



Deviations request #78 for an ETSO approval for CS-ETSO applicable to a combined transponder and TCAS system (ETSO-C112c) Consultation Paper

1. Introductory note

The hereby presented deviation requests shall be subject to public consultation, in accordance with EASA Management Board Decision No 7-2004 as amended by EASA Management Board Decision No 12-2007¹ products certification procedure dated 11th September 2007, Article 3 (2.) of which states:

“2. Deviations from the applicable airworthiness codes, environmental protection certification specifications and/or acceptable means of compliance with Part 21, as well as important special conditions and equivalent safety findings, shall be submitted to the panel of experts and be subject to a public consultation of at least 3 weeks, except if they have been previously agreed and published in the Official Publication of the Agency. The final decision shall be published in the Official Publication of the Agency.”

2. ETSO-C112c#1

Deviate from ETSO-C112c §3.1 to continue to use Eurocae ED-73B in lieu of Eurocae ED-73C in the following context:

- The unit combines several functions (ETSO-2C112b, ETSO-C119c and ETSO-C166a);
- The unit has been upgraded in order to comply with ETSO-C119c and there are no updates to the ETSO-2C112b function;
- The unit received the original FAA TSO Approval a few days after the date of applicability of EASA ETSO-C112c;
- ETSO-C112c is based on a Minimum Operational Performance Standards (MOPs) which is now completely harmonised between RTCA/DO-181D and Eurocae ED-73C. However, RTCA/DO-181D and Eurocae ED-73C have been drastically changed in contents and organisation. Traceability between Eurocae ED-73C and ED-73B is not straightforward either;
- The achieved compliance of the unit versus with ETSO-2C112b and ETSO-C119c requirements has been assessed;
- Subsequent to the update of transponder's requirements, ADS-B MOPs were updated to RTCA/DO-260B and Eurocae ED-102A. Updates to the ADS-B MOPs forced a new update to the transponder MOPs with RTCA/DO-181E being harmonized with Eurocae ED-73E.

Industry:

It is difficult to establish direct traceability between Eurocae ED- 73C/E and ED-73B. The result of this situation is that it is virtually untenable to attempt to file for certification to ETSO-C112c and simply claim deviations for an implementation that is predominantly based on ETSO-2C112b.

In order to alleviate the need to address each and every minor difference between ETSO-C112c and ETSO-2C112b, Table 1 lists the primary functions required of the unit and allocates the appropriate ETSO-2C112b and ETSO-C112c requirements to each function. Likewise, the table provides clarification and commentary as necessary for each function.

¹ Cf. EASA Web: <http://easa.europa.eu/management-board/docs/management-board-meetings/2007/04/MB%20Decision%2012-2007%20amending%20the%20certification%20procedure.pdf>



Review of **Table 1** indicates that for the most part the needs of ETSO-C112c are at least met and normally exceeded by the unit.

Of considerable concern is the issue of “ETSO Unit Label Marking” as addressed in Note 1 of Table 1. Virtually all aircraft operators have to maintain appropriate Aircraft Log Books which detail the TSO Markings for the Mode S transponder. As indicated in Table 1, Note 1, the harmonisation process between RTCA DO-181D/E and Eurocae ED-73C/D significantly changed the marking requirements. This makes it almost impossible to submit the unit for ETSO-C112c approval without having to take multiple exceptions or deviations which will just tend to confuse the Aircraft Operators. Similarly, it will force significant update to virtually all documents that are required as part of the TSO/ETSO Submittal Package.

Review of Figure 1 indicates that FAA TSO-C112d (for Mode-S transponders) was released 06/06/2011. Likewise, FAA TSO-C166b (for ADS-B Out) was released 12/02/2009. Both of these TSO documents will have to be satisfied to get US Approval before the unit can be submitted for the approvals that will be necessary to meet the European ADS-B Out Forward Fit Rule date of January 8, 2015. It is expected that the equivalent transponder TSO document will be ETSO-C112d which currently is rumoured to be expected in April, 2013. As far as an ADS-B Out TSO, one does not exist with EASA at this time; however, an equivalent to US FAA TSOC166b will be needed in the very near future. In fact, in order to meet the January 8, 2015, mandate, it is expected that certified equipment will be needed by the end of 2013 in order to have any chance at meeting aircraft installation certification needs prior to the mandate becoming effective.

Considering the forthcoming schedule crunch just discussed, it would be better to simply allow an EASA certification to ETSO-2C112b until such time as the equipment is updated to meet the January 8, 2015 mandate. As a worse case alternative, if ETSO-C112c must be used, then it is recommended that the approval document read as such and the deviation is that the approval and all marking and documents remain as they were for ETSO-2C112b.



Table 1: ETSO-C112b and C112c comparison for unit

Functions	ETSO-2C112b	ETSO-C112c	Capabilities Implemented in this TSO/ETSO Submittal for the unit	Comment	Note
Primary transponder (XPDR) function					
Level 2 Mode-S Transponder	ED-73B	ED-73C	ED-73C	Implementations in the unit are consistent with ED-73C and thereby exceed the requirements of ETSO-2C112b, ED-73B and DO-185A	
Antenna Diversity	ED-73B	ED-73C	ED-73C		
ACAS II Compatibility	ED-73B (DO-185A)	ED-73C (DO-185B)	ED-73C (Compatible with DO-185B)		
Extended Squitter Capability	ED-73B	ED-73C	ED-73B	ED-73B	
Extended Squitter Protocols	ED-102 (DO-260)	ED-102 (DO-260)	RTCA/DO-260A Change 2	The unit implements Extended Squitter ADS-B Out Register formats as per RTCA/DO-260A	
Elementary Surveillance (ELS) Capability	ED-73B for Flight Identification DFS_AIC IFR 6_23 Jan 03 DFS_AIC IFR 3_17 Feb 05	ED-73C	ED-73B for Flight Identification DFS_AIC IFR 6_23 Jan 03 DFS_AIC IFR 3_17 Feb 05	There are no fundamental requirements changes for ELS between ETSO-2C112b and ETSO-C112c. Therefore, the unit is consistent with both ETSO documents.	
Enhanced Surveillance (EHS) Capability	EASA NPA 11/2005 AMC 20-13 DFS_AIC IFR 7_23 Jan 03 DFS_AIC IFR 3_17 Feb 05	ED-73C	EASA NPA 11/2005 AMC 20-13 DFS_AIC IFR 7_23 Jan 03 DFS_AIC IFR 3_17 Feb 05	There are no fundamental requirements changes for EHS between ETSO-2C112b and ETSO-C112c. Therefore, the unit is consistent with both ETSO documents.	



Functions	ETSO-2C112b	ETSO-C112c	Capabilities Implemented in this TSO/ETSO Submittal for the unit	Comment	Note
Surveillance Identifier (SI) Code Capability	ED-73B	ED-73C	ED-73C	The unit's implementation is consistent with ED-73C and thereby exceeds the requirements of ETSO-2C112b and ED-73B.	
Mode-S GICB Register Formats	ICAO Annex 10 Vol. III, Amendment 77, Chapter 5 Appendix for MSSS	ICAO Annex 10, Vol. IV, Amendment 82 ICAO Doc. 9871, 1 st. Edition, 2008.	ICAO Annex 10 Vol. III, Amend. 77, Chapter 5 Appendix for MSSS	The unit's implementation is consistent with ETSO-2C112b with the exception that Extended Squitter ADS-B Out registers are consistent with ETSO-C112c.	
Other Important XPDR Requirements					
Mode-S Subnetwork Number in BDS 1,0	Set to "3" as per ICAO Annex 10 Volume III, Amendment 77, Chapter 5 Appendix for MSSS	Set to "4" as per ICAO Document 9871, 1 st. Edition, 2008, for BDS 1,0 Also, ED-73C	Set to "3" as per ICAO Annex 10 Volume III, Amendment 77, Chapter 5 Appendix for MSSS	The unit's implementation is consistent with ETSO-2C112b .	
ETSO Unit Label Markings	As Per ICAO Annex 10, Volume IV, Amendment 77	ED-73C	As Per ICAO Annex 10, Volume IV, Amendment 77	The unit's implementation is consistent with ETSO-2C112b .	1

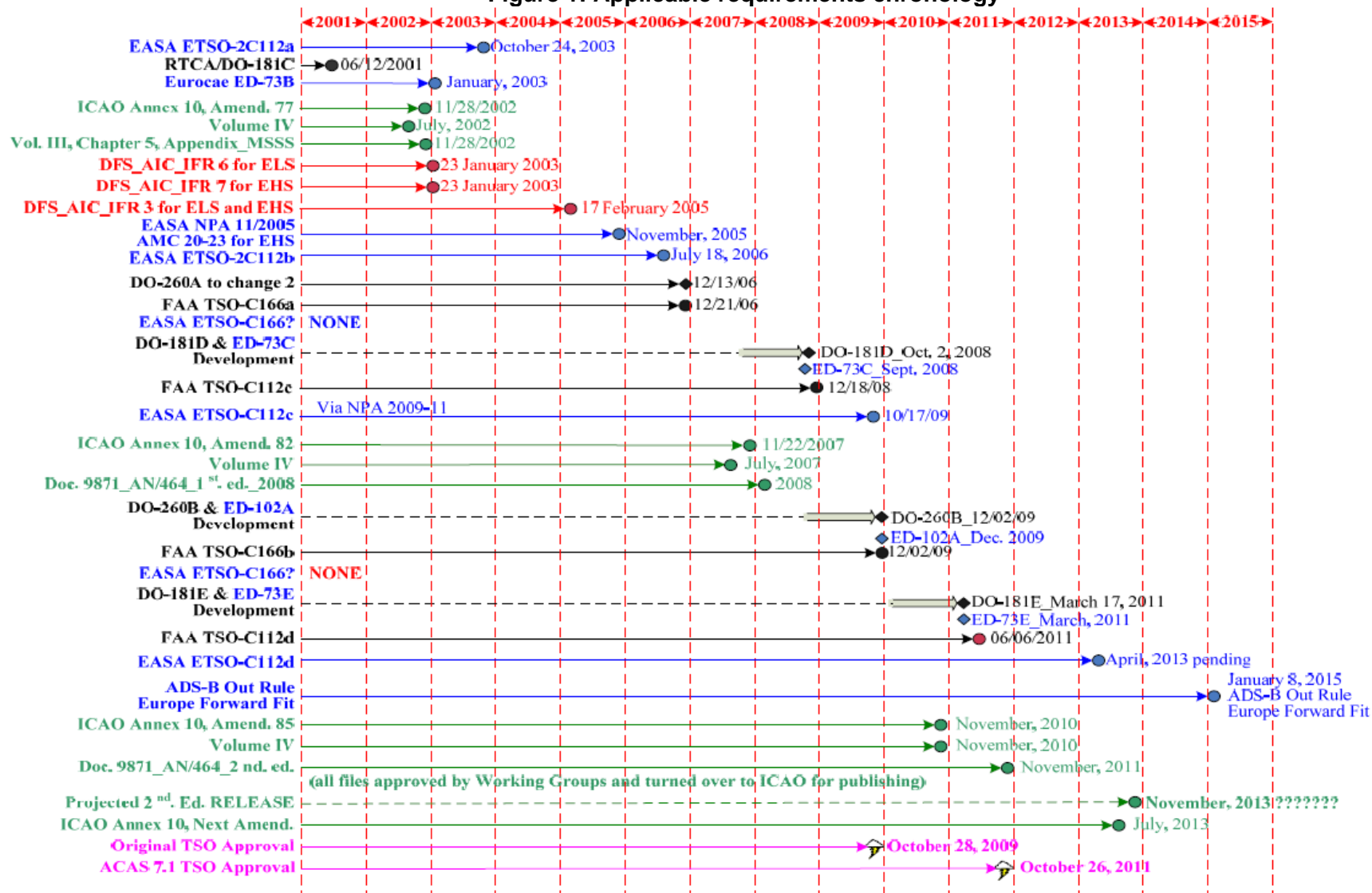
Note 1: ETSO Unit Label Marking requirements changed significantly between ETSO-2C112b and ETSO-C112c.

The markings used for ETSO-2C112b were established in ICAO Annex 10, Volume IV, Amendment 77 and would typically read as "Level 2es" to declare (a). a level 2 transponder as per Annex 10, Volume IV, section 2.1.5.1.2, (b). extended squitter capability as per Annex 10, Volume IV, section 2.1.5.6, and (c). "SI" Code capability as per Annex 10, Volume IV, section 2.1.5.7. Therefore, the unit ETSO-2C112b markings should be "Level 2es".



European Aviation Safety Agency

Figure 1: Applicable requirements chronology





EASA:

The unit combines several functions including a transponder which will **have to be modified** in order to meet the future European ADS-B Out Forward Fit mandate. Moreover, the unit software upgrade is limited to the changes introduced by EUROCAE ED-143/RTCA DO-185B (also known as “**TCAS II version 7.1**”).

EUROCAE ED-143/RTCA DO-185B MOPS (Minimum Operational Performance Standards) were revised in order to address two safety issues in the existing TCAS version 7.0 logic as embedded in ETSO C-119b and FAA TSO TSO-C119b. EASA published ETSO C119c² in December 2009 and FAA published TSO C119c in April 2009.

On 25 March 2010, EASA published Notice of Proposed Amendment (NPA) No. 2010-03³ containing a draft opinion for a Commission Regulation for the requirements applicable to airspace usage. The purpose was to mandate the carriage of TCAS II with collision avoidance logic version 7.1 for all turbine-powered aeroplanes having a maximum certificated take-off mass exceeding 5700 kg or authorised to carry more than 19 passengers operating within European airspace. Appendix C of NPA No. 2010-03 provides the rationale for this proposal. This NPA No. 2010-03 also introduced Draft Decisions for Acceptable Means of Compliance related to the implementing rules for Airspace User and to the Airworthiness Certification Considerations for the Airborne Collision Avoidance System (ACAS II). The Comment Response Document (CRD)⁴ to the above mentioned NPA No. 2010-03 was published in September 2010. The EASA Opinion 05/2010⁵⁶ for a Commission Regulation laying down common airspace usage requirements and operating procedures and the draft regulation⁷ were released in October 2010.

This NPA No. 2010-03 was part of a series of actions initiated by the Agency to address the issues associated with identified deficiencies with the ETSO C119b/TSO C119b TCAS II version 7.0 collision avoidance logic.

These actions also included:

- issue of Safety Information Bulletin (SIB) 2009/16⁸;
- issue of revised ETSO-C119c⁹.

On 16 December 2011, the European Commission published Implementing Rule 1332/2011 mandating the carriage of ACAS II version 7.1 within European Union airspace from 1 December 2015 by all aircraft currently equipped with version 7.0 and from 1 March 2012 by all new aircraft above 5,700 kg maximum take-off mass or a maximum passenger seating capacity of more than 19ⁱ.

²http://easa.europa.eu/ws_prod/g/doc/Agency_Mesures/Agency_Decisions/2009/cs_etso_5/Annex%20II%20-%20ETSO.pdf

³<http://www.easa.europa.eu/rulemaking/docs/npa/2010/NPA%202010-03.pdf>

⁴<http://www.easa.europa.eu/rulemaking/docs/crd/2010/CRD%202010-03.pdf>

⁵<http://easa.europa.eu/agency-measures/opinions.php>

⁶<http://easa.europa.eu/agency-measures/docs/opinions/2010/05/Opinion%2005-2010.pdf>

⁷<http://easa.europa.eu/agency-measures/docs/opinions/2010/05/Draft%20Regulation%20laying%20down%20common%20airspace%20usage%20requirements%20and%20operating%20procedures.pdf>

⁸<http://ad.easa.europa.eu/ad/2009-16>

⁹http://easa.europa.eu/ws_prod/g/doc/Agency_Mesures/Agency_Decisions/2009/cs_etso_5/Annex%20II%20-%20ETSO.pdf



The operators shall have a mean to easily upgrade their installation to comply with ACAS II version 7.1 mandate. On the other hand, the transponder part of the unit will have to be modified to meet the future European ADS-B Out Forward Fit mandate. In the specific context described in this deviation, EASA considers that it is better to keep ETSO C119b marking and declarations for the unit for the unchanged transponder function. It is to be noted that the transponder function could be recognised without deviations as an additional function based on Eurocae ED-73B and accepted on a non-interference basis. EASA judges that compliance and marking for ETSO-2C112b accurately reflect the performance achieved by the unit for the transponder function. Moreover, the traceability to ETSO-2C112b and ETSO-C119c, and the capabilities as detailed in Table 1 help to determine compliance to applicable requirements.

Regarding transponder requirements, EASA indicates that ETSO-C166a ADS-B out (20.11.2008) will be soon updated to ETSO-C166b as reflected in [RMT.0186 \(ETSO.008\)](#). EASA also anticipates updating ETSO-C112d for Mode S transponder in 2013 by taking into account EUROCAE ED-73E.

Consequently, EASA accepts this deviation provided that the Declaration of Design and Performance includes this detailed Table 1. Subsequent usage of this deviation is limited to cases similar to the context described in paragraph 2 and cannot be used to substitute ETSO-2C112b to ETSO-C112c.

ⁱ <http://eur-lex.europa.eu/LexUriServ/LexUriServ.do?uri=OJ:L:2011:336:0020:0022:EN:PDF>