



Deviations requests for an ETSO approval for CS-ETSO applicable to various aircraft instruments (ETSO-C10b, -C45a, -C46a) and ETSO-2C126 ELT Consultation Paper

1. Introductory note

The hereby presented deviations requests 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 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-C10b#3a – Aircraft Altimeter, Pressure Actuated, Sensitive Type

Deviate from SAE AS 392C Section 4.2.4 to not display ALTITUDE or ALT next to the tape indicating altitude.

AS392C (minimum performance standard for ETSO-C10b)

4.2.4 Name: The words “Altitude” or “Alt” shall be marked on the dial and may be in the same finish as the numerals.

Industry:

The justification for this deviation is that the proposed instrument design provides an equivalent level of safety based on the following factors:

- (1) The conventional “basic T” arrangement of instruments. Can be regarded as a compensating factor for lack of marking.
- (2) The use of ARP 4102-7 recommended symbology, which has been proven in extensive use on air transport and some GA aircraft. The use of ARP 4102-7 symbology is specifically recommended by AC 23.1311-1A, Installation of Electronic Displays in Part 23 Airplanes.
- (3) The collocation of related information.

The PFD will present airspeed through the use of an airspeed scale/tape and present airspeed pointer with digital readout. Altitude will be presented similarly with an altitude tape and present altitude pointer with digital readout. The arrangement of these indicators relative to other primary flight instruments will conform to the mandated basic “T” with attitude centred in front of the pilot, airspeed directly to the left of attitude, altitude directly to the right of attitude, and heading information directly below attitude. This arrangement, being mandated, is very familiar to pilots. Furthermore, the tapes and present value pointers conform to the symbology recommended in ARP 4102-7 and appendices. Labeling of the function or units of the airspeed and altitude indicators is not recommended in 4102-7. Additional cues to the functions and units of these indicators come from their proximity with related flight information. The true airspeed and ground speed digital readouts are presented just below the airspeed indicator. Both these readouts are labeled as to type and have “KTS” labels to indicate the units of the displayed quantity, implying the units of the airspeed indicator. Likewise, directly above

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

the altitude indicator tape is the digital readout for pre-selected altitude with “FT” indicating the units, implying the units of the altitude indicator. Below the altitude indicator is a digital readout of the barometric pressure correction setting with inches of mercury indicated with quote marks (”).

EASA: The deviation has already been published and agreed with reference to the SAE AS 8009A which is the successor document for the outdated AS 392c.

3. ETSO-C10b#5 – Aircraft Altimeter, Pressure Actuated, Sensitive Type

Use of an altitude tape and present altitude pointer with digital readout instead of 360° circular readout.

Regulatory Requirement(s):

AS392c (minimum performance standard for ETSO-C10b)

- 4.1 *Indication Method: The following method of indication shall be employed. For indicating an ascent in altitude, the sensitive pointer shall move in a clockwise direction completing one revolution (360°) for each 1,000 feet of altitude change. A means shall be provided for showing multitudes of 1,000 feet.*

Industry:

The proposed instrument design provides an equivalent level of safety by:

- (1) Compliance with the objectives of the AS392c requirement, though by different means.
- (2) Use of AC 23.1311-1A and ARP 4102-7 recommended symbology and format.

The presentation of altitude will be through the use of an altitude tape and present altitude pointer with digital readout. The tape and present altitude pointer along with digital readout provide direct indication of the current altitude. The tape moves down relative to the fixed pointer to indicate an ascent in altitude. Thus, the pointer moves up relative to the tape for increasing altitude. The tape, present altitude pointer, and digital readout conform to the symbology recommendations of ARP 4102-7. In addition, visual enhancements of the tape are provided at standard 500- and 1,000-foot increments as recommended in AC 23.1311-1A and ARP 4102-7.

EASA: The use of a tape with a pointer in addition with a digital read out is accepted for altitude information and the newer standards as SAE AS 8009 do not have such requirement any longer.

4. ETSO-C10b#6 – Aircraft Altimeter, Pressure Actuated, Sensitive Type

Use a blue/brown background instead of a black one to display the altitude

Regulatory Requirement(s):

AS392c (minimum performance standard for ETSO-C10b)

- 4.2.3 *Finish: Unless otherwise specified by the user, matte white material shall be applied to major graduations, numerals and pointers. Non-functional surfaces shall be durable dull black.*

Industry:

The justification for this deviation is that the proposed instrument design provides enhanced attitude awareness while not diminishing the performance and safety features of the altitude indicating function.

This altitude indicator design overlays the altimeter functional surfaces (scale, pointer, and digital readout) on the moving sky (blue)/ground (brown) patches of the attitude indicator. Sufficient contrast is provided between the altitude indicator functional surfaces and the blue/brown background to ensure readability in all cockpit lighting

conditions. Human factors evaluations and flight tests will be used to demonstrate this and to show that the proposed instrument design adequately and safely performs the intended function.

EASA: Such a design has been frequently used on electronic displays. Newer standards as SAE AS 8009 do not have such requirement any longer.

5. ETSO-C45a#3a – Manifold Pressure Instruments

Use MAP or MAN PRESS instead of the required titles.

Regulatory Requirement(s):

The use of SAE AS 8042 instead of AS 411 has been previously accepted with ETSO-C45a#1

AS8042

3.10.5 Instrument Title: The instrument title, MANIFOLD PRESSURE or MANIF PRESS, shall be of the same approximate size but no larger than the numerals.

Industry:

The justification for this deviation is that the proposed instrument design provides an equivalent level of safety based on the following factors:

- (1) The indication of units of measurements;
- (2) The collocation of related information;
- (3) Similarity with the instrument being replaced.

If displayed on the PFD or MFD, industry would like to use instrument titles MAP and MAN PRESS as options to the TSO specified titles, (MANIFOLD PRESSURE or MANIF PRESS) to indicate the gauge function. These titles provide design options to reduce clutter on the displays.

The gauge will always be labeled with the units of measurement (in Hg). In addition the manifold pressure gauge will always be collocated with other engine instruments (i.e. propeller RPM). These two features along with an appropriate acronym or abbreviated title, (MAP or MAN PRESS), are sufficient to provide quick determination of instrument function. Furthermore, the existing manifold pressure gauge in the PA-32 (Saratoga) is labeled with "MAP". A STC project will replace the manifold pressure gauge and other engine gauges in the PA-32 with indicators on the PFD and MFD. Thus, the MAP title for the manifold pressure indicator on the PFD and MFD would be consistent with the convention for the PA-32 aircraft.

EASA: In addition to the use of MAN as abbreviation – see ETSO-C45a#3 - EASA agrees to use MAP as well to stay in line with existing cockpit philosophy.

6. ETSO-C46a#1 Maximum Allowable Airspeed Indicator Systems

Use of RTCA DO-160D change 3 instead of the „Federal Aviation Administration Standard, Maximum Allowable Airspeed Indicator Systems“ as environmental standard.

Industry: The equipment is mounted in one location. Consequently one set of environmental requirements should be applied. It makes no sense to apply environmental conditions been developed for a specific instrument and based on mechanical design for the electronic display.

EASA: For the environmental standard in general CS-ETSO request the use of EUROCAE ED-14D / RTCA DO-160D change 3. For some ETSOs specific environmental requirements apply especially to reflect specifics of the sensor. In this case only the display and the associated computer are affected and consequently one common set of requirements should be used reflecting the assumed installation

environment in the cockpit. There is no need having specific requirements for the displaying of one instrument.

7. ETSO-2C126#1 406 MHz Emergency Locator Transmitter (ELT), ED-62 3.2.1.1

Use of 406.028 MHz instead of 406.025 MHz as operating frequency.

Industry: The COSPAS-SARSAT Specification for 406 MHz Distress Beacons C/S T.001 requires the use of 406.028 MHz as centre frequency for new developments after 1. January 2002 in accordance with the COSPAS-SARSAT 406 MHz Frequency Management Plan C/S T.012. There is a need to use the new frequency to receive the required COSPAS-SARSAT approval.

EASA: EASA recognise COSPAS-SARSAT as the supervisor of the frequency allocation in the 406 MHz band. Consequently all ELTs shall be in compliance with the COSPAS-SARSAT requirements to ensure interoperability. EUROCAE Working Group 74 is currently updating ED-62.

8. ETSO-2C126#2 406 MHz Emergency Locator Transmitter (ELT), ED-62 3.1

ELT without 243.0 MHz transmitter capability:

Industry:

- a) **Harmonization of requirements.** The FAA currently accepts either 121.5 and 243.0 MHz homing frequencies or 121.5 MHz homing frequency alone. Clearly the FAA regards the 243.0 MHz transmitter as superfluous. Granting the deviation request would bring the ETSO requirements in line with the FAA TSO requirements.
- b) **Harmonization of aviation and marine requirements.** 406 MHz Emergency Position Indicating Radio Beacons (EPIRB) do not contain a 243.0 MHz transmitter. The marine beacon specification (RTCM) excludes this requirement and EPIRB manufacturers have taken advantage of this to design their products at a lower price point. Marine beacons use the identical technology as the Aviation beacons do. These beacons are not to be confused with the L-Band maritime system that use the INMARSAT-E satellite system, but in fact the actual transmissions are identical to the Aviation beacons. The only differences are the fact that Aviation beacons are required to pass additional environmental testing such as Vibration, Shock, Impact, Fire, Humidity, etc. The differences stop at that point. The same Search & Rescue (SAR) teams respond to both Aviation and Marine distress signals, and there is no data to indicate any difference in response to Marine SAR emergency calls versus Aviation calls. In fact from a safety perspective most SAR rescue personnel consider the Maritime system to be ahead of the Aviation community. They were the first to mandate 406 MHz beacons. Granting the deviation request would make the European Marine and Aviation requirements identical, simplifying the design of future SAR location electronics, and permitting a single world-wide design.
- c) **JAR-OPS 1, 3.820, 1.820 Requirements.** These JAR-OPS requirements specify that ELT operate on 121.5 and 406 MHz only. We cannot find any requirement for an ELT to operate on 243.0 MHz.
- d) **ICAO Requirements.** Here again we cannot find a requirement that a ELT operate on 243.0 MHz. ICAO ANNEX 10 – Volume V Chapter 2.1 “Frequencies for emergency locator transmitters (ELTs) for search and rescue” states that emergency locator transmitters shall operate on both 406 MHz and 121.5 MHz.
- e) **Price reduction.** As noted above, elimination of the requirement for a 243.0 MHz transmitter will allow industry to eliminate components and simplify production processes, resulting in lower-priced ELTs. In future designs the reduced current drain may permit the elimination of one of the Lithium battery cells, reducing weight,

volume and the amount of hazardous material in the ELT. While price normally wouldn't be considered in a deviation, the cost of beacons is major factor in the Aviation community acceptance of 406MHz beacons. 406MHz beacons have a number of advantages over 121.5/243.0MHz beacons and quite a number of organizations and countries are doing everything that they can to encourage adoption of 406MHz beacons. One of the things they are encouraging is lower cost 406 MHz beacon designs to facilitate replacement of older 121.5/243.0 MHz beacons. However for Europe unless the requirements are changed or a deviation granted to exclude 243.0MHz what will happen is a two tiered pricing system. Beacons complying with European requirements will cost more in order to comply with the more stringent requirements.

- f) **Phase out of 121.5/243.0 MHz Satellite Surveillance:** As of February 2009 COSPAS/SARSAT will stop satellite surveillance of both 121.5 and 243.0 MHz frequencies through the LEO satellites. Granting the deviation request promotes the transition to a "pure" 406 MHz SAR environment.
- g) **Equivalent level of safety:** Normally, for a deviation to be approved the applicant must demonstrate that the deviation has an equivalent level of safety to the "undeviated" product. In practical terms this could be interpreted as meaning that the aircraft operation is not compromised in any way. In this case the removal of the 243.0 MHz homing transmitter from the ELT has no effect on aircraft operations.

EASA:

We agree to the fact that there is no world wide requirement having a 243.0 transmitter capability. Historically this military rescue frequency has been used in parallel to have a better location possibility. Meanwhile the strategy to locate an ELT has changed and the satellite observation on those frequencies will be phased out. Even though the 243.0 MHz transmitter could provide an additional homing possibility we agree that the benefit is limited compared with the additional effort. Consequently we step back to the minimum requirement as agreed on ICAO level and agree to the deviation not to have a 243.0 ELT transmitter capability.

Currently the EUROCAE working group 74 is updating ED-62.