



Deviation request #58 for an ETSO approval for CS-ETSO applicable to Traffic Alert and Collision Avoidance System (TCAS) airborne equipment, TCAS II (ETSO- C119c) Consultation Paper

1. Introductory note

The hereby presented deviation request shall be subject to public consultation, in accordance with EASA Management Board Decision No 7-2004¹ products certification procedure dated 30 March 2004, 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-C119c – Traffic Alert and Collision Avoidance System (TCAS) airborne equipment, TCAS II

ETSO-C119c#4 – Traffic Alert and Collision Avoidance System (TCAS) airborne equipment, TCAS II

Deviate from EUROCAE ED-143/RTCA DO-185B section 2.2.3.13.2.1.1 to not interface with ETSO-C119a compatible transponder units.

Requirement:

ED-143/DO-185B section 2.2.3.13.2.1.1: “...if the transponder is DO-185A,B compatible, then the TCAS/transponder system shall be considered DO-185A,B compatible; if the transponder is FAA TSO-C119A compatible, then the TCAS/transponder system shall be considered FAA TSO-C119A compatible.”

Industry:

Deviate from EUROCAE ED-143/RTCA DO-185B section 2.2.3.13.2.1.1 to not interface with ETSO-C119a compatible transponder units. The equipment will treat a connection to an ETSO-C119a compatible transponder as a transponder interface failure, which would be reported by the equipment as a failure at power-up. An Equivalent Level of Safety is provided for the following reasons:

1. The equipment will treat a connection to an ETSO-C119a compatible transponder as a transponder interface failure, which will be reported by the equipment as a failure at power-up.
2. Industry will state in the installation manual that the equipment is not to be installed in an aircraft with an ETSO-C119a compatible transponder.

¹ Cf. EASA Web: http://www.easa.europa.eu/ws_prod/g/doc/About_EASA/Manag_Board/2004/mb_decision_0704.pdf

3. This deviation has no effect on the equipment and its own aircraft's transponder computer from interoperating with other aircraft's ETSO-C119A systems or ED-143(A/B)/DO-185(A/B) systems in the airspace.

EASA:

We agree to the industry approach. This limitation will be clearly addressed during installation. It can not be expected that an ACAS can interface with any kind of transponder. The ETSO is not meant to define all interface restrictions allowing interchange ability based on the ETSO approval.

ETSO-C119c#5 – Traffic Alert and Collision Avoidance System (TCAS) airborne equipment, TCAS II

Deviate from EUROCAE ED-143/RTCA DO-185B section 2.2.4.4.2.2 b. to use the Enhanced Preamble Detection method of RTCA DO-260B Appendix I section I.4.1 for preamble acceptance.

Requirement:

EUROCAE ED-143/RTCA DO-185B section 2.2.4.4.2.2 b: Criteria for Preamble Acceptance: The first qualifying criterion for reception of a Mode S signal shall be the detection of a Mode S preamble. A preamble shall be accepted if each of the four pulse positions of the preamble waveform contains a pulse that is above the receiver threshold for at least 75% of its nominal duration, AND the last three pulses are within ± 0.125 microseconds of their nominal positions relative to the first pulse, AND at least two of the four preamble pulses have actual leading edges (as defined in 2.2.4.4.2.1b.) that occur within ± 0.125 microseconds of their nominal edge positions and there are no earlier leading edges associated with those pulses.

Industry:

Deviate from EUROCAE ED-143/RTCA DO-185B section 2.2.4.4.2.2 b. to use the Enhanced Preamble Detection method of RTCA DO-260B Appendix I section I.4.1. This Mode S preamble detection technique is required for 1090 MHz Extended Squitter ADS-B receivers (Class A1, A1S, A2 and A3) certified to TSO-C166b. The request for this deviation is justified by RTCA DO-260B section 2.2.4.4.2 which describes it as an improvement over RTCA DO-185B methods that reduces the probability of a false alarm caused by detection of an apparent Mode S preamble synthesized by overlapped Mode A/C FRUIT replies. It is based on threshold detection, pulse duration analyses, leading edge detection, searching for the 4-pulse preamble on a logged video sample.

EASA:

We accept the deviation solving a requirement conflict between two standards both applicable to one unit if providing a combined functionality.

ETSO-C119c#6 – Traffic Alert and Collision Avoidance System (TCAS) airborne equipment, TCAS II

Deviate from EUROCAE ED-143/RTCA DO-185B section 2.2.4.4.2.2.c to use the Baseline Multi-sample bit and confidence declaration technique of RTCA DO-260B Appendix I section I.4.2.3.1.

Main Requirement:

Each bit of the Mode S data block shall be decoded by comparing the received signal with a 0.5-microsecond delayed replica of itself to determine the difference between the signal amplitudes at the centres of the two possible pulse positions for that bit.

Industry:

Deviate from EUROCAE ED-143/RTCA DO-185B section 2.2.4.4.2.2.c to use the Baseline Multi-Sample bit and confidence declaration technique of RTCA DO-260B Appendix I section I.4.2.3.1. The multi-sample enhanced bit and confidence declaration technique makes use of all 10 samples for each Mode S bit position to determine the bit and confidence values. Sample amplitudes in each chip are compared to the amplitude reference level established by the preamble to quantify the number of samples in each chip that match the preamble or are significantly lower in amplitude. This Mode S bit and confidence declaration technique is required for 1090 MHz Extended Squitter ADS-B receivers (Class A1, A1S, A2 and A3) certified to TSO-C166b. The deviation is justified by RTCA DO-260B section 2.2.4.4.2 which describes this method as an improvement over RTCA DO-185B methods.

EASA:

We accept the deviation solving a requirement conflict between two standards both applicable to one unit if providing a combined functionality.

Note: EASA is preparing an update to ETSO-C166a to make RTCA DO-260B the applicable standard for ADS-B capable transponder systems, and required by the proposed implementing rule for surveillance performance². The use of DO-260B instead of DO-260A was accepted as deviation to ETSO-C166a.

ETSO-C119c#7 – Traffic Alert and Collision Avoidance System (TCAS) airborne equipment, TCAS II

Deviate from EUROCAE ED-143/RTCA DO-185B section 2.2.6.7.2 (Table 2-22 item 'Intruder Bearing') to utilize tracked correlated ADS-B data for TCAS display instead of tracked bearing from Collision Avoidance System.

Industry:

Deviate from EUROCAE ED-143/RTCA DO-185B section 2.2.6.7.2 (Table 2-22 item 'Intruder Bearing') to utilize tracked correlated ADS-B data for TCAS display instead of tracked bearing from Collision Avoidance System. (CAS) when such ADS-B data is available and of sufficient integrity. This deviation applies only when a target tracked through passive ADS-B surveillance is correlated with a target tracked through active surveillance. This deviation does not alter the bearing that is supplied for Collision Avoidance System (CAS) algorithms per RTCA DO-185B section 2.2.4.8.1. Measured bearing from active interrogations will be used for CAS algorithms. When a traffic advisory (TA) or a resolution advisory (RA) is in effect for a target, intruder bearing from CAS takes precedence (Reference FAA AC 120-86, Appendix G, paragraph 3.3). The ADS-B bearing estimation function will use the own-ship bearing, own-ship GPS position, and target ADS-B position. ADS-B data will be used only when the Navigation Accuracy Category for Position (NACp) for both own-ship and correlated target indicate that bearing can be calculated to within 9.0 degrees of accuracy with 95% probability. For targets tracked only through active surveillance, the intruder bearing from CAS is provided for display. The proposed deviation will result in displayed target bearing that is

² Cf. EUROCONTROL web:
http://www.eurocontrol.int/ses/gallery/content/public/docs/SES_IOP_SPL_ACID_REP_v2_0.pdf

more accurate than the 15 degrees RMS accuracy requirement of the bearing filter of DO-185B section 2.2.4.6.4.4.1. If ADS-B bearing data becomes unavailable for a target, the GTS Processor will revert to display intruder bearing from CAS. This deviation results in an equivalent ELOS for the following reasons:

- Bearing data from the direction finding antenna(e) will exceed the bearing accuracy requirements of RTCA DO-185B.
- Bearing data from the direction finding antenna(e) will be available for each target tracked through active surveillance.
- Bearing data from the direction finding antenna(e) will be used for any target for which a Traffic Advisory or Resolution Advisory is active.
- ADS-B bearing data will be used only when data integrity indicates that bearing can be calculated to within 9.0 degrees of accuracy with 95% probability.

EASA:

We agree to the proposed deviation but like to emphasise that the computation of the related Intruder Bearing Valid Flag has to reflect the status of the blended Intruder Bearing information. This may be considered implicit in the described deviation but needs to be verified under all conditions. The status information must reflect the presented information.

ETSO-C118#2 – Traffic Alert and Collision Avoidance System (TCAS) Airborne Equipment, TCAS I

Deviate from ETSO-C118 3.1.1 to use RTCA DO-197A section 2 amended by Appendix 1 of ETSO-C147 instead of RTCA DO-197 section 2 as the Minimum Performance Standard.

Industry:

In the past EASA had accepted with ETSO-C118#1 the use of RTCA DO-197A instead of DO-197 as the most accurate industry standard to design a TCAS I system. To allow the development of consistent TCAS systems the modifications as introduced by ETSO-C147 to DO-197A need to be taken into consideration as well. If not this may lead to inconsistencies in the system.

EASA:

We thank industry for making us aware of this inconsistency we have generated. In future we will not grant the approved deviation ETSO-C118#1 any more but will accept the deviation as modified by this request. Further deviations to DO-197A are recorded under ETSO-C147 and will be accepted to ETSO-C118 as well, if they are linked to the common requirements of section 2 of RTCA DO-197A.