section so "None" is incorrect.

This appears to be a global issue in this new batch of ETSOs when there is no specific technical conditions required of the ETSO (Sect. 3.2). Suggest that the new Failure Condition Classification be given a different outline heading, allowing "None" to be used when there actually are no specific technical conditions required of the ETSO.

response

Partially accepted

The error has been corrected. However, the Agency considers the failure classification a specific item. Furthermore, a possible revision of the ETSO template is being considered.

The resulting text of ETSO-C170 is contained in Appendix A.

resulting text

CONCLUSION ON COMMENTS ON DRAFT ETSO-C170:

Only one comment has been received on the proposed ETSO-C170. It was partially accepted.

Furthermore, the Agency accepted the idea of a possible revision of the ETSO template in the future.

The resulting text of ETSO-C170 is contained in Appendix A.

B. Draft Decision - I. Draft Decision ETSO - ETSO C172 p. 63-64

comment

12 comment by: *GPI*

Comments ETSO C172

Parag. 3.1.1 Minimum performance standard

Comment:

SAE AS 5385C paragraph 4.5.1 "Environmental degradation"

"*The available data concerning degradation of woven textile fiber performance when exposed to environment factors, as provided in AIR 1409B, shall be taken into account for webbing and thread selection and treatment, commensurate with the expected storage and service life of the restraint strap assembly.*"

Same comment as for ETSO C90d: This paragraph does not give a clear PASS/FAIL technical criteria for evaluation of textile performance when expose to environmental factors.

It widely opens evaluation of conformity to interpretations by both applicants and authorities.

In this respect it could not guarantee a common minimum performance for products proposed by different applicants and evaluated by different EASA PM.

Rationale for comment

SAE AIR 1490B data demonstrates that textile performance when exposed to environmental factors is highly depending on fiber (Polyester, Nylon,…), with possibly difference between similar fiber of different performance (dtex value) or different fiber supplier.

But tests results also clearly show that weaving design, webbing/rope breaking strength, width, thickness, color, type of dying agent, and also coating, have an extreme influence on UV resistance.

Problem is that SAE AIR 1490B does not give the detailed technical specifications of the different products tested.

In these conditions, how could the applicant take into account partial and highly variable technical data to substantiate performance of its own unique textile material ?

Recommendation

<u>a) Long term solution</u>

Consider revising paragraph 3 to propose uniform PASS/FAIL criteria, which is the only way to guarantee a common minimum performance for all products. A simple, clear and unquestionable PASS/FAIL criteria could be to load test the textile material before and after defined artificial weathering.

<u>(b) Interim action</u>:

Understand the above, though more appropriate, is not readily available today, and should be set as a research goal. Recommend considering a wording amendment such as:

In lieu of SAE AS 5385C paragraph 4.5.1 :

"*The available data concerning degradation of woven textile fiber performance when exposed to environment factors, as provided in AIR 1409B, may be taken into account for webbing and thread selection and treatment, commensurate with the expected storage and service life of the restraint strap assembly. NOTE: Environmental degradation data others than that documented in AIR1490B may be used, if substantiated by the applicant and approved by EASA.*"

response

Partially accepted

(a) Long-term solution:

A common minimum performance is not necessary for safety although it may be desirable for the industry. The criteria for degradation of a material are that at the life limit declared by the manufacturer, the material must still meet the minimum performance requirments of ETSO-C172.

(b) Interim action:

A deviaiton per rule 21A.610 in Part-21 may be requested and applied to use alternate means of testing.

A marking specification has been added to ETSO-C172 for life-limited parts. The intent is incorporated.

The resulting text of ETSO-C172 is contained in Appendix A.

comment

27 comment by: *Jean-Jacques MACHON*

Attachment #2

3.1.1 MPS

It appears inappropriate for the European authorities and certain third party governments to exclusively refer to U.S. (e.g. SAE) standards. As is already the case with e.g. EUROCAE ED-14/RTCA DO-160 in CS-ETSO Subpart A paragraph 2.1, where two identical standards are published in the U.S. and internationally they should both be referred to as acceptable equivalents, as follows:

"... the SAE AS 5585C, Cargo Restraint Straps - Design Criteria and Testing Procedures, dated January 2007 / International Organization for Standardization ISO 16049-1 "Air cargo - Restraint straps - Part 1: Design criteria and testing methods, 2nd edition, Draft International Standard, dated August, 2011."

Note 1:

The 1st edition of ISO 16049-1, on which was based later SAE AS 5385, was published in July 2001. A revised 2nd edition, identical to rev. C of SAE AS 5385, is in ISO DIS ballot process and will be published in early 2012. See attached copy. By ISO rules, a Draft International Standard (under DIS ballot) is available to the public on request and may be referred to in other publications after the starting date of the DIS vote.

Note 2:

Being the author of both AS 5385 and ISO 16049-1 which had been developed under an ISO TC20/SC9 mandate, I confirm that both documents are technically absolutely identical. See attached copy of ISO 16049-1.

3.2 - Specific

There should be a mention that restraints straps are a textile component, and as such submitted to the same environmental degradation assessment specified in ETSO-C90d paragraph 3.2 under "Textile degradation" for pallet nets (also see comments thereon). If not, continued rated strength may not be guaranteed.

4 – Markings

4.1 – General

CS-ETSO Subpart A paragraph 1.2 calls for Part 21 Subpart Q applicable paragraph 21A.801, which requires manufacturer's name, product designation and serial number. Individual serial numbers for restraint straps, low cost items made by millions, are never used. Imposing them would result in proportionally significant cost increases for engraving serial numbers which would be useless in operational practice and not contribute to flight safety. Request changing to:

"Marking as detailed in CS-ETSO Subpart A paragraph 1.2, except the serial number may be replaced by a production batch number."

4.2 – Specific

Moreover, CS-ETSO Subpart A paragraph 1.2 (Part 21 Subpart Q applicable paragraph 21A.801) contains no requirement for an ETSO marking. This is essential because, on a market where only non-TSO/ETSO approved straps are presently used, many of them with sub-standard design and performance, the intent of the ETSO will be lost unless the airlines are able to readily identify TSO/ETSO straps to use them. Therefore, request adding:

"In addition, the word "ETSO-C172", followed by the identification of the standard the article was designed and tested to."

This is in accordance with FAA TSO-C172 paragraph 4.a (calling for 14CFR § 21.607 (d), which requires "the applicable TSO number").

Other markings are necessary to the operators, namely :

- rated ultimate load,
- year/month of manufacture,
- expiry date.

While these markings are required in both standards of reference AS 5385C and ISO 16049-1, it is suggested consideration might be given by EASA to explicitly listing them under 4.2. They are required by FAA TSO-C172 paragraphs 4.a (2) and (3).

Submitted by:
Jean-Jacques Machon
V.Chair ISO TC20 SC9

response

Noted

1.1 Noted

The Agency has not reviewed ISO or any other documents, beyond what is already included in the ETSO for acceptable use. This prevents them from being included in the ETSO. An applicant may request permission to use a different standard by applying for a deviation according to rule 21A.610 in Part-21.

3.2 Accepted

4.1 Not accepted

Part-21 is European legislation and therefore it cannot be changed at the level of Certification Specifications. As an alternative to a serial number, Part 21A.807(a)3 also allows to mark the parts with the date of manufacture.

4.2 Partially accepted

Requirements for marking ETSO articles are contained in Part-21, rule 21A.807,

not in rule 21A.801, which refers to products. However, additional information marking is permitted.

The resulting text of ETSO-C172 is contained in Appendix A.

comment *36* comment by: *GITA AVIATION*

Beyond the ETSO issues, it should be identified by EASA for which specific applications a ETSO´d cargo restraint strap must be used and in which other cases (ETSO Net used) the cargo restraint strap could be a non-ETSO´d strap.

AS5385C - 4.5.1.:

We do not agree with the proposal that SAE AIR 1490B is an appropriate document to substantiate the lifetime (degradation) of the material a cargo net is manufactured of. Reason for our comment: The report does not identify the testing standards, the conditions under which this material is being stored/handled etc. and last not least it does not provide detailed information on the specification of the individual materials tested, or are not used anymore for current approved nets. We would propose following text instead:

"3.2 - Specific

In lieu of para 4.5.1. of AS5385C the applicant has to provide substantiation of the effects of environmental degradation on nets commensurate with the expected storage and service life to satisfy SAE AS 36100 Rev. A, paragraph 4.11.

Note: In absents of experience or analytical data the document AIR 1490B may be used to substantiate the environmental degradation"

We believe that is a higher standard but clearly identify that the applicant data are superior to the data in AIR1490B.

There are a number of paragraphs in the SAE standard especially Section 6 which clearly relates to production and not to the design (ETSO is a design criteria). I would appreciate a clarifying statement in the ETSO standard that criteria defining "quality control" tasks are not being part of the minimum performance standards.

3.2. Flammability criteria:

a) we would appreciate to update the reference here to the latest standards and include that into para. 3.2 - "In lieu of the reference in para 4.4. the materials used in the construction of cargo restraint straps must meet the appropriate provision in CS-25 Amdt. 11, Appendix F, Part I, paragraph (a)(1)(v)"

response *Noted*

General: *Not accepted*

The use of an ETSO article is set by its performances.

AS538C – 4.5.1: *Partially accepted*

Applicant data could be used as an alternative to AIR1490B, if found acceptable by the Agency in the context of a specific project.

Section 6: *Noted*

ETSO provides authorisation for both design and production. Compliance to

Section 6 of SAE AS538C will be anyway excluded by this ETSO.

3.2: *Noted*

Reference to CS-25 Appendix F, Part I, paragraph (a)(1)(v) is already in SAE AS5385C, paragraph 4.4.

The resulting text of ETSO-C172 is contained in Appendix A.

resulting text

CONCLUSION ON COMMENTS ON DRAFT ETSO-C172:

A few comments have been received on the proposed ETSO-C172. They were at least partially accepted, where possible.

The resulting text of ETSO-C172 is contained in Appendix A.

B. Draft Decision - I. Draft Decision ETSO - ETSO C179 p. 65-66

comment *5* comment by: *MAv*

Please can EASA explain why this new ETSO is based on FAA TSO-C179 issued on 22/08/2006, and not on the revised FAA TSO-C179a issued on 19/04/2011.

response *Accepted*

During the preparation of the NPA 2011-12, the updated TSO had not yet been available. The proposal in the present CRD is to transpose revision A of TSO-C179.

The resulting text of ETSO-C179a is contained in Appendix A.

comment *38* comment by: *THALES-Avionics*

Both ETSO and TSO requires UL 1642 dated 19/09/2005.

But in the TSO-C179 of the FAA, additional testing is required for multi-cell batteries for fire safety requirements (appendix 1): this has not been implemented into the ETSO-C179.

response *Accepted*

Proposal now updated to C179a. See also comment 5 above.

The resulting text of ETSO-C179a is contained in Appendix A.

comment *92* comment by: *Garmin*

Segment ALL

Pg. 65

Suggest updating this ETSO to ETSO-C179a to better align with the most current TSO-C179a.

-This includes an update to the subject text as well as the Minimum Performance Standard from UL 1642 to RTCA/DO-311 sections 2 and 3.

response *Accepted*

C179a has been updated as proposed. See also comment 5 above.

The resulting text of ETSO-C179a is contained in Appendix A.

comment *93* comment by: *Garmin*

3.2.1
Pg. 65

Failure Condition Classification is airframe dependent.

-Suggest removing text specifying failure of the function is a major failure condition.

response *Not accepted*

See response to comment 71.

comment *94* comment by: *Garmin*

3.2

Pg. 65

"None" noted under Specific. There is an entry (Sect. 3.2.1) under this section so "None" is incorrect.

This appears to be a global issue in this new batch of ETSOs when there is no specific technical conditions required of the ETSO (Sect. 3.2). Suggest that the new Failure Condition Classification be given a different outline heading, allowing "None" to be used when there actually are no specific technical conditions required of the ETSO.

response *Partially accepted*

See response to comment 91.

The resulting text of ETSO-C179a is contained in Appendix A.

resulting text

CONCLUSION ON COMMENTS ON DRAFT ETSO-C179a:

A few comments have been received on the proposed ETSO-C179. Most of them proposed to transpose not TSO C179, but the new version of C179a. The

suggestion is accepted by the Agency.

The resulting text of ETSO-C179a is contained in Appendix A.

B. Draft Decision - I. Draft Decision ETSO - ETSO C184 p. 67-68

comment *39* comment by: *Boeing*

Page: 67

Paragraph *2.1. (Procedures) General*

NPA text*:*

Applicable procedures are detailed in CS-ETSO Subpart A.

The ETSO requires that marking requirements be in accordance with Part 21, Section A, Subpart Q, and the MPS does not disregard AS 8057, paragraph 3.2.7a. (Identification). However, the requirements are not the same.

Please consolidate part-marking requirements in one section. We suggest that paragraph 3.2.7a. be deleted, but 3.2.7.b. be retained.

JUSTIFICATION: Our suggested change will eliminate conflict and provide clarity.

response *Accepted*

AS8057 paragraph 3.2.7a requires 'date of manufacture' and 'serial No', whereas Part-21, Section A, Subpart Q, requires 'serial No' or 'DOM'. Per Appendix 1 of ETSO-C184, par. 3.2.7 of AS8057 is to be disregarded.

The resulting text of ETSO-C184 is contained in Appendix A.

comment *40* comment by: *Boeing*

Page: 67

Paragraph: *3.1.2 Environmental Standard*

NPA text:

See CS-ETSO Subpart A paragraph 2.1.

There is a conflict in this text, as the ETSO refers to D0-160 without identifying applicable conditions, while retaining AS 8057, paragraph 3.17., which provides applicable conditions per D0-160.

Please change paragraph 3.1.2. to indicate " *… per AS 8057, paragraph 3.17."*

JUSTIFICATION: Retain the specific environmental requirements published in AS 8057, as this will provide better clarity to ETSO applicants/installers.

response | *Partially accepted*

It is acceptable to clarify the conditions. In additon, the proposed subpart A now refers to several versions of DO-160: rev. D, E, F and G.

comment | *41* comment by: *Boeing*

Page: 67

Paragraph: *3.1.2 Environmental Standard*

NPA text:

See CS-ETSO Subpart A paragraph 2.1.

There is a conflict in this text, as the ETSO refers to D0-160 without identifying applicable conditions, while retaining AS 8057, paragraph 3.17., which provides applicable conditions per D0-160.

Please change paragraph 3.1.2. to indicate " *… per AS 8057, paragraph 3.17."*

JUSTIFICATION: Retain the specific environmental requirements published in AS 8057, as this will provide better clarity to ETSO applicants/installers.

response | *Partially accepted*

It is acceptable to clarify the conditions. In additon, the proposed subpart A now refers to several versions of DO-160: rev. D, E, F and G.

However, this comment is identical to comment 40 above.

comment | *43* comment by: *Boeing*

Page: 67

Paragraph: *3.2.1 Failure condition classification*

NPA Text:

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.*

The ETSO states that failure of function of galley equipment is determined to be a minor failure condition. However, function of galley equipment is not required or essential in the perspective of safe flight and landing of the aircraft.

We suggest revising paragraph 3.2.1. to delete the last sentence, as shown below:

3.2.1 Failure Condition Classification

- *See CS-ETSO Subpart A paragraph 2.4.*

JUSTIFICATION: FAA AC 20-168 and D0-313 define galley equipment as non-essential, non-required equipment, and prescribes that a safety analysis be performed per ARP 4761 to ensure the modes of failure (which could be

	classified as *no safety affec*t, *minor, major, hazardous*, etc.) are mitigated commensurate with their hazard classification. This TSO's required FMEA should be used to support the installer's (applicant's) system safety assessment.
response	*Noted* To receive an ETSO authorisation, it is expected that the article will meet the designated failure condition/classification and a FMEA has to be performed as required per AS 8057 para. 3.19 and Appendix 1 item 67 of ETSO-C184. For installation of the article on a/c that would need to be re-visited.

resulting text

CONCLUSION ON COMMENTS ON DRAFT ETSO-C184:

A few comments have been received on the proposed text ETSO-C184. None was rejected.

A few comments also related to CS-ETSO Subpart A (environmental testing). They were also accepted.

The resulting text of ETSO-C184 is contained in Appendix A.

B. Draft Decision - I. Draft Decision ETSO - ETSO C184 - Appendix 1 p. 69-74

comment	*19* comment by: *Sell GmbH* Due to respective multiple modifications to SAE AS 8057 the ETSO-C184 should contain the complete set of applicable and modified MPS. This would improve clarity to ensure standardization and uniform implementation particular in case of future revisions of SAE AS 8057. In addition a note should be added that the requirements as specified in Appendix 1 are minimum performance standards and that deviations from these requirements are acceptable if the requirement does not provide a real safety benefit and the applicant can show that an equivalent level of safety is provided with specific design features, installation or operational provisions.
response	*Not accepted* The ETSOs refer to a speficic issue of industry standards, in the case of ETSO-C184 to SAE AS 8057. Any change in the referred standards would require a revision of the concerned ETSO. MPS are already declared in both the title and text of Appendix 1 to ETSO-C184. Should SAE produce a new version of their AS 8057 before the ETSO-C184 is updated, applicants could request a 'deviation' in order to apply the new standard, according to rule 21A.610 in Part-21.

comment	*20* comment by: *Sell GmbH* Page 15, disregard paragraph 3.2.7. The identification as specified in this chapter does not comply with the requirements of CS-ETSO Part A paragraph 1.2 and thus Part 21 Section A Subpart O. To prevent any ambiguity and to assure compliance with Part 21 requirements this paragraph has to be disregarded. In addition the second placard as required in paragraph 3.2.7.b is considered as an aid in the MPS and therefore cannot become an airworthiness standard and has to be disregarded.
response	*Not accepted* See answer to comment 19 above.

comment	*21* comment by: *Sell GmbH* Page 21, in paragraph 3.4.5 (d) disregard the Note. This requirement can only be met if appropriate ground wiring provisions are available on aircraft side, which is beyond the scope of this performance standard. Also there is no real safety benefit provided with this requirement.
response	*Not accepted* This requirment only applies to the ETSO article. Evaluation of the airworthiness aspects after the installation of an 'article' into an aircraft remains responsibility of the aircraft manufacturer or, respectively, the design organisation (in case of STC) installing the article.

comment	*22* comment by: *Sell GmbH* Page 23, replace paragraph 3.6.4.b: "Equipment connected to the airplane potable water system should have a manual drain." This requirement is in contradiction to operational requirements as the self-draining will lead to a high amount of potable water loss since the equipment will self-drain each time in case it is switched off. In addition this will increase safety risks due to water leakages if the self-draining fails. This requirement will also prevent today's state of design galley insert equipment to become approved under this ETSO although there is no safety issue associated with this requirement. Thus there is no real safety benefit provided with this requirement.
response	*Not accepted* Manual drain would be an operational burden for the user and could be forgotten. Residual water in the article may cause electrical failure and/or

hygiene issues.

comment 23 comment by: *Sell GmbH*

Page 25, replace paragraph 3.8.a and 3.8.b:

"Equipment shall be designed to prevent external surfaces to be handled or contacted from exceeding operating temperatures of 100°C in an ambient temperature of 20°C."

To assure that there is one airworthiness standard commonly specified with CS-ETSO and CS-25, the MPS has to be in line with CS 25.1360(b) and respective AMC. In addition para. 2 of AMC 25.1360(b) specify conditions for exclusion from these requirements. However, considering today's galley operations there are no safety hazards experienced due to surface temperatures since there are appropriate tools (e.g. gloves) used by cabin crew to prevent injuries. Thus there is no real safety benefit provided with this requirement and the CS-25 requirements should be the applicable airworthiness standard.

response *Not accepted*

A maximum external surface temperature limit must be specified to protect users and to be also used as a specification basis for personal protective devices (e.g. gloves). Paragraph 3.8.c. addresses equipment which would require higher surface temperatures than specificed in pargraph 3.8.a and 3.8.b.

comment 24 comment by: *Sell GmbH*

Page 25, replace paragraph 3.8.c:

"External surfaces … are excluded from 3.8 a) and 3.8 b)."

The wrong references to paragraphs 3.9 a) and 3.9 b) in the MPS have to be corrected to receive clear and unambiguous provisions in ETSO-C184.

response *Accepted*

Appendix 1 to ETSO-C184 corrected accordingly.

The resulting text of Appendix 1 to ETSO-C184 is contained in Appendix A.

comment 25 comment by: *Sell GmbH*

Page 25, replace paragraph 3.8.d: "Equipment shall not … that their surface temperatures exceeds 85°C in normal operation."

To be in compliance with latest RTCA-DO160 and aircraft manufacturer's environmental requirements applied for type certification respective high temperature conditions should be applied to implement a realistic and uniform requirement from equipment to aircraft type certification. In addition this requirement introduces additional burden without providing a real safety

benefit.

response *Not accepted*

Compliance with paragraph 3.8.d of AS 8057 is required because an ETSO 'article' has to be able to be installed in a number of unspecified aircraft and compartments.

comment *26* comment by: *Sell GmbH*

Page 50, replace paragraph i.: "Test shall be conducted under normal operation conditions as defined in respective equipment operating instructions."

The MPS test procedure does not consider the real operational conditions, e.g. max. 30 minutes heating in high temperature mode and thereafter exchange of meals and thus a steady state cannot be met due to removing hot meals and reloading cold meals. Thus a more realistic test procedure has to be specified to provide a real safety benefit.

response *Not accepted*

AS 8057, on page 50 item (i.), takes into account that if a steady state temperature cannot be attained after multiple cycles, then a determination of maximum temperature is the appropriate result of this test.

comment *44* comment by: *Boeing*

Page: 69

Paragraph: *Appendix 1*

We note that many sentences in Appendix 1 have been rewritten (which is an improvement); however, as part of this rewrite, the term "shall" in many instances has been replaced with the term "must," leaving a mix of "shall" and "must" throughout the documents (Appendix 1 and AS 8057)

We recommend consistently using either the word "shall" or "must," but not both. If the term "must" is to be used instead of "shall," we request that its meaning be defined in AS 8057, Section 1.3.

JUSTIFICATION: AS 8057 consistently uses either "should" or "shall" and provides definitions of these terms in Section 1.3. Replacing the term "shall" with "must" in select places in this ETSO only introduces an unnecessary inconsistency. "Shall" is already defined as a mandatory criterion in AS 8057, but there is no definition provided for "must."

response *Accepted*

The resulting text of Appendix 1 to ETSO-C184 is contained in Appendix A.

comment	*45* comment by: *Boeing* Page: 69 Paragraph: *Appendix 1, Item 3* NPA text: ***3.*** *Page 9, replace paragraph 2.2 Definitions: MAXIMUM NORMAL OPERATING PRESSURE (MNOP) with: "MAXIMUM NORMAL OPERATING PRESSURE (MNOP): The maximum attainable pressure of the equipment's pressure system when all the equipment's components are functioning normally."* We request that this change to AS 8057 be withdrawn and the current definition provided in AS 8057 be retained. **JUSTIFICATION**: We consider that the sentence below (which is currently provided in AS 8057 and would be deleted by this NPA) adds more clarity and understanding; deleting it would be inappropriate: *"For wet equipment connected and open to the airplane potable water system, the maximum airplane water system pressure determines the MNOP."*
response	*Not accepted* The comment goes beyond the scope of an ETSO. In fact, the purpose of an ETSO authorisation is to confirm that the design of an 'article' conforms to the applicable minimum performance standard. The 'article' shall still comply with the ETSO after the installation on the aircraft. However, verifying it is part of the installation process.

comment	*46* comment by: *Boeing* Page: 70 ***(Suggested new Item 18)*** AS 8057, page 16 Paragraph: *3.3.4* The last paragraph of 3.3.4 contains the requirement to impose a 1.15 overload test factor during full-scale static testing to account for material variability. We request that the last paragraph be deleted. **JUSTIFICATION:** We are unaware of any EASA guidance requiring galley equipment to apply an overload test factor to account for material variability. Implementing this through an ETSO could create a burden on certification of ETSO galley equipment that may not exist if the equipment were certified without an ETSO or that may not exist on other passenger cabin equipment of the same construction. We note that neither FAA AC 20-168 nor RTCA D0-313 address overload test factors.
response	*Not accepted* Guidance for material qualification, including instructions for material variation factors determination, are set in AMC 23.307. This AMC could be used in the certification effort of any installed item, including galleys and equipment.

comment *47* comment by: *Boeing*

Page: 71

Paragraph: *Appendix 1, Item 24*

NPA Text:

24. *Page 20, replace paragraph 3.4.4 with:*

"Equipment must be designed to be capable of withstanding over-voltage events without arcing, sparking, smoke or fire. Equipment must be designed to pass the following dielectric tests: (Note: Components (filters, protection diodes) normally not capable of withstanding the dielectric withstanding voltage test without damage may be disconnected or individually disabled (e.g., short circuited) for these tests. The dielectric withstanding voltage test must be run prior to the insulation resistance test.)." Paragraphs 3.4.4.a and b. remain unchanged.

We are concerned that some components are allowed to be disconnected for the dielectric test, which may lead to incomplete qualification, and that the requirement for an acceptance test on each production unit is deleted. We therefore suggest the following revision of the proposed text:

24. Page 20, replace paragraph 3.4.4 with:

"Dielectric tests shall be performed to qualify the equipment design and to provide an acceptance test on each production unit. For the qualification test all components must be connected and component failures are acceptable provided they fail without arcing, sparking, smoke or fire. For the acceptance test run on each production unit, components (filters, protection diodes) normally not capable of withstanding the dielectric withstanding voltage test without damage may be disconnected or individually disabled (e.g., short circuited) for these tests. The dielectric withstanding voltage test must be run prior to the insulation resistance test. The tests are: …"

JUSTIFICATION: All components need to be included in the one-time qualification test to ensure that they do not cause a hazard or unsafe condition if they fail during this test. An acceptance test on each production unit ensures correct manufacture.

response *Not accepted*

Over-voltage testing of components in their assembled state is required by AS 8057 paragraph 3.17 Table 2 (Power Input and Voltage Spike Sections of DO-160F).

comment *48* comment by: *Boeing*

Page: 71

Paragraph: *Appendix 1, Item 32*

NPA Text:

32. *Page 24, replace paragraph 3.6.6.a. with:*

"Demonstrate equipment proof and burst pressure values by test and list results in the CMM or other documentation required to be furnished with each article."

We suggest revising the text as follows:

32. *Page 24, replace paragraph 3.6.6.a. with:*

"Demonstrate equipment proof and burst pressure values by test and identify the values used in the tests on the interface control document. It is suggested that the equipment be qualified at the maximum proof and burst pressures required by aircraft manufacturer to facilitate usage on more than one airplane type."

JUSTIFICATON: The proposed ETSO change introduces the acronym "CMM" and this acronym is not defined anywhere in the ETSO. Adding this information to the interface control document will aid installers of the equipment.

Additionally, we request the last sentence with the suggestion be added back in (as indicated in our suggested revision), as this provides ETSO applicants with the logic for testing to worst-case pressures.

response

Partially accepted

Revised item 32 (in the NPA version; now item 47 in the version attached to this CRD) requires to provide design pressure values in a manual containing operating instructions and equipment limitations sufficient to describe the equipment operational capability.

Reference to CMM is deleted.

The Agency agrees that it is up to the holders of the ETSO authorisation to qualify their products with the broadest possible appeal. But this goes beyond the scope of the regulatory nature of ETSOs.

Resulting text of Appendix 1 to ETSO-C184 is contained in Appendix A.

comment

49 comment by: *Boeing*

Page: 72

(Suggested new Item 34)

AS 8057, page 25

Paragraph: *3.8.a. and 3.8.b - Maximum Temperature Design Requirements*

The maximum surface temperatures provided in paragraphs 3.8.a. (49° C) and 3.8.b. (60° C) are primarily based on a bare metal surface. Finished metal (e.g., alodine) and non-metallic surfaces have surface thermal resistance values different from bare metal. These different resistance values for a given time period provide higher temperature limits until the onset of a burn condition exists. Galley equipment surfaces today (e.g., oven doors) are primarily non-metallic surfaces and our concern is that the ETSO temperature limits will prevent applicants from meeting the ETSO even though the non-metallic surfaces present no burn hazard.

We recommend that paragraphs 3.8.a. and 3.8.b. be revised as follows:

a. Equipment shall be designed to prevent external surfaces intended to be handled or contacted by personnel in a prolonged

manner from exceeding operating temperatures prescribed in UL858 Table 36.2 (excluding the Note pertaining to higher limits allowed during a self-cleaning oven cycle) in normal operation.

b. Equipment shall be designed to prevent external surfaces with the possibility of momentary contact, but not intended to be handled or contacted by personnel in a prolonged manner, from exceeding operating temperatures prescribed in UL858 Table 36.1 (excluding the Note that increase limits 17° C) during normal operation.

JUSTIFICATION: UL858 is for household electric ranges, which present the same potential burn hazard as aircraft galley equipment. UL858 provides temperature limits for bare metal, plastic, and glass/ceramic, and these limits are approximately the same as those that can be calculated using ASTM C1057. We consider these established industry standards are more appropriate than providing a single temperature limit for all surface material types.

We note that for "handled" surface, AMC 1360(b) provides a limit of *"on the order of 25° C above ambient,"* but only applies this limit to metal surfaces. For "momentary" contact surfaces, AMC 1360(b) seems to allow a temperature limit of 100° C, which is higher than any limit provided in UL858.

It is important to note that the External Surface Temperature procedure provided AS 8057, Appendix A, requires the equipment to be run until steady state temperature is reached, which typically requires multiple-heating cycles for an oven. This is a good test, as it eliminates any confusion or debate over what the normal operating condition is by making it the maximum.

Since this test will provide worst-case temperature values for the normal condition, this also justifies establishing maximum temperature limits based on surface material.

response *Not accepted*

The intent of this paragraph is to protect the user, not to prevent overheat conditions of the equipment (see also response to comment 23).

comment *50* comment by: *Boeing*

Page: 72

(Suggested new Item 40)

AS 8057, page 26

Paragraph: 3.11.4.

We suggest the following changes be made

1. Delete paragraph 3.11.4.a.
2. Rewrite paragraphs 3.11.4.b. and c. as follows:

*"b. Equipment that uses retention devices to hold loose and/or associated components (e.g., beverage server, brew cup) in place during flight and crash conditions ~~shall~~ **should** be placarded with special stowage instructions (e.g.: "Brew handle must be down for taxi, take off, turbulence and landing"). **When these instructions are not provided on the equipment, the interface control document shall specify the instructions that the installer needs***

to provide.

*c. Equipment without provisions to hold loose and/or associated components in place during flight and crash conditions ~~shall~~ **should** be placarded with instructions to stow these components in the galley monument (e.g., "Beverage server must be stowed in the galley for taxi, take off, turbulence, and landing"). **When these instructions are not provided on the equipment, the interface control document shall specify the instructions that the installer needs to provide**."*

JUSTIFICATION: The equipment may not have the physical space available to include these instructions in a location that is readable when the equipment is installed. Most, if not all, galleys already have instructions to stow all loose items and this covers equipment not intended to leave the galley work area. Only equipment intended to leave the galley work area during in-flight service (e.g., carts, etc.) needs this type of placard.

response

Not accepted

Before the Agency can take action, the raised topic should be considered by the appropriate SAE Committee.

comment

51 comment by: *Boeing*

Page: 72

Paragraph: *Appendix 1, Item 41*

NPA Text:

41. *Page 27, replace paragraph 3.17. Notes on Pass/Fail criteria at bottom of Table 2 with:*

"(1) Equipment must comply with the performance requirements of this ETSO in each instance RTCA/DO-160 reads 'DETERMINE COMPLIANCE WITH APPLICABLE EQUIPMENT PERFORMANCE STANDARDS.

(2) See note (1)."

AS 8057 provides the following pass/fail criteria for the environmental conditions (see bottom of Table 2)

"Pass/Fail criteria:

(1) Equipment shall be operated and shall not present an unsafe condition, during and after the test.

(2) Equipment shall pass the ATP after the test (refer to 4.3)."

The change to Appendix 1, Item 41, to AS 8057, as proposed in the NPA, eliminates this pass/fail criteria and replaces it with no specific performance criteria. We do not consider the proposed change appropriate.

JUSTIFICATION: The MPS should define the pass/fail criteria, which will provide a consistent standard for all.

response

Partially accepted

The suggested change to Note 1 would open the door to a subjective evaluation of the tests, which would not be appropriate. The proposed ETSO-C184 requires

a clear 'pass/fail' criterion through application of the environmental tests specified in DO-160.

Note 2 of Table 2 will be modified as follows:

'(2) Equipment shall comply with the performance requirments of this ETSO in each instance RTCA/DO-160 reads 'DETERMINE CMPLIANCE WITH APPLICABLE EQUIPMENT PERFORMANCE STANDARDS. The equipment shall also comply with the performance standards of this ETSO after DO-160 testing.'

The resulting text of Appendix 1 to ETSO-C184 is contained in Appendix A.

comment

52 comment by: *Boeing*

Page: 73

(***Suggested new Item 50)***

AS 8057, page 39

Paragraph: 5.1b, Item 16

We suggest that AS 8057, paragraph 5.1.b., Item 16, be revised as follows:

"16. MNOP for wet equipment connected to the airplane potable water system. ***Proof and burst test pressure values****. Additionally, the normal operating pressure range should be given."*

JUSTIFICATION: Adding this information to the interface control document will aid installers of the equipment.

response

Not accepted

This information shall be included in a manual containing operating instructions and equipment limitations sufficient to describe the equipment's operational capability.

comment

53 comment by: *Boeing*

Page: 73

Paragraph: *Appendix 1, Item 44*

NPA Text:

44. *Page 33, replace paragraph Table 3 Note (2) with:*

"(2) Load factors may be increased to meet aircraft flight and ground cases. If increased factors are used, they must be listed in CMM or other appropriate document."

We suggest revising the proposed text for Note (2) as follows:

44. *Page 33, replace paragraph Table 3 Note (2) with:*

"(2) Load factors may be increased to meet aircraft flight and ground cases. ~~If increased factors are used, they must be listed in CMM or other appropriate document~~."

JUSTIFICATION: AS 8057, Section 5, Item 17, already requires this information to be provided on the interface control document. This is where

	installers have indicated they want the information. Additionally, the proposed change introduces the acronym CMM, but this acronym is not defined anywhere in the ETSO.
response	*Partially accepted* Changed to: *'(2) Load factors may be increased to meet aircraft flight and ground cases. If increased factors are used, they shall be provided in a manual containing operating instructions and equipment limitations, sufficient to describe the equipment's operational capability.'* The resulting text of Appendix 1 to ETSO-C184 is contained in Appendix A.

comment	*54* comment by: *Boeing* Page: 73 Paragraph: *Appendix 1, Item 51* NPA Text: ***51.*** *Page 8, disregard paragraph 2.2 Definitions: "ACCEPTANCE TEST", "ASSOCIATED COMPONENTS, item 2.", "DETRIMENTAL PERMANENT DEFORMATION", "FAILURE", and "FAIL-SAFE".* Except for deletion of the term "*DETRIMENTAL PERMANENT DEFORMATION,"* we recommend deleting this proposed change to AS 8057 and retaining the definitions provided in current AS 8057. **JUSTIFICATION**: These terms are used throughout AS 8057 and we consider it appropriate and necessary to provide definitions for these terms that level-set all users. We request that either the definitions be restored, or alternatives be provided.
response	*Partially accepted* An alternative definition of 'FAILURE' is a failure to meet the Minimum Performance Standards of the ETSO. The standard ensures an acceptable level of safety. The other terms will be disregarded for the following reasons: • 'ACCEPTANCE TEST' refers to a test at the end of the production process; • The Agency considers such 'ACCEPTANCE TEST' being a responsibility of the applicant or holder of an ETSO authorisation to be discharged during the production process; • 'ASSOCIATED COMPONENTS' are defined in part by CS-25, which contradicts the intent of an ETSO authorisation and, therefore, this term is deleted; • 'DETRIMENTAL PERMANENT DEFORMATION' remains excluded; • 'FAIL SAFE' is properly determined at aircraft level and needs to be evaluated and assured at the time of installation. The resulting text of Appendix 1 to ETSO-C184 is contained in Appendix A.

comment 55 comment by: *Boeing*

Page:74

Paragraph: *Appendix 1, Item 65*

NPA Text

65. *Page 27, disregard paragraphs 3.14.a., 3.14.b., and 3.14.c.*

We request that paragraphs 3.14.b. and 3.14.c. be retained in AS 8057.

JUSTIFICATION: These paragraphs describe valid design requirements. (We believe this paragraph may have been inadvertently deleted when deleting the part numbering requirements.)

response *Not accepted*

These items were deleted as they pertain to installation. The applicant for an ETSO authorisation can follow the relevant AS standard in this regard, but the installation, at the proper time and place, remains the responsibility of the aircraft manufacturer.

comment 56 comment by: *Boeing*

Page:74

Paragraph: *Appendix 1, Item 67*

NPA Text:

67. *Page 32, disregard paragraph 4.1.*

We request that that this proposal be deleted and that paragraph 4.1 be retained in AS 8057.

JUSTIFICATION: That paragraph allows more severe or additional environmental tests to be conducted under the TSO. Retaining this paragraph allows ETSO applicants to conduct additional or more severe environmental tests that may be needed by the installer as part of their TSO applications, instead of having to run additional tests as part of a type cert program.

response *Accepted*

The resulting text of Appendix 1 to ETSO-C184 is contained in Appendix A.

comment 57 comment by: *Boeing*

Page:74

Paragraph: *Appendix 1, Item 68*

NPA text:

68. *Page 38, disregard section 4.3.*

We request that this proposal be deleted and that section 4.3. be retained in AS 8057.

JUSTIFICATION: We recommend that a minimum performance standard for acceptance tests remain in the document. This makes it clear to TSO applicants what the minimum standard is and, from our experience, this is not only helpful, but provides consistency as well.

response *Not accepted*

The applicant or holder of an ETSO authorisation is required to make available the Acceptance Test Procedure (ATP) to the Agency, when this is deemed necessary.

On a voluntary basis the applicant or holder of the ETSOA may make the ATP also available to the installer of the 'article' on the aircraft.

resulting text

CONCLUSION ON COMMENTS ON THE DRAFT APPENDIX 1 TO ETSO-C184:

Several comments have been received on the proposed Appendix 1 to ETSO-C184. Not all of them were accepted. When it was not possible to accept the suggestion, the safety or technical reasons were given.

In particular, the Agency clarified different responsibilities of the holder of an ETSO authorisation (which terminate with the signature of Form 1 at factory level), and those of the aircraft manufacturers that are responsible for all aspects linked to the installation and the related airworthiness. Consequently, the scope of the ETSOs cannot include installation aspects.

The resulting text of Appendix 1 to ETSO-C184 is contained in Appendix A.

B. Draft Decision - I. Draft Decision ETSO - ETSO C194 p. 75-76

comment *95* comment by: *Garmin*

3.1.1

Pg. 75

Editorial "RTCA DO-309", add a "/" after RTCA.

response *Partially accepted*

Text is now harmonised with other ETSO wording.

The resulting text of ETSO-C194 is contained in Appendix A.

resulting text

CONCLUSION ON COMMENTS ON ETSO-C194:

Only one editorial comment on the proposed ETSO-C194 has been received and accepted.

The resulting text of ETSO-C194 is contained in Appendix A.

B. Draft Decision - I. Draft Decision ETSO - ETSO C195 p. 77-78

comment

96 comment by: *Garmin*

Entire ETSO

Recommend that EASA not publish ETSO-C195 because the FAA's will release TSO-C195a referencing RTCA/DO-317A. This release is due within the next 6 months.

response

Partially accepted

ETSO-C195 is now upgarded to version 'a' (i.e. C195a), in turn referring to RTCA/DO-317A.

The resulting text of ETSO-C195a is contained in Appendix A.

resulting text

CONCLUSION ON COMMENTS ON ETSO-C195a:

A stakeholder suggested to upgrade the version of ETSO-C195 to 'a', following the publication of RTCA/DO-317A.

The comment was accepted.

The resulting text of ETSO-C195a is contained in Appendix A.

B. Draft Decision - I. Draft Decision ETSO - ETSO C196a p. 77-123

CONCLUSION ON COMMENTS ON ETSO-C196a:

Stakeholders raised no comments in relation to the draft ETSO-C196 attached to NPA 2011-12.

However, the Agency is aware that the FAA plans to publish an amended version 'a' of the corresponding TSO.

Hence it is proposed to upgrade the EASA ETSO from C196 to C196a.

The resulting text of ETSO-C196a is contained in Appendix A.

B. Draft Decision - I. Draft Decision ETSO - ETSO 2C197 p. 126-127

comment	*97* comment by: *Garmin* 3.2 Pg. 127 The ETSO specifies a specific requirement: "The lowest of the height (a), width (b), and depth (c) of the crash enclosure must be 4 cm (1.5 inches) or greater." This requirement is ambiguous in that it is difficult to discern whether all of those dimensions must be 1.5" or greater, or if only one of them is required to be so. If intending for only one dimension suggest "The lowest of the height (a), width (b), **or** depth (c) of the crash enclosure must be 4 cm (1.5 inches) or greater." If intending for all dimensions suggest "The height (a), width (b), and depth (c) of the crash enclosure must each be 4 cm (1.5 inches) or greater."
response	*Accepted* New text is: *'The height (a), width (b), and depth (c) of the crash enclosure must each be 4 cm (1.5 inches) or greater.'* The resulting complete text of ETSO-2C197 is contained in Appendix A.

resulting text

CONCLUSION ON COMMENTS ON ETSO-2C197:

Only one comment on draft ETSO-2C197 has been received and accepted.

The resulting text of ETSO-2C197 is contained in Appendix A.

GENERAL CONCLUSIONS ON COMMENTS TO NPA 2011-12:

Based on the 95 comments received from 17 commentators and the individual responses to each of them, as contained in present CRD, the Agency concludes that:

- in principle stakeholders agreed to transpose all the FAA TSO included in the NPA, in some cases upgrading the version to the latest corresponding FAA TSO;
- the Agency therefore intends to adopt the proposed amendments to CS-ETSO in the revised text attached to this CRD.

In addition, it is also the intention of the Agency to:

- take the opportunity to propose in this CRD minor amendments to ETSO-2C70a;
- make the ETSOs accessible individually on the website in order to facilitate consultation; and
- publish the second NPA under the same Rulemaking Task RMT.0186 (former ETSO.008) for a second batch of TSOs to be transposed, as listed in Issue 3 of the related ToR.

The resulting text of the proposed draft ETSOs is contained in Appendix A.

After two months given to stakeholders to react to this CRD if their comments were misinterpreted or not fairly taken into account, the Agency intends to progress towards the adoption and publication of the said ETSOs, after the Decision of the Executive Director.

See Appendix A for resulting text.

Appendix A – Resulting text of draft Decision

B. Draft Decision

The text of the amendment is arranged to show deleted text, new text or new paragraph as shown below:

1. deleted text is shown with a strike through: ~~deleted~~
2. new text is highlighted with grey shading: new
3. ….

   indicates that remaining text is unchanged in front of or following the reflected amendment.

I. Draft Decision ETSO

SUBPART A – GENERAL

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.

SUBPART B – LIST OF ETSOs (INDEX 1 AND INDEX2)

INDEX 1

~~ETSO-C31d~~	~~HF Transmitting Equipment~~	Cancelled
~~ETSO-C32d~~	~~HF Receiving Equipment~~	Cancelled
ETSO-C55a	Fuel and Oil Quantity Instruments ~~(Reciprocating Engine Aircraft)~~	
ETSO-C62~~d~~e	Aircraft Tyres	
ETSO-C90~~c~~d	Cargo Pallets, Nets and Containers	
ETSO-C95a	Mach Meters	
ETSO-C126a	406MHz Emergency Locator Transmitter	
~~ETSO-C129a~~	~~Airborne Supplemental Navigation Equipment Using Global Positioning System (GPS)~~	Cancelled

ETSO-C154c	Universal Access Transceiver (UAT) Automatic Dependent Surveillance - Broadcast (ADS-B) Equipment Operating on the Frequency of 978 MHz
ETSO-C157	Aircraft Flight Information Services-Broadcast (FIS-B) Data Link Systems and Equipment
ETSO-C158	Aeronautical Mobile High Frequency Data Link (HFDL) Equipment
ETSO-C159a	Avionics Supporting Next Generation Satellite Systems (NGSS) = Airborne Iridium Satellite Transceiver for Voice or Data
ETSO-C161a	Ground Based Augmentation System Positioning and Navigation Equipment
ETSO-C162a	Ground Based Augmentation System Very High Frequency Data Broadcast Equipment
ETSO-C166~~a~~b	Extended Squitter Automatic Dependent Surveillance - Broadcast (TIS-B) Equipment Operating on the Radio Frequency of 1090 Megahertz (MHz)
ETSO-C170	High Frequency (HF) Radio Communications Transceiver Equipment Operating Within the Radio Frequency 1.5 to 30 Megahertz
ETSO-C172	Cargo Restraint Strap Assemblies
ETSO-C179	Rechargeable Lithium Cells and Lithium Batteries
ETSO-C184	Galley Equipment
ETSO-C194	Helicopter Terrain Awareness and Warning System (HTAWS)
ETSO-C195	Avionics Supporting Automatic Dependent Surveillance - Broadcast (ADS-B) Aircraft Surveillance
ETSO-C196	Airborne Supplemental Navigation Sensors for Global Positioning System Equipment Using Aircraft-Based Augmentation

INDEX 2

ETSO-2C70~~a~~b	Liferafts (reversible and nonreversible)	
~~ETSO-2C126~~	~~406MHz Emergency Locator Transmitter (ELT)~~	Cancelled
ETSO-2C197	Information Collection and Monitoring Systems	

ETSO- C55a
~~**Date : 24.10.03**~~
Date: xx.xx.2012

European Aviation Safety Agency

European Technical Standard Order

Subject: Fuel and Oil Quantity Instruments ~~(RECIPROCATING ENGINE AIRCRAFT)~~

1 - Applicability

This ETSO gives the requirements which Fuel and Oil Quantity 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 Conditions

3.1 - Basic

3.1.1 - Minimum Performance Standard

Standards set forth in the SAE AS 405~~B~~C, Fuel and oil quantity Instruments, dated July 2001, as amended and supplemented by this ETSO:

(i) Conformance with the following paragraphs of AS 405~~B~~C is not required: 3.1; 3.1.1, 3.1.2, 3.2 and 4.2.1.

(ii) Substitute the following for paragraph 7: „Performance tests: The following tests, in addition to any others deemed necessary by the manufacturer, shall be the basis for determining compliance with the performance requirements of this standard".

3.1.2 - Environmental Standard

See CS-ETSO Subpart A paragraph 2.1.

As specified in the SAE Aerospace Standard AS 405~~B~~C.

3.1.3 – Computer Software

See CS-ETSO Subpart A paragraph 2.2.

3.1.4 - Electronic Hardware Qualification

See CS-ETSO Subpart A paragraph 2.3.

3.2 - Specific

ETSO- C55a

~~None~~

3.2.1 Failure Condition Classification

See CS-ETSO Subpart A paragraph 2.4.

The failure condition classification will depend on the system on which the fuel and oil quantity instrument is installed. The classification must be determined by the safety assessment conducted as part of the installation approval. Develop each fuel and oil quantity instrument to at least the design assurance level assigned to the system on which the fuel and oil quantity instrument is installed.

4 - Marking

4.1 - General

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

4.2 - Specific

~~None~~

a. Mark at least one major component permanently and legibly with all the information in SAE AS405C, Section 3.2 (except paragraph 3.2.b). Also, mark the component with the following information:

(1) The basic type and accuracy classification, and

(2) The fluids for which the instrument is substantiated

b. If the fuel and oil quantity instrument includes a digital computer, 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 to show the modification status.

NOTE: Similar software versions, approved for different software levels, must be differentiated by part number.

5 - Availability of Referenced Document

See CS-ETSO Subpart A paragraph 3.

ETSO-C62~~d~~e

~~Date : 24.10.03~~
Date: xx.xx.2011

European Aviation Safety Agency

European Technical Standard Order

Subject: Aircraft Tyres

Since **no comments** on this proposed ETSO-C62e have been received during the consultation on NPA 2011-12, the resulting text is identical to the one attached to the said NPA. It is not considered necessary to republish the text in this CRD.
Nevertheless, stakeholders may consult it on: http://www.easa.europa.eu/rulemaking/docs/npa/2011/NPA%202011-12.pdf

ETSO-C90~~e~~d
Date: xx.xx.2012

European Aviation Safety Agency

European Technical Standard Order

Subject: Cargo Pallets, Nets and Containers (Unit Load Devices)

1 - Applicability

This ETSO gives the requirements which Cargo Unit Load Devices 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

For new models of Type I ULDs s~~S~~tandards set forth in standard of Aerospace Industries Association of America, Inc. (AIA), National Aerospace Standard, NAS 3610, "Cargo Unit Load Devices.- Specification for," Revision 10, dated November 1, 1990~~, as amended and supplemented by this ETSO:~~

~~Il lieu of NAS 3610, paragraph 3.5, paragraph 4 of this ETSO provides the marking requirements.~~

When using NAS 3610 Revision 10, the following errors must be corrected:
- in lieu of Figure 31, sheet 87, substitute Figure 31, sheet 88;
- in lieu of Figure 31, sheet 88, substitute Figure 32, sheet 87 of NAS 3610 Revision 8 dated April 1987

For new models of Type II ULDs standards set forth in the Society of Automotive Engineers, Inc. (SAE) Aerospace Standard (AS) 36100, "Air Cargo Unit Load Devices - Performance Requirements and Test Parameters", Revision A, dated April 2006.

For Type I and II ULDs, the standards set forth in SAE AS 36102, Air Cargo Unit Load Devices - Testing Methods, dated March 2005 are applicable.

ETSO-C90~~c~~d

3.1.2 - Environmental Standard

See CS-ETSO Subpart A paragraph 2.1.

3.1.3 – Computer Software

None

3.1.4 - Electronic Hardware Qualification

None

3.2 - Specific

Environmental degradation due to ageing, ultra-violet (UV)-exposure, weathering, etc. for any non-metallic materials used in the construction of pallets, nets and containers must be considered.

In lieu of NAS 3610 Rev. 10, paragraph 3.7 and SAE AS 36100 Rev. A, paragraph 4.7 use the following paragraph which provides the fire protection requirements for ULDs:

The materials used in the construction of pallets, nets and containers must meet the appropriate provisions in CS-25, Appendix F, Part I, paragraph (a)(2)(iv).

Textile Performance: See SAE Aerospace Information Report (AIR) 1490B, Environmental Degradation of Textiles, dated December 2007, for available data for textile performance when exposed to environmental factors. These data shall be taken into account for consideration of the effects of environmental degradation on nets commensurate with the expected storage and service life to satisfy SAE AS 36100 Rev. A, paragraph 4.11.

NOTE: Environmental degradation data other than that documented in AIR1490B may be used if substantiated by the applicant and approved by EASA.

~~None~~

3.2.1 Failure Condition Classification

N/A

4 - Marking

4.1 - General

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

~~In addition, the following information shall be legibly and permanently marked on the major components:~~

~~- The identification of the article in the code system set out in paragraph 1.2.1 of NAS 3610, Revision 8.~~

~~- If the article is not omnidirectional, the words „FORWARD", „AFT", and „SIDE" must be conspicuously and appropriately placed.~~

~~- The burning rate determined for the article under NAS 3610, paragraph 3.7, Revision 8.~~

4.2 - Specific

~~None~~

In addition, the following information shall be legibly and permanently marked on the ULD:

1. The identification of the article in the code system explained in
   a. NAS 3610, Revision 10, paragraph 1.2.1, for Type I ULDs.
   b. SAE AS 36100, Rev. A, paragraph 3.5 for Type II ULDs.
2. The nominal weight of the article in kilogram and pound in the format: Weight: …kg (…lb)
3. If the article is not omni-directional, the words "FORWARD", "AFT", and "SIDE" must be conspicuously and appropriately placed.
4. The manufacturer's serial number of the article, with the option to add the date of manufacture.
5. The burning rate determined for the article under paragraph 3.2 of this ETSO.
6. If applicable, the expiration date in the format " EXP YYYY-MM" must be marked on the ULD.

5 - Availability of Referenced Document

See CS-ETSO Subpart A paragraph 3.

ETSO-C95a
~~**Date : 24.10.03**~~
Date: xx.xx.2012

European Aviation Safety Agency

European Technical Standard Order

Subject: Mach Meters

1 - Applicability

This ETSO gives the requirements which Mach Meters 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 8018A, Mach Meters, dated 01/09/1996.

3.1.2 - Environmental Standard

See CS-ETSO Subpart A paragraph 2.1.

3.1.3 – Computer Software

See CS-ETSO Subpart A paragraph 2.2.

3.1.4 - 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.

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

ETSO-C95a

4 – Marking

4.1 - General

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

4.2 - Specific

None, marking in accordance with AS 8018A addendum 1 section 2 is optional.

5 - Availability of Referenced Document

See CS-ETSO Subpart A paragraph 3.

ETSO-~~2~~C126a
Date: xx.xx.2012

European Aviation Safety Agency

European Technical Standard Order

Subject: 406MHz Emergency Locator Transmitter

1 - Applicability

This ETSO gives the requirements which 406MHz Emergency Locator Transmitter 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-62A, Minimum Operational Performance Specification for Aircraft Emergency Locator Transmitters 406 MHz and 121.5 MHz (Optional 243 MHz), dated February 2009.

3.1.2 - Environmental Standard

See CS-ETSO Subpart A paragraph 2.1.

3.1.3 – Computer Software

See CS-ETSO Subpart A paragraph 2.2.

3.1.4 - Electronic Hardware Qualification

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.

ETSO-~~2~~C126a

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

See EUROCAE ED-62A paragraph 2.7.3.~~None~~

5 - Availability of Referenced Document

See CS-ETSO Subpart A paragraph 3.

ETSO-C154c

Date: xx.xx.2012

European Aviation Safety Agency

European Technical Standard Order

Subject: Universal Access Transceiver (UAT) Automatic Dependent Surveillance - Broadcast (ADS-B) Equipment Operating on the Frequency of 978 MHz

1 - Applicability

This ETSO gives the requirements which Universal Access Transceiver (UAT) Automatic Dependent Surveillance - Broadcast (ADS-B) Equipment Operating on the Frequency of 978 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 Conditions

3.1 - Basic

3.1.1 - Minimum Performance Standard

Standards set forth in the Radio Technical Commission for Aeronautics (RTCA) Document DO-282B, Minimum Operational Performance Standards for Universal Access Transceiver (UAT) Automatic Dependent Surveillance Broadcast (ADS-B), dated 02/12/2009.

3.1.2 - Environmental Standard

See CS-ETSO Subpart A paragraph 2.1.

3.1.3 – Computer Software

See CS-ETSO Subpart A paragraph 2.2.

3.1.4 - Electronic Hardware Qualification

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

Transmitting and receiving components must be permanently and legibly marked. The following table explains how to mark components. Find the equipment class in RTCA/DO-282B, Section 2.1.11.

If component can:	***Mark it with:***	***Sample marking pattern:***
Transmit and receive	Equipment class it supports	Class A1H or Class A3
Transmit, but not receive	Equipment class it supports	Class B1 or Class A3 - Transmit Only
Receive, but not transmit	Equipment class it supports	Class A2 - Receive Only
Perform the optional frequency diplexer function developed under this ETSO	The words "UAT Diplexer,"	UAT Diplexer
	Maximum amplitude attenuation between the antenna port (A) and UAT port (U) of the diplexer, and	A/U -0.x dB A/T -0.x dB
	Maximum amplitude attenuation between the antenna port (A) and transponder port (T) of the diplexer	

5 - Availability of Referenced Document

See CS-ETSO Subpart A paragraph 3.

ETSO-C157a
Date: xx.xx.2012

European Aviation Safety Agency

European Technical Standard Order

Subject: Aircraft Flight Information Services-Broadcast (FIS-B) Data Link Systems and Equipment

1 - Applicability

This ETSO gives the requirements which Aircraft Flight Information Services-Broadcast (FIS-B) Data Link Systems and 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

This standard apply to equipment intended to display weather and other non-control flight advisory information to pilots in a manner that will enhance their awareness of the flight conditions.

Standards set forth in the Radio Technical Commission for Aeronautics (RTCA) Document DO-267A, Minimum Aviation System Performance Standards (MASPS) for Flight Information Services-Broadcast (FIS-B) Data Link, Rev. A dated 29 April 2004. The standard applies to the equipment classes as defined in the following table 1. Demonstrate the required functional performance under the test conditions specified in RTCA/DO-267A Section 4.

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Equipment Class	Equipment Name	Functionality
1	FIS-B Equipment using Universal Access Transceiver (UAT) and Interoperable with the Surveillance and Broadcast Services (SBS) Provider	RTCA/DO-267A Sections 2 and 3, with amendments per Appendix 1 of this ETSO.
2	FIS-B Equipment not Interoperable with the SBS Provider	RTCA/DO-267A Section 2 (except 2.1.4; 2.2.12; and 2.2.13) and Section 3.8.

Table 1. Equipment Classes for FIS-B

3.1.2 - Environmental Standard

See CS-ETSO Subpart A paragraph 2.1.

3.1.3 – Computer Software

See CS-ETSO Subpart A paragraph 2.2.

3.1.4 - Electronic Hardware Qualification

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.

Loss or malfunction 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.

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APPENDIX 1. AMENDMENTS TO THE MINIMUM PERFORMANCE STANDARD FOR EQUIPMENT PROVIDING FIS-B VIA THE UNIVERSAL ACCESS TRANCEIVER

This Appendix prescribes addendums to the MPS for aircraft FIS-B systems and equipment when using the Surveillance Broadcast Services system.

1.1 RTCA/DO-267A. The applicable standard is RTCA/DO-267A Sections 2 and 3. We modified it as follows:

1.1.1 Page 19, 3.6.2.3, Reassembly of Linked Application Protocol Data Units (APDU) to Form an FIS-B Product File, Paragraph 3, Sentence 1, reads as follows:

Change from:

…Separate APDU sequences are maintained for each Product and ground station combination for which linked APDUs are transmitted.

To:

… Separate APDU sequences are maintained for each Product and *each Product File ID or* ground station combination for which linked APDUs are transmitted.

1.1.2 Appendix D, Page D-1, Paragraph 2, Sentence 1:

Change from:

…The APDU structure shall begin with an APDU Header consisting of data fields as shown in Table D-1.

To:

… The APDU structure shall begin with an APDU Header consisting of data fields as shown in Table D-1, except the UAT transmission of the APDU header does not include the 16-bit FIS-B APDU ID field.

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1.1.3 Appendix D, Page D-1, Table D-1 FIS-B APDU Header Format, replace Header. Time rows as follows:

Change From:

Head Time	22 – 37 bits	Section D.4
Time Option Bits	2 bits	
Date (optional)	9 bits (if included)	
Month of Year	4 bits	
Day of month	5 bits	
UTC Time Hours	5 bits	
Time Minutes	6 bits	
Time Seconds (optional)	6 bits (if included)	

To:

Head Time	22 – 37 bits	Section D.4
Time Option Bits	2 bits	
Month of Year (optional)	4 bits (if included)	
Day of month (optional)	5 bits (if included)	
UTC Time Hours	5 bits	
Time Minutes	6 bits	
Time Seconds (optional)	6 bits (if included)	

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1.1.4 Appendix D, Page D-1, amend the Segmentation Data Block entries and add a new Product File ID entry in Table D-1 to read as follows:

Change From:

Field	Number of Bits	Document Section
Product File Length	12 bits	
Number	12 bits	
Zero Padding Bits	0-7 bits to force octet-alignment	Section D.6

To:

Field	Number of Bits	Document Section
Product File ID	10 bits	ETSO-C157a Appendix 1 paragraph 1.1.9
Product File Length	9 bits	Section D.5.1
APDU Number	9 bits	Section D.5.2
Zero Padding Bits	0-7 bits to force octet-alignment	Section D.6

1.1.5 Appendix D, Page D-3, Table D-2 Format of the FIS-B Product Descriptor, reads as follows:

Change from:

Geographic Locator (region) (optional)	20 bits (if present)	Section D.2.4

To:

Geographic Locator (region) (optional)	20 bits (if present)	Section D.2.4
Latitude	7 bits	Section D.2.4
Longitude	8 bits	Section D.2.4
Extent	5 bits	Section D.2.4

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1.1.6 Appendix D, Page D-15, Figure D-3, Block Reference Indicator Format, reads as follows:

Change from:

Byte #	Bit Number							
	7	6	5	4	3	2	1	0
0	Element Identifier	N/S	Spare		Block Number (MSb)			
1	Block Number							
2	Block Number (LSB)							

To:

Byte #	Bit Number							
	7	6	5	4	3	2	1	0
0	Element Identifier	N/S	Scale		Block Number (MSb)			
1	Block Number							
2	Block Number (LSB)							

1.1.7 Appendix D, Page D-15, Section 2.3.5.2.2 The Block Reference Indicator, after the "Hemisphere N/S" paragraph add new paragraph to read as follows:

"Scale: an encoded multiplier applied to the base size of the GBR block in both latitude and longitude dimensions. Values represented by the Scale encoding are either system or product specific. Any mathematical calculations that are needed to reduce a high-resolution product down to a lower-resolution 'scaled' product are left for the implementer to separately describe/document."

1.1.8 Appendix D, Page D-21, D.5, Segmentation Data Block, Sentence 5, reads as follows:

Change from:

…The Segmentation Data Block (if present) shall consist of two components, the Product File Length field and the APDU Number field.

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To:

…The Segmentation Data Block (if present) shall consist of three components, the Product File *ID* field, Product File Length field and the APDU Number field.

1.1.9 Appendix D, Page D-21, supplement section D.5 with the following:

The Product File ID Field contains a reference number to associate segmented APDUs with the appropriate Product File. Such a reference is necessary when broadcasting the same APDU segments for a Product File from multiple radio stations.

1.1.10 Appendix D, Page D-23, Figure D-9 APDU Header Layouts, amend the optional Segmentation Data Block fields to read as follows:

Change from:

<table>
<tr><td colspan="5">ADPU Header (48 to 112 bits)</td></tr>
<tr><td rowspan="2">FIS-B APDU ID
(16 bits)</td><td rowspan="2">• • •</td><td colspan="2">Segmentation Data Block (Optional 24 bits)</td><td rowspan="2">Zero Pad
(0 – 7 bits)</td></tr>
<tr><td>Product File Length
(12 bits)</td><td>APDU Number
(12 bits)</td></tr>
<tr><td>1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 0</td><td></td><td></td><td></td><td></td></tr>
</table>

To:

<table>
<tr><td colspan="5">ADPU Header (48 to 112 bits)</td></tr>
<tr><td rowspan="2">FIS-B APDU ID
(16 bits)</td><td rowspan="2">• • •</td><td colspan="3">Segmentation Data Block (Optional 28 bits)</td><td rowspan="2">Zero Pad
(0 – 7 bits)</td></tr>
<tr><td>Product File ID
(10 bits)</td><td>Product File Length
(9 bits)</td><td>APDU Number
(9 bits)</td></tr>
<tr><td>1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 0</td><td></td><td></td><td></td><td></td><td></td></tr>
</table>

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1.1.11 Appendix D, Page D-23, Figure D-9 APDU Header Layouts, amend the APDU Header Time field text to read as follows:

Change from:

APDU Header Time (13 or 28 bits)

To:

APDU Header Time (13, *19, or 22* bits)

1.1.12 Appendix D, Page D-23, Figure D-9, APDU Header Layouts, add note to Option Flags table to read as follows:

"Note: A given APDU shall not have Time Flag #1 and Time Flag #2 set to one (1) within the same APDU Header."

1.1.13 Appendix K, Page K-1, the last entry in Table K-1, reads as follows:

Change from:

The last entry in Table K-1 shows the encoding of the CC (Change Cipher) character as "011111."

To:

The last entry in Table K-1 shows the encoding of the "**|**" character as "011111."

1.1.14 Appendix K, Page K-1, new note at the bottom of the table, reads as follows:

"**|** = The change cipher character is not used by FIS-B (per MASPS), so there is no expected impact on legacy users."

ETSO-C158

Date: xx.xx.2012

European Aviation Safety Agency

European Technical Standard Order

Subject: Aeronautical Mobile High Frequency Data Link (HFDL) Equipment

1 - Applicability

This ETSO gives the requirements which Aeronautical Mobile High Frequency Data Link (HFDL) 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 Radio Technical Commission for Aeronautics (RTCA) Document DO-265, Minimum Operational Performance Standards for Aeronautical Mobile High Frequency Data Link (HFDL)", dated 14/12/2000.

3.1.2 - Environmental Standard

See CS-ETSO Subpart A paragraph 2.1.

3.1.3 – Computer Software

See CS-ETSO Subpart A paragraph 2.2.

3.1.4 - Electronic Hardware Qualification

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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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-C159a

Date: xx.xx.2012

European Aviation Safety Agency

European Technical Standard Order

Subject: Avionics Supporting Next Generation Satellite Systems (NGSS) = Airborne Iridium Satellite Transceiver for Voice or Data

1 - Applicability

This ETSO gives the requirements which Avionics Supporting Next Generation Satellite Systems (NGSS) = Airborne Iridium Satellite Transceiver for Voice or Data that are manufactured on or after the date of this ETSO must meet in order to be identified with the applicable ETSO marking.

The ETSO Authorisation does not include the verification of aspects (e.g. quality and continuity of electric power) which shall be assessed at aircraft level, but it includes verification of the system behaviour in presence of such failure conditions.

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 Radio Technical Commission for Aeronautics (RTCA) Document DO-262A, Minimum Operational Performance Standards for Avionics Supporting Next Generation Satellite Systems (NGSS), dated 16/12/2008.

3.1.2 - Environmental Standard

See CS-ETSO Subpart A paragraph 2.1.

3.1.3 – Computer Software

See CS-ETSO Subpart A paragraph 2.2.

3.1.4 - Electronic Hardware Qualification

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.

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-C161a

Date: xx.xx.2012

European Aviation Safety Agency

European Technical Standard Order

Subject: Ground Based Augmentation System Positioning and Navigation Equipment

1 - Applicability

This ETSO gives the requirements which 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 Radio Technical Commission for Aeronautics (RTCA) Document DO-253C, Minimum Operational Performance Standards for GPS Local Area Augmentation System Airborne Equipment, dated 16/12/2008, section 2 as modified by appendices 1 and 2 of this ETSO for airborne equipment class (AEC) C to support Category I precision approach. These standards also apply to equipment that implements the optional GBAS positioning service. This ETSO does not apply to AEC D equipment as the additional requirements to support the GBAS Approach Service Type D and Category III precision approaches have not been validated. A new ETSO or a revision to this ETSO for AEC D equipment will be issued once these additional requirements are validated.

This TSO's standards apply to equipment intended to output deviations relative to a precision approach path using GBAS, and to provide position information to an ETSO-C161a navigation management unit that outputs deviation commands referenced to a desired flight path. These standards do not address integration issues with other avionics except for automatic dependent surveillance. The positioning and navigation functions are defined in section 2.3 of RTCA/DO-253C. In accordance with section 2.1 of RTCA/DO-253C, equipment obtaining this ETSOA must also comply with the position, velocity and time (PVT) output requirements of either, ETSO-C145c, ETSO-C146c or ETSO-C196a.

Note: ETSO-C196a, which is based on RTCA/DO-316, Minimum Operational

Performance Standards for Global Positioning System/Aircraft Based Augmentation System Airborne Equipment, is not referenced in RTCA DO-253C. RTCA/DO-316 was published after the publication of DO-253C. ETSO-C129a is not applicable to this ETSO.

3.1.2 - Environmental Standard

See CS-ETSO Subpart A paragraph 2.1. The required performance is defined in RTCA/DO253C section 2.4.

3.1.3 – Computer Software

See CS-ETSO Subpart A paragraph 2.2.

3.1.4 - Electronic Hardware Qualification

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 for the malfunction of position data and a hazardous failure condition for the malfunction of precision approach navigation data.

Failure of the function defined in paragraph 3.1.1 of this ETSO has been determined to be a minor failure condition for the loss of position data and a minor failure condition for the loss of precision approach navigation data.

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-C161a

APPENDIX 1. MINIMUM PERFORMANCE STANDARD FOR GROUND BASED AUGMENTATION SYSTEM POSITIONING AND NAVIGATION EQUIPMENT

This Appendix prescribes the minimum performance standards (MPS) for GBAS equipment for airborne equipment class (AEC) C and equipment using the GBAS Positioning Service. The applicable standard is RTCA/DO-253C, *Minimum Operational Performance Standards for GPS Local Area Augmentation System Airborne Equipment*, dated 16/12/2008, section 2. The applicable standard is modified as follows:

1. Except as modified by appendix 2 of this ETSO, for all RTCA/DO-253C references to RTCA/DO 246(), use RTCA/DO-246B, *GNSS-Based Precision Approach Local Area Augmentation System (LAAS) Signal-In-Space Interface Control Document (ICD)*, dated 28/11/2001.

2. Page 35, section 2.3.6.4.1, ***modify*** Table 2-7 and the note under the table as highlighted below (rest of section unchanged):

Table 2-7 GPS Tracking Constraints for DD DLL Discriminators

Region (see Figure 2-3)	3 dB Pre-correlation bandwidth, BW	Average Correlator Spacing (d_1 and $2d_1$) [C/A chips]	Instantaneous Correlator Spacing (d_1 and $2d_1$) [C/A chips]	Differential Group Delay	Applicable AEC
1	(-50*x)+12<BW≤7 MHz	0.1-0.2	0.09-0.22	≤ 600 ns – D_A – D_C	C
	2<BW≤7 MHz	0.2-0.6	0.18-0.65		
2	(-50*x)+12<BW≤(133.33*x)+2.667 MHz	0.07-0.085	0.063-0.094	≤ 150 ns – D_A – D_C	C & D
	(-50*x)+12<BW≤14 MHz	0.085-0.1	0.077-0.11		
	7<BW≤14 MHz	0.1-0.24	0.09-0.26		
3	14<BW≤16 MHz	0.1-0.24	0.09-0.26	≤ 150 ns – D_A – D_C	C & D
	(133.33*x)+2.667<BW≤16 MHz	0.085-0.1	0.077-0.11		

Note (1): D_A *is the differential group delay contribution of the antenna through the output of the pre-amp.* D_C *is the differential group delay contribution of the installation specific connection between the antenna and the PAN equipment*.

Note (2): x denotes the average correlator spacing for d_1 in C/A chips.

3. Page 49, section 2.3.8.1.3, ***add*** a new paragraph g. to the list of conditions as follows:

g) The distance (slant range) between the aircraft and the GBAS reference point is less than the maximum GBAS usable distance, if the maximum GBAS usable distance (D_{max}) is provided in the Type 2 message being used *[LAAS-281]*.

4. Page 57, section 2.3.9.5, ***replace*** the differential correction magnitude check, δPR_i equation as follows:

$\delta PR_i = PRC_i + RRC_i*(t-t_{zcount}) + TC_i$

5. Page A-6, ***replace*** the Maximum Use Distance (D_{max}) definition as follows:

Maximum Use Distance (Dmax) – the maximum distance from the GBAS reference point for which the integrity is assured.

6. If a manufacturer elects to provide the authentication capability in its equipment as specified in section 2.3.7.3 of RTCA/DO-253C, the equipment shall also perform the differential correction magnitude check in section 2.3.9.5.

NOTE: There are additional sections of RTCA DO-246D that are applicable when VDB authentication is implemented. These are specified in appendix **2**.

7. Summary of ETSO changes relative to DO-253C.

LAAS Requirement Designator [LAAS-xxx]	Change Status from DO-253C
093	Changed
123	Changed
281	Added
351 and 352	New application (see item 6 above)

ETSO-C161a

APPENDIX 2. MINIMUM PERFORMANCE STANDARD FOR GNSS-BASED PRECISION APPROACH LOCAL AREA AUGMENTATION SYSTEM (LAAS) SIGNAL-IN-SPACE INTERFACE CONTROL DOCUMENT (ICD)

This Appendix prescribes the interface control document for GBAS as it applies to AEC C for this ETSO. The applicable standard is RTCA/DO-246B, GNSS-Based Precision Approach Local Area Augmentation System (LAAS) Signal-in-Space Interface Control Document, dated 28 November 2001. The applicable standard is modified as follows:

1. Page 22, ***replace*** the ephemeris CRC bit order of transmission in section 2.4.3.2. *Message Type 1* parameters, ***with*** the updated definition in the latest revision, RTCA/DO-246D, dated December 16, 2008, section 2.4.3.2.

> NOTE: This change reorders the bits of the ephemeris CRC from their previous transmission order of r1, r2, r3, r4 … r16, where r1 is the least significant bit and bit r16 is the most significant bit, to r9, r10, r11 … r16, followed by r1, r2, … r8, where r9 and r1 are the first bits of each bite into the bit scrambler. This change is not backwards compatible with the existing standard. The change was adopted for compatibility with a significant number of current implementations of ground equipment and avionics. This change affects [LAAS-107], [LAAS-117], [LAAS-118], and [LAAS-214]. Other changes to RTCA/DO-246B, reflected in RTCA/DO-246D, to support the newly incorporated GBAS Approach Service Type D are not relevant for this ETSO and should not be implemented.

2. Appendix A, ***replace*** appendix A, *Cyclic Redundancy Checks (CRCs)*, ***with*** RTCA/DO-246D, Appendix A.

3. Page B-2, ***replace*** Table B-1 *Example of Type 1 Message*, with RTCA/DO-246D, Table B-1.

4. Page B-4, ***replace*** Table B-2 *Example of Type 1 and Type 2 Messages in One Burst* ***with*** RTCA/DO-246D, Table B-2.

5. Page B-7, ***replace*** Table B-3 *Example of Type 4 Message* ***with*** RTCA/DO-246D, Table B-4 as modified below for the runway number valid range.

> The valid range for runway number is 0-36.

6. Page B-10, ***replace*** Table B-4 *Example of Type 5 Message* ***with*** RTCA/DO-246D, appendix B, Table B-6, *Example of Type 5 Message*.

7. If a manufacturer elects to provide the authentication capability in its equipment as specified in section 2.3.7.3 of RTCA/DO-253C, the following paragraphs from RTCA/DO-246D, dated 16/12/2008 are applicable:

> a. *Message Type 2, Additional Data Block 4, VDB Authentication Parameters* description and Table 2-16 in DO-246D, section 2.4.4.1, pages 33 and 35.
>
> b. *Message Type 3 – Null Message* and Table 2-17 *Format of Message Type 3* in DO-246D, section 2.4.5, page 37.
>
> c. *Reference Path Identifier* in DO-246D, section 2.4.6.4, page 53.

8. Summary of RTCA/DO-253C requirements affected by these modifications to DO-246B.

ETSO-C161a

Appendix 2 Item number	**LAAS Requirement Designator [LAAS-xxx]**
1	**107, 117, 118, 214**
2	**Editorial**
3	**Editorial**
4	**Editorial**
5	**Editorial**
6	**Editorial**
7	**328, 329, 330 and 331**

ETSO-C162a

European Aviation Safety Agency

European Technical Standard Order

Subject: Ground Based Augmentation System Very High Frequency Data Broadcast Equipment

1 - Applicability

This ETSO gives the requirements which Ground Based Augmentation System Very High Frequency Data Broadcast 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 Radio Technical Commission for Aeronautics (RTCA) Document DO-253C, Minimum Operational Performance Standards for GPS Local Area Augmentation System Airborne Equipment, dated 16/12/2008.

NOTE: All RTCA/DO-253C references to RTCA/DO 246() apply to RTCA/DO-246B, *GNSS-Based Precision Approach Local Area Augmentation System (LAAS) Signal-In-Space Interface Control Document (ICD)*, dated November 28, 2001. Modifications to these references are noted in appendix 2 of ETSO-C161a.

3.1.2 - Environmental Standard

See CS-ETSO Subpart A paragraph 2.1.

3.1.3 – Computer Software

See CS-ETSO Subpart A paragraph 2.2.

3.1.4 - Electronic Hardware Qualification

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.

ETSO-C166~~a~~b

~~Date : 24.10.03~~
Date: xx.xx.2012

European Aviation Safety Agency

European Technical Standard Order

Subject: Extended Squitter Automatic Dependent Surveillance - Broadcast (ADS-B) and Traffic Information Services (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 Conditions

3.1 - Basic

3.1.1 - Minimum Performance Standard

~~Section 2 of RTCA DO-260A *" Squitter Automatic Dependent Surveillance - Broadcast (ADS-B) and Traffic Information Services - Broadcast (TIS-B)",* dated April 10, 2003, as modified by Change 1 to RTCA/DO-260A, dated June 27, 2006, and Change 2 to DO-260A, dated December 13, 2006. The 1090 MHz equipment classes applicable to this ETSO are defined in RTCA/DO-260A, Section 2.1.11.~~

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

(a) 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 TISB messages and delivering both ADS-B and TIS-B reports, as well as transmitting ADS-B messages. A Receive-only Class of equipment is allowed.

(b) **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 Standard

~~EUROCAE ED-14E (RTCA DO160E) "Environmental Conditions and Test Procedures for Airborne Equipment" from March 2005.~~

~~The means for verifying equipment performance must be consistent with the test procedures specified in section 2.3 of RTCA/DO-260A dated April 10, 2003 Change 1 to RTCA/DO-260A, dated June 27, 2006, and Change 2 to DO-260A, dated December 13, 2006.~~

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 Software

~~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 - 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.

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 Referenced Document

See CS-ETSO Subpart A paragraph 3.

ETSO-C170
Date: xx.xx.2012

European Aviation Safety Agency

European Technical Standard Order

Subject: High Frequency (HF) Radio Communications Transceiver Equipment Operating Within the Radio Frequency 1.5 to 30 Megahertz

1 - Applicability

This ETSO gives the requirements which High Frequency (HF) Radio Communications Transceiver Equipment Operating Within the Radio Frequency 1.5 to 30 Megahertz 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 cancels ETSO-C31d "High Frequency (HF) Radio Communications Transmitting Equipment Operating within the Radio Frequency Range 1.5-30 Megahertz" and ETSO-C32d "High Frequency (HF) Radio Communications Receiving Equipment Operating within the Radio Frequency Range 1.5-30 Megahertz".

2 - Procedures

2.1 - General

Applicable procedures are detailed in CS-ETSO Subpart A.

2.2 - Specific

None.

ETSO-C170

3 - Technical Conditions

3.1 - Basic

3.1.1 - Minimum Performance Standard

Standards set forth in the Radio Technical Commission for Aeronautics (RTCA) Document DO-163, Minimum Operational Performance Standards - Airborne HF Radio Communications Transmitting and Receiving Equipment Operating within the Radio-Frequency Range of 1.5 to 30 MHz, dated 09/03/1976.

3.1.2 - Environmental Standard

See CS-ETSO Subpart A paragraph 2.1.

3.1.3 – Computer Software

See CS-ETSO Subpart A paragraph 2.2.

3.1.4 - Electronic Hardware Qualification

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.

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-C172
Date: xx.xx.2011

European Aviation Safety Agency

European Technical Standard Order

Subject: Cargo Restraint Strap Assemblies

1 - Applicability

This ETSO gives the requirements which Cargo Restraint Strap Assemblies 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 5385C, Cargo Restraint Straps - Design Criteria and Testing Methods, dated January 2007, as amended by Appendix 1 of this ETSO.

3.1.2 - Environmental Standard

See Section 4 of SAE AS 5385C.

3.1.3 – Computer Software

None.

3.1.4 - Electronic Hardware Qualification

None.

3.2 - Specific

3.2.1 Failure Condition Classification

N/A

4 - Marking

4.1 - General

Marking as detailed in CS-ETSO Subpart A paragraph 1.2. In addition, each Cargo Restraint Strap Assemblies shall be legibly and permanently marked in accordance

with SAE AS 5385C, section 7.3 with the following:

(i) dates of manufacture and expiration per SAE AS 5385C, section 4.5.2. Format the dates per SAE AS 5385C, section 7.2.

(ii) the rated ultimate load in daN and lbf.

(iii) a unique identifier if required by SAE AS 5385C, section 4.5.2(b).

Also mark permanently and legibly, with at least the manufacturer's name, subassembly part number, and the ETSO number:

(1) each component that is easily removable (without hand tool), and

(2) each subassembly of the article that may be interchangeable.

NOTE 1: any extra information listed in SAE AS 5385C, section 7, not specifically required in this paragraph, may be marked.

NOTE 2: Compliance with this ETSO does not necessarily indicate compliance with SAE AS 5385C. To make the cargo strap assembly as complying with SAE AS 5385C, the cargo strap assembly must be shown to meet the requirements of SAE AS 5385C in conformance with SAE AS 5385C, Para 7.1 and Note 8.

4.2 - Specific

None.

5 - Availability of Referenced Document

See CS-ETSO Subpart A paragraph 3.

ETSO-C172

APPENDIX 1. MINIMUM PERFORMANCE STANDARD FOR CARGO RESTRAINT STRAP ASSEMBLIES

This Appendix prescribes the MPS for cargo restraint strap assemblies. The applicable standard is SAE AS 5385C *"Cargo Restraint Straps – Design Criteria and Testing Methods"*, dated January 2007 modified as follows:

AS5385C Section	Action
1	Disregard
2	Modify Paragraph 2. "REFERENCES" by disregarding the last sentence.
3	Disregard 3.14
4	Disregard 4.5.4 and 4.9.1 Modify 4.5.1 by adding the following note: "NOTE: Environmental degradation data other than that documented in AIR490B may be used if substantiated by the Applicant and approved by the Agency."
5	Disregard 5.9, 5.10 and 5.11 Modify 5.1 by adding the following note: "NOTE: Equivalent alternate methods must be approved by the Agency".
6	Disregard
7	Apply per Paragraph 4 of this ETSO
8	Disregard
9	Disregard
10	Disregard

ETSO-C179a
Date: xx.xx.2011

European Aviation Safety Agency

European Technical Standard Order

Subject: Permanently Installed Rechargeable Lithium Cells, Batteries, and Battery Systems

1 - Applicability

This ETSO gives the requirements which permanetly installed rechargeable lithium cells, batteries, and battery 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 Conditions

3.1 - Basic

3.1.1 - Minimum Performance Standard

For permanently installed rechargeable lithium cells, batteries and lithium battery systems intended to provide power for aircraft equipment Standards set forth in Sections 2 and 3 of Radio Technical Commission for Aeronautics (RTCA) Document DO-311, Minimum Operational Performance Standards for Rechargeable Lithium Battery Systems, dated March 13, 2008. Refer to Table 4-1 of DO-311 for test schedule information.

3.1.2 - Environmental Standard

Test the equipment according to Section 3 of RTCA/DO-311 , *Minimum Operational Performance Standards for Rechargeable Lithium Battery Systems* document dated March 13, 2008.

3.1.3 – Computer Software

See CS-ETSO Subpart A paragraph 2.2.

3.1.4 - Electronic Hardware Qualification

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

Specific marking requirements are detailed in Section 1.9.7 of RTCA/DO-311, *Minimum Operational Performance Standards for Rechargeable Lithium Battery Systems* document, dated March 13, 2008.

5 - Availability of Referenced Document

See CS-ETSO Subpart A paragraph 3.

ETSO-C184
Date: xx.xx.2011

European Aviation Safety Agency

European Technical Standard Order

Subject: Airplane Galley Insert Equipment, Electrical/Pressurised

1 - Applicability

This ETSO gives the requirements which Airplane Galley Insert Equipment, Electrical/Pressurised that is 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 Society of Automotive Engineers (SAE) Aerospace Standard (AS) 8057, Minimum Design and Performance of Airplane Galley Insert Equipment, Electrical/Pressurized, issued July, 2008 as modified by Appendix 1 of this document.

3.1.2 - Environmental Standard

See *AS 8057, paragraph 3.17* as modified by appendix 1 of this document.

3.1.3 – Computer Software

See CS-ETSO Subpart A paragraph 2.2.

3.1.4 - Electronic Hardware Qualification

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.

ETSO-C184

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-C184

APPENDIX 1. MINIMUM PERFORMANCE STANDARD FOR AIRPLANE GALLEY INSERT EQUIPMENT, ELECTRICAL/PRESSURIZED

This Appendix prescribes the minimum performance standards (MPS) for airplane galley insert equipment. The applicable standard is SAE AS 8057, *Minimum Design and Performance of Airplane Galley Insert Equipment, Electrical/Pressurized,* issued July, 2008. EASA did revise it as follows:

1 . Page 5, replace paragraph 1.3.b. with:

"The word "should" indicates a criterion for which an alternative, including non-compliance, may be applied."

2 . Page 8, disregard paragraph 2.2 Definitions: "ACCEPTANCE TEST", "ASSOCIATED COMPONENTS", "DETRIMENTAL PERMANENT DEFORMATION", and "FAILSAFE".

3 . Page 8, replace paragraph 2.2 Definitions: "FAILURE" with: "FAILURE: is a failure to meet the Minimum Performance Standard of the ETSO. The standard ensures a level of safety that is acceptable.

4 . Page 9, replace paragraph 2.2 Definitions: INTERCHANGEABILITY with:

"INTERCHANGEABILITY: That quality which allows an assembly or part to substitute or be substituted for another and to meet all physical, functional, and structural requirements of the original."

5 . Page 9, replace paragraph 2.2 Definitions: MAXIMUM NORMAL OPERATING

PRESSURE (MNOP) with: "MAXIMUM NORMAL OPERATING PRESSURE (MNOP):

The maximum attainable pressure of the equipment's pressure system when all the equipment's components are functioning normally."

6 . Page 9, replace paragraph 2.2 Definitions: OPTION with

"OPTION: A function capable of being included as part of equipment. It shall be fully developed and able to be incorporated without adverse effects to meeting the performance requirements of this AS included in this ETSO."

7 . Page 9, disregard paragraph 2.2 Definitions: "PERIODIC TESTING".

8 . Page 10, disregard paragraph 2.2 Definitions: "PROCESS SPECIFICATION"

9 . Page 10, replace paragraph 3.1 with:

"Table 1 identifies applicable requirements for typical galley insert equipment designs. Novel designs may require compliance to additional requirements, or requirements in Table 1 not identified by a bullet. To use the table, find the equipment in question along the top row, and then read down that column; the row in which a bullet appears indicates requirements that shall be addressed. A bullet in brackets indicates that the requirements are applicable for only a part of the equipment in question."

ETSO-C184

10 . Page 11, disregard paragraphs 3.2.1 and 3.2.1.1.

11 . Page 12, disregard paragraph 3.2.1.2.a.

12 . Page 12, replace paragraph 3.2.1.2.c with:

"Aluminium honeycomb core shall be finished for corrosion resistance."

13 . Page 12, disregard paragraphs 3.2.1.4. through 3.2.1.6.

14 . Page 12, replace paragraph 3.2.1.8 with:

"Components shall be protected against deterioration or loss of strength in service due to environmental causes. Selection and finishing of material (including fasteners), where dissimilar metals may be placed in contact, shall be per MIL-STD-889 or equivalent. Material not inherently corrosion resistant shall be finished with a protective treatment or coating. Magnesium alloys shall not be used."

15 . Page 13, disregard paragraphs 3.2.1.9. through 3.2.2.3.

16 . Page 14, replace paragraph 3.2.2.4 with:

"Bonded joints shall not be loaded primarily in tension"

Disregard paragraphs 3.2.2.4.a through d.

17 . Page 14, disregard paragraph 3.2.2.5.

18 . Page 14, replace paragraph 3.2.3 with:

"Construction for Trash Compactors

Trash compactors shall be constructed of fire-resistant materials capable of containing fire (see 3.10) under the conditions expected to result in service."

Note: Fire-resistant, with respect to sheet or structural members, means the capacity to withstand the heat associated with fire at least as well as aluminium alloy in dimensions appropriate for the purpose for which they are used.

19 . Page 15, disregard paragraph 3.2.4.

20 . Page 15, replace paragraph 3.2.5 with:

"Interface clearances between equipment and the surrounding galley or structure required for ventilation, heat dissipation, installation, loading, etc. shall be clearly defined and included in the application data for this ETSO."

21 . Page 15, replace paragraph 3.2.6 with:

"Equipment shall comply with US Food and Drug Administration (FDA) requirements for sanitary construction in Sections 1, 2, 4, and 6 of Attachment 3 *Guidelines for Sanitary Construction of Aircraft Galleys and Galley Equipmen*t, to FDA document, *Guide to Inspections of Interstate Carriers and Support Facilities*, (Reference 2.1.5)."

ETSO-C184

22 . Page 15, disregard paragraph 3.2.7.

23 . Page 16, disregard paragraph 3.2.8.

24 . Page 16, replace paragraph 3.3.1.a. with:

"Equipment shall be designed to meet the structural loading as specified in 4.2.1."

25 . Page 16, replace paragraph 3.3.2.a. with:

"The structure of equipment shall address the load case in each direction and be verified according to 4.2.1."

26 . Page 16, replace paragraph 3.3.2.b with:

"The loading conditions shall be determined by assuming installation of equipment around the z-axis of the airplane (see Figure 1)."

27 . Page 16, disregard paragraph 3.3.2.c.

28 . Page 16, replace paragraph 3.3.2.d. with:

"Failure shall not occur under ultimate load cases. All permanent deformation that occurs under ultimate or limit load cases shall be reported in the data furnished with each article."

Disregard "NOTE" following paragraph 3.3.2.d.

29 . Page 16, replace paragraph 3.3.3 with:

"A local attachment factor of 1.33 shall be applied in addition to the design load factors for attachments (such as door hinges, latches and retaining devices)."

30 . Page 16, replace paragraph 3.3.4 with:

"Material strength properties shall be based on tests of material meeting industry specifications to establish design values on a statistical basis. Design values shall be chosen to minimize the probability of structural failure due to material variability. The applicable specifications are Metallic Materials Process Development and Standardization (MMPDS, formerly MIL-Handbook-5) and the Composite Materials Handbook (CMH-17, formerly MIL-Handbook-17).

Analytical substantiation of material strength shall be based on material design values shown to be statistically reliable by repeated structural testing. Strength substantiation shown by full scale testing shall account for the variability of the materials and processes used to fabricate the parts by applying an appropriate overload factor. See chapter 2 in General Aviation Manufacturer's Association (GAMA) document Publication 13 for guidance in determining the appropriate overload factor."

31 . Page 18, replace paragraph 3.3.5.i. with:

"Forces generated by the conditions tested in 3.17, 4.2.1., or the weight of the retaining device itself, shall not cause the retaining device to release."

ETSO-C184

32 . Page 18, replace paragraph 3.3.5.m. with:

"Equipment with a stowage compartment (e.g., trash compactors, ovens, refrigerators and freezers, wine chillers) shall be designed such that the stowage compartment completely encloses its contents."

33 . Page 18, correct 3.3.6.b.2. to read:

"maximum wet weight, including associated components used for normal operation of the equipment (with the exception of attached hoses, tubes, pipes and/or electrical conduit), maximum amount of water in the equipment plumbing system and including water in tank, beverage in server, soaked pillow pack (if applicable)."

34 . Page 19, disregard paragraph 3.3.8.

35 . Page 19, disregard paragraph 3.3.9.

36 . Page 19, replace paragraph 3.4.1.a. with:

"Equipment shall be designed for the primary power levels typically found in aircraft (e.g., 28VDC, and/or 115 VAC (Constant frequency (CF) or Wide variable frequency (WF), or 230 VAC (CF) or (WF))."

37 . Page 20, replace paragraph 3.4.4 with:

"Equipment shall be designed to be capable of withstanding over-voltage events without arcing, sparking, smoke or fire. Equipment shall be designed to pass the following dielectric tests: (Note: Components (filters, protection diodes) normally not capable of withstanding the dielectric withstanding voltage test without damage may be disconnected or individually disabled (e.g., short circuited) for these tests. The dielectric withstanding voltage test shall be run prior to the insulation resistance test.)" Paragraphs 3.4.4.a and b. remain unchanged.

38 . Page 21, replace paragraph 3.4.7. with:

"In addition to the requirements of this document, microwave ovens shall meet the provisions of the U.S.A. Code of Federal Regulation 21 CFR § 1030.10, Performance Standards for Microwave and Radio Frequency Emitting Products."

39 . Page 21, replace paragraph 3.4.8.a. with:

"Equipment shall be designed to minimize the generation of or susceptibility to electromagnetic interference."

40 . Page 21, disregard paragraph 3.4.8.b.

41 . Page 22, replace paragraph 3.4.9.b. with:

"Hidden installed equipment (e.g., remote water heater, air chiller) may have a separate control module capable of being installed on the front of the galley for the following functions:" Information in bullets remains unchanged.

ETSO-C184

42 . Page 23, replace paragraph 3.6.2.a. with:

"Show the complete equipment plumbing interface in the application data for this ETSO."

43 . Page 23, disregard paragraphs 3.6.2.c and 3.6.2.d.

44 . Page 23, replace paragraph 3.6.3 with:

"Equipment, capable of being connected to the potable water system of an airplane, that heats and stores water shall incorporate a feature for sensing a low water condition. Indication of low water shall both illuminate a warning light and interrupt power to the equipment heating elements."

45 . Page 23, replace paragraph 3.6.4.a. with:

"Equipment capable of being connected to an airplane potable water system shall incorporate a self-venting device."

46 . Page 23, replace paragraph 3.6.4.b. with:

"Equipment capable of being connected to an airplane potable water system shall be self-draining."

47 . Page 24, replace paragraph 3.6.6.a. with:

"Demonstrate equipment proof and burst pressure values by test and provide pressure values in the application data for this ETSO."

48 . Page 25, replace paragraph 3.6.7.b. with:

"Water taps/faucets shall be self-closing unless the application data for this ETSO specify this equipment is intended for installation above a sink in the galley monument."

49 . Page 25, revise paragraph 3.8.c. first sentence with:

"External surfaces that have to be heated directly to meet the equipment purpose (e.g., toaster slot, skillet surface, heating plates of a sandwich press, warmer pad for beverage server) are excluded from 3.8.a. and 3.8.b.

50 . Page 25, replace paragraph 3.9 with:

"Materials (including finishes or decorative surfaces applied to the materials) shall comply with the appropriate paragraphs of CS-25, App. F, as follows:"

51 . Page 25, replace paragraph 3.9.1.a. with:

"Equipment shall comply with the appropriate flammability requirements of CS-25 when tested per Appendix F, Part I."

52 . Page 25, replace paragraph 3.9.1.b. with:

"Thermal and acoustic insulation material and components (batting, cover foil, foam, etc.) shall comply with the flame propagation requirements of CS-25, Appendix F, Part

VI. Consult Advisory Circular AC 25.856-1, *Thermal/Acoustic Insulation Flame Propagation Test Method Details*, for appropriate guidance."

53 . Page 26, replace paragraph 3.9.2. with:

"Exposed surfaces of equipment, when stowed, shall meet the heat release and smoke density requirements of CS-25, Appendix F, Parts IV and V."

54 . Page 26, replace paragraph 3.10.a. with:

"Equipment dedicated to, or that may be used for, waste stowage (e.g., trash compactors) shall meet AC 25-17A *Transport Airplane Cabin Interiors Crashworthiness Handbook* Appendix 8 *Fire Containment Test Methods,* Sections 4.2 CARTS and 5.2 ACCEPTANCE CRITERIA."

55 . Page 26, replace paragraph 3.11. with:

"Equipment shall be marked using materials and/or processes that will ensure legibility during its lifespan. Markings shall be conspicuous and worded in mandatory "command" English. Non-English language marking is acceptable, in addition to English. Non-English marking may be used alone when airworthiness requirements are not involved. Marking location, style and wording should be consistent. Weight placards shall include both English and metric units. The location and wording of placards shall be shown in the application data for this ETSO."

56 . Page 26, replace paragraph 3.11.3.a. with:

""No Cigarette Disposal" shall be placed on or near each waste receptacle disposal door (e.g., the waste disposal flap of a trash compactor)."

57 . Page 27, disregard paragraphs 3.14.a, 3.14.b, and 3.14.c.

58 . Page 27, disregard paragraph 3.17 Note #1 on Pass/Fail criteria at bottom of Table 2 and replace Note #2 with:

"(2) Equipment shall comply with the performance requirements of this ETSO in each instance RTCA/DO-160 reads 'DETERMINE COMPLIANCE WITH APPLICABLE EQUIPMENT PERFORMANCE STANDARDS'. The equipment shall also comply with the performance standards of this ETSO after DO-160 testing.

59 . Page 30, replace paragraph 3.18.1 with:

"The power consumption of the equipment shall be defined in the application data for this ETSO."

60 . Page 32, replace paragraph 3.19. with:

"A Failure Mode and Effects Analysis (FMEA) shall be performed at the equipment level independent of the aircraft. The analysis shall include typical and hidden failure modes throughout the entire operating range and include the effects of mishandling."

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61 . Page 33, replace paragraph 4.2.1 Table 3 Note (2) with:

"(2) Load factors may be increased to meet aircraft flight and ground cases. If increased factors are used, they shall be provided in a manual, containing operating instructions and equipment limitations sufficient to describe the equipment's operational capability, as part of the application data for this ETSO."

62 . Page 33, replace paragraph 4.2.1 Table 3 Note (5) with:

"(5) For equipment with a stowage compartment, maximum door deflections shall meet 3.3.5.n.

63 . Page 34, replace paragraph 4.2.4.a. with:

"Proof Pressure Test: The qualification unit shall have its pressurized components tested to the required proof pressure; this pressure shall be held for five minutes. The equipment shall not be damaged nor leak as a result of the test."

64 . Page 35, replace paragraph 4.2.6.2.b. with:

"The top, sides and front surfaces of equipment shall be tested per CS-25, Appendix F, Parts IV and V."

65 . Page 35, correct 4.2.7. to read:

"Trash compactors used to receive combustible material shall comply with the fire containment requirements of 3.10, when substantiated per AS 8056, 4.6."

66 . Page 35, disregard section 4.2.9.

67 . Page 37, replace paragraph 4.2.15. with:

"Conduct and prepare the FMEA in accordance with ARP 4761 at the equipment level independent from the aircraft."

68 . Page 38, disregard section 4.3.

69 . Page 39, replace paragraph 5.1.b.12 with:

"Maximum amount of discharge air emitted by equipment, if applicable."

70 . Page 40, disregard section 5.2.

71 . Page 41, disregard section 6.

ETSO-C194

Date: xx.xx.2011

European Aviation Safety Agency

European Technical Standard Order

Subject: Helicopter Terrain Awareness and Warning System (HTAWS)

1 - Applicability

This ETSO gives the requirements which Helicopter Terrain Awareness and Warning System (HTAWS) 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 Radio Technical Commission for Aeronautics (RTCA) Document DO-309, Minimum Operational Performance Standards (MOPS) for Helicopter Terrain Awareness and Warning System (HTAWS) Airborne Equipment, dated 13/03/2008.

3.1.2 - Environmental Standard

See CS-ETSO Subpart A paragraph 2.1.

3.1.3 – Computer Software

See CS-ETSO Subpart A paragraph 2.2.

3.1.4 - Electronic Hardware Qualification

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.

ETSO-C194

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-C195a

Date: xx.xx.2011

European Aviation Safety Agency

European Technical Standard Order

Subject: Avionics Supporting Automatic Dependent Surveillance - Broadcast (ADS-B) Aircraft Surveillance Applications (ASA)

1 - Applicability

This ETSO gives the requirements which Avionics Supporting Automatic Dependent Surveillance - Broadcast (ADS-B) Aircraft Surveillance Applications (ASA) 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 Section 2 of Radio Technical Commission for Aeronautics (RTCA) DO-317A, dated December 13, 2011), Minimum Operational Performance Standards for Aircraft Surveillance Applications System.

Functional equipment classes for this ETSO are defined by the avionics equipment functionality they provide for one or more of the applications listed in Table 1. The three equipment functionalities are Cockpit Display of Traffic Information (CDTI) (Surface Only), CDTI, and Airborne Surveillance and Separation Assurance Processing (ASSAP). Applicable performance standards for these classes are identified per equipment class in Appendix L of ED-194 and are based on Section 2 of ED-194. The functional equipment classes are shown in the following table.

Avionics / **Application**	**CDTI (Surface Only) (A)**	**CDTI (B)**	**ASSAP (C)**
Airborne (1)	**Not Permitted**	CLASS B1	CLASS C1
Surface (2) (Runways Only)	CLASS A2	CLASS B2	CLASS C2
Surface (3) (Runways & Taxiways)	CLASS A3	CLASS B3	CLASS C3
Enhanced Visual Approach (4)	**Not Permitted**	CLASS B4	CLASS C4

Table 1 – ASA Functional Equipment Classes

3.1.2 - Environmental Standard

See CS-ETSO Subpart A paragraph 2.1. The system performance to be demonstrated during the environmental testing is defined in EUROCAE ED-194 section 2.4.

Explosion testing in accordance with EUROCAE ED-14( )/RTCA DO-160( ) section 9 is considered optional.

Electrostatic Discharge testing in accordance with EUROCAE ED-14( )/RTCA DO-160( ) section 25 is required for all equipment having control elements and are expected to be touched during operation.

3.1.3 – Computer Software

See CS-ETSO Subpart A paragraph 2.2.

3.1.4 - Electronic Hardware Qualification

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 for malfunctions causing the display of hazardously misleading information in airborne aircraft and aircraft on the ground greater than 80 knots. Failure of the function defined in paragraph 3.1.1 of this ETSO has been determined to be a minor failure condition for malfunctions causing the display of hazardously misleading information in aircraft on the ground less than 80 knots groundspeed. Loss of function 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.

ETSO-C196a

European Aviation Safety Agency

European Technical Standard Order

Subject: Airborne Supplemental Navigation Sensors for Global Positioning System Equipment Using Aircraft-Based Augmentation

1 - Applicability

This ETSO gives the requirements which Airborne Supplemental Navigation Sensors for Global Positioning System Equipment Using Aircraft-Based Augmentation 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 cancels ETSO-C129a *Airborne Supplemental Navigation Equipment Using Global Positioning System (GPS)*

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 Radio Technical Commission for Aeronautics (RTCA) document DO-316, Minimum Operational Performance Standards (MOPS) for Global Positioning System/Aircraft Based Augmentation System Airborne Equipment, dated 14/04/2009, Section 2.

3.1.2 - Environmental Standard

See CS-ETSO Subpart A paragraph 2.1.

Test to EUROCAE ED-14( ) section9 and 26 are considered optional. Test to section 10, 11, 12, 13, and 14 are required only, when the component is installed on the outside of the aircraft, like the antenna.

3.1.3 – Computer Software

See CS-ETSO Subpart A paragraph 2.2.

3.1.4 - Electronic Hardware Qualification

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 for malfunction of oceanic/remote, en route and terminal navigation and lateral navigation (LNAV) approaches.

Failure of the function defined in paragraph 3.1.1 of this ETSO has been determined to be a minor failure condition for loss of navigation of oceanic/remote, en route and terminal navigation and lateral navigation (LNAV) approaches.

3.2.2

Barometric-aided Fault Detection and Exclusion (FDE). If the equipment uses barometric-aiding to enhance FDE availability, then the equipment must meet the requirements in RTCA/DO-316, Appendix G.

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-2C70~~a~~b

Date: xx.xx.2011

European Aviation Safety Agency

European Technical Standard Order

Subject: LIFERAFTS (REVERSIBLE AND NONREVERSIBLE)

….

4 -**Marking**

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

4.2 - Specific
~~As given in Appendix 1.~~ In addition, weight and rated and overload capacities of the liferaft must be shown also. The weight of the liferaft includes any accessories required in this ETSO.

…

APPENDIX 1. **STANDARD FOR LIFERAFTS (REVERSIBLE AND NONREVERSIBLE)**

…

3.1.8 Flammability. The device (including carrying case or stowage container) must be constructed of materials which meet CS 25.853, as follows:

Type I rafts must meet CS 25 Appendix F Part 1 ~~a(ii)~~ (a)(1)(ii)

Type II rafts must meet CS 25 Appendix F Part 1 ~~a(v)~~ (a)(1)(v)

…

ETSO-2C197

Date: xx.xx.2011

European Aviation Safety Agency

European Technical Standard Order

Subject: Information Collection and Monitoring Systems

1 - Applicability

This ETSO gives the requirements which Information Collection and Monitoring Systems that record cockpit audio, aircraft data, airborne images, or data link communications and 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-155, Minimum Operational Performance Specification for Lightweight Flight Recording Systems, dated July 2009.

All ICMS must meet the requirements in ED-155 Chapters 2-1, 2-2, 2-3 and 2-4 of Section 2. All deployable ICMS must also meet the requirements in ED-155 Chapters 3-1, 3-2, 3-3 and 3-4 of Section 3. Additionally, each Type of ICMS must meet the requirements of ED-155 listed in the table below.

ETSO-2C197

ICMS Type	Your design must also meet the following requirements in ED-155	Your design does not need to meet the following requirements in ED-155
I	Part I, Cockpit Audio Recording System	I-2.1.7 and I-6
II	Part II, Aircraft Data Recording System	II-2.1.7, II-2.1.9, II-2.1.12, and II-6
III	Part III, Airborne Image Recording System	III-2.2 and III-6
IV	Part IV, Data-link Recording System	IV-2.1.6, IV-2.1.11, and IV-6

3.1.2 - Environmental Standard

See CS-ETSO Subpart A paragraph 2.1.

3.1.3 – Computer Software

See CS-ETSO Subpart A paragraph 2.2.

3.1.4 - Electronic Hardware Qualification

See CS-ETSO Subpart A paragraph 2.3.

3.2 - Specific

3.2.1 - The height (a), width (b), and depth (c) of the crash enclosure must each be 4 cm (1.5 inches) or greater.

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

Note: The failure classification is driven by the accident investigation need.

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.

Appendix B - Attachments

ISO 21100_2011(E).pdf

Attachment #1 to comment #18

ISO DIS 16049-1(E).pdf

Attachment #2 to comment #27