European Aviation Safety Agency

Deviation request #81 for an ETSO approval for CS-ETSO applicable to Mode S Transponder with ADS-B-Output Capability (ETSO-C112c, C166a and C166b) Consultation Paper

Introductory note

The hereby presented deviation requests shall be subject to public consultation, in accordance with EASA Management Board Decision No 7-2004[1] 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."

This update reflects that for some of the requirements, which are subject of this deviation consultation paper, there is no legal basis foreseen to grant exemptions from regulation (EU) No 1207/2011.

ETSO-C112c#3 - Air Traffic Control Radar Beacon System/Mode Select (ATCRBS/MODE S) Airborne Equipment

Deviate to use EUROCAE ED-73E instead of EUROCAE ED-73C.

Requirement:

ETSO C112c 3.1.1 requires the use of EUROCAE ED-73C, MOPS for Secondary Surveillance Radar Mode S Transponders.

Industry:

EUROCAE ED-73C has been replaced by a newer version, ED-73E, which is the basis of compliance with the upcoming ETSO-C112d, which will replace ETSO-C112c.

ED-73E represents the current desired compliance standard for Mode S transponders. The upcoming release of ETSO-C112d will cause ETSO-C112c and its reference to ED-73C to be obsolete. TSO-C112d already calls out the technical equivalent document DO-181E. Therefore, ED-73E represents the appropriate Minimum Operational Performance Standard for Mode S transponder compliance.

EASA: We accept the deviation and have foreseen the ETSO update in the rulemaking task RMT.0186. To meet regulation (EU) No 1207/2011 requirements for the performance and the interoperability of surveillance for the single European sky, compliance to ED-73E will be required. ED-73E reflects the current requirements of ICAO Annex 10 Volume IV amendment 85 as referenced by regulation (EU) No 1207/2011 Requirements for the Performance and the Interoperability of Surveillance for the Single European Sky.

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

ETSO- C112c#4 - Air Traffic Control Radar Beacon System/Mode Select (ATCRBS/MODE S) Airborne Equipment
Deviate to EUROCAE ED-73E 3.22.2.6.d / RTCA DO-181E 2.2.18.2.6.d Transmission of Acquisition Squitters Requirement.

Requirement:
EUROCAE ED-73E / RTCA DO-181E, Transmission of Acquisition Squitters, Section 3.22.2.6.d. (paragraph 2.2.18.2.6.d in DO-181E), states: *"Future Suppression of Regular Transmission of Acquisition Squitter: Transponders equipped for extended squitter operation should have a means to disable acquisition squitters when extended squitters are being emitted. After regular acquisition squitter suppression has been implemented, the acquisition squitter **shall** continue to be broadcast by transponders if they are not emitting any extended squitters."*

> **Note 1:** Provision of this means will facilitate the suppression of acquisition squitters when all TCAS units have been converted to receive the extended squitter.
>
> **Note 2:** Broadcast of acquisition squitters when no extended squitter is broadcast is necessary in order to ensure acquisition by TCAS.
>
> **Note 3:** A TCAS will need to retain the ability to receive the acquisition squitter even after that TCAS has been converted to receive the extended squitter.

Industry:
This provisional function has not been implemented; comply with this provision by issuing a future software modification if and when the appropriate regulatory guidance to do so has been issued.

The Transponder does not implement this function because inadvertent activation of such a function would render the aircraft "invisible" to TCAS. All other requirements in ED-73E, Section 3.22.2.6 (DO-181E, Section 2.2.18.2.6) will be implemented. The means to disable the acquisition squitter is not made available at the system level. This deviation results in an equivalent or higher level of safety.

A similar deviation for this future function was previously approved for an earlier version of the ETSO under ETSO-2C112b#4 in ETSO.DevP.43.

EASA:
ED-73E 1.5.1
The use of the word SHOULD (and phrases such as "IT IS RECOMMENDED THAT ...", etc.) indicate that though the procedure or criterion is regarded as the preferred option, alternative procedures, specifications or criteria may be applied, provided that the manufacturer, installer or tester can provide information or data to adequately support and justify the alternative.

We accept the proposed alternative as done already for an earlier version of the MOPS. The requirement is considered optional.

As ICAO Annex 10 Volume IV 2.1.5.4.2 (amendment 85) list this requirement as a recommendation only, the transponder having such deviation is still compliant with that ICAO document and is still able to meet regulation (EU) No 1207/2011 requirements for the performance and the interoperability of surveillance for the single European sky.

ETSO-C112c#5 - Air Traffic Control Radar Beacon System/Mode Select (ATCRBS/MODE S) Airborne Equipment
Deviate from EUROCAE ED-73C / ED-73E paragraph 3.2.4 g (RTCA DO-181D, / DO-181E paragraph 2.2.2.4.g.) Sensitivity and Dynamic Range requirements.

Requirement:
ED-73C / ED-73E paragraph 3.2.4.g. (DO-181D / DO-181E paragraph 2.2.2.4.g.) states:

The spurious ATCRBS (Air Traffic control Radar Beacon System) reply ratio resulting from low level Mode-S interrogations shall be no more than:

1. *An average of 1% in the input interrogation signal range between -81 dBm and the Mode-S MTL (Minimum Triggering Level), and;*
2. *A maximum of 3% at any given amplitude in the input interrogation signal range between -81 dBm and the Mode-S MTL.*

Industry:
This requirement was added in ED-73C/DO-181D in 2008 to address potential spurious interference when interrogation signal levels are just below Minimum Triggering Level (MTL). The existing transponder hardware was designed before the requirement was introduced and is not able to meet the requirement with the current hardware design. This transponder is a legacy design which is being re-used with a software only change to provide ADS-B operation. The current performance for spurious ATCRBS reply ratio from low level Mode-S interrogations is an average of 7.2% with a maximum of 31.8% in the input interrogation signal range between -81 dBm and the Mode-S MTL. These numbers are derived from a conservative theoretical worst case analysis demonstrating that the non-compliant performance of these transponders does not adversely impact the level of safety at the aircraft or airspace level.

Equivalent Level Of Safety (ELOS) Analysis
The number of replies to low level signals has no consequences to the own aircraft systems or performance. The limitations on the maximum number of possible replies are independent from the received signal level.

A spurious ATCRBS reply has the potential to temporarily garble another aircraft's reply to air-to-air or ground-to-air interrogations from TCAS or ATC ground stations respectively as well as adds to overall demand on the frequency spectrum. As such, safety impacts would result if these spurious replies negatively impacted the timely performance of another aircraft's TCAS function or ground ATC radar or created sufficient additional demand on the frequency spectrum to exhaust all available capacity.

RTCA Special Committee 209 (SC-209) modeled what a victim transponder located in the US Northeast corridor would see at the transponder receiver (UF=0 interrogations). This model was used to derive the above DO-181E requirement. Based on collected flight data, it was decided that the modeled numbers should be increased by a factor of three (3) to represent a worst case scenario accommodating all Uplink Format (UF) interrogations that could be received. The density of the US Northeast corridor is comparable to the most congested airspaces in Europe. The Mode S Rate (Hz) data are summarized below:

Mode S Rate		
(Model)	**Count**	**Power**
(241)	723	-85
(257)	771	-84

(237)	711	-83
(214)	642	-82
(187)	561	-81
(196)	588	-80
(181)	543	-79
(129)	387	-78
(109)	327	-77
(90)	270	-76
(79)	237	-75
(53)	159	-74
(47)	141	-73
(38)	114	-72
(44)	132	-71
(33)	99	-70
(48)	144	-69
(42)	126	-68
(25)	75	-67
(13)	39	-66
(9)	27	-65
(12)	36	-64
(3)	9	-63
(0)	0	-62
(1)	3	-61
(0)	0	-60
0		GT -60

Given that typical MTL of the specific transponder is -74 dBm and it does not reply to any interrogations lower than -77 dBm, we must consider only the highlighted portions of the table. This sums to a rate of 993 Mode S interrogations per second. The average spurious reply rate of this transponder between -74 dBm and -77 dBm is 15.5%. Therefore, the number of FRUIT replies generated per second by this transponder in worst-case densities is 154 (993 * 0.155 = 153.9). The allowable spurious reply rate is 31 (3072 * 0.01 = 30.72; the 3072 interrogations are based on receiving interrogations between -81 dBm and -74 dBm (MTL)). Thus, this transponder produces only 123 spurious replies per second (154 – 31 = 123) more than the MOPS requirement allows.

a. Impact on Frequency Spectrum

United States Federal Aviation Administration 2011 flight test data collected in the United States Northeast corridor indicate an average of around 300 aircraft within a 100 nm area. If each aircraft were Mode S equipped and MOPS compliant, there would be an additional 9300 spurious replies (300 aircraft * 31 spurious replies per second).

This transponder is installed on regional jets from one manufacturer and certain business jets. Based on figures included in industry reports (including the Airbus Global Market Forecast and the Boeing Current Market Outlook), in 2011, these regional jets comprised approximately 5% of the European aircraft fleet (~225 of a total 5000 aircraft). Due to their relative low operating frequency, business jets make up a much lower percentage of

overall flight operations in Europe. Operations of business jets equipped with these transponders are assumed to be <1% of total operations.

Applying a very conservative estimate of 10% of traffic equipped with this transponder, there would be an additional 3690 spurious replies in the airspace (30 aircraft * 123 additional spurious replies = 3690).

2007 Northeast corridor flight test data indicate each aircraft is transmitting between 100 and 150 Mode A/C replies per second and about 25 Mode S replies per second. Worst case in the 100 nm region is 52500 replies (300 a/c * 150 replies + 300 a/c * 25 replies = 52500). Assuming 10% of the aircraft are equipped with this transponder, the additional spurious replies generate approximately 7.0% additional demand on the frequency spectrum (3690 / 52500 * 100 = 7.0) of the overall reply rate in the 100 nm area.

This worst case performance analysis results in only a maximum 7.0% loading change on the airspace frequency spectrum linked to this deviation request. Today this loading is existing already and we are not aware of problems which are linked directly to this specific channel load. We consider that the same load, as existing today, can be dealt with in future and there is no retroactive requirement to update existing transponder design to the new requirements in place today. Until such requirements may be implemented, we consider that our older receiver design may continue to be used even when implementing updated transponder and ADS-B functionality into the unit.

It should be further noted, that the effect of the reply rate limitation as requested by ED-73E/ED-73C 3.11 (DO-181D/DO-181E 2.2.7.3) may reduce the replies by applying sensitivity-reduction in case of high channel loads. This effect has not been considered in the worst case analysis.

Note: No consideration was given to the spectrum impact of ATCRBS replies versus Mode S replies. ATCBRS replies are comprised of up to 15 pulses and last approximately 21 microseconds. There are two formats of Mode S replies: 56-bit data (plus four preamble pulses) lasting 64 microseconds and 112-bit data (plus four preamble pulses) lasting 120 microseconds. As can be seen, spurious ATCRBS replies have less of an impact on the 1090 MHz spectrum than Mode S replies which make up much of the other communication on the frequency.

b. Impact on TCAS Performance:

i. TCAS FRUIT Processing

According to RTCA/DO-185B, §2.2.1.2.3.1, the maximum ATCRBS FRUIT (False Replies Unsolicited In Time) rate for which TCAS must account is 30,000 per second. The 3690 additional replies generated by these transponders in the airspace is 12.3% of the amount TCAS is designed to handle (3690 / 30000 * 100 = 12.3).

ii. TCAS Tracking

Each second, TCAS tracks other aircraft via one of two interrogation types: Mode C or Mode S (UF=0). For Mode C tracking, TCAS uses a whisper-shout sequence that guarantees two replies per intruder per second. For Mode S tracking, if the initial interrogation (UF=0) does not yield a reply (DF=0), TCAS transmits a second (or retry) interrogation. Thus TCAS is able to overcome a garbled reply. TCAS also jitters its one second interrogation sequence by ±10 percent to help prevent synchronous garbling.

Another mitigating factor in TCAS tracking is that TCAS can coast an intruder for up to six seconds before the intruder track is dropped. So, TCAS needs just one reply from an aircraft every 12 interrogations to maintain a track. The additional spurious replies from

these transponders will not result in too much garbling to prevent TCAS from tracking either Mode C or Mode S aircraft.

When TCAS II generates a Resolution Advisory (RA) against another TCAS II equipped aircraft, the two aircraft coordinate their RAs each second the RA is active. The mechanism for coordination is via the 1030/1090 MHz interrogation/reply protocol. To ensure its intent is received by the conflicting TCAS II, the interrogation containing the intent is retransmitted between six and 12 times in a 100 millisecond period if replies are not received.

Once again, spurious ATCRBS replies from these transponders do not impact the TCAS coordination process due to its robustness of retries.

c. Impact on Ground ATC Radar Performance:
The Secondary Surveillance Radar (SSR) interrogations result in multiple replies per aircraft per scan. The radar will re-interrogate in case no reply was received. The ground radar uses a directional antenna and is therefore not affected by all data transmitted on the channel but mainly by those in the antenna reception sector, which will reduce the effect of spurious replies further. ATC ground stations have very robust garble detection and correction methods. Due to these factors, the spurious ATCRBS replies from these transponders have a negligible effect on the airspace and an equivalent level of safety is maintained.

d. ADS-B reception:
The EASA study on transponder reception has shown that there is a range reduction with increasing channel load for ADS-B receivers. All ADS-B applications are designed in a way that there is sufficient range margin for the specific application. We consider that the additional channel load has therefore no safety affect to ADS-B applications.

Summary
The deviation to the requirements included in §2.2.2.4.g of RTCA/DO-181E will result in a worst case of 3690 additional replies per second or 7.0% of total frequency spectrum load. Mitigations built into TCAS, ground ATC radar processing, and ADS-B applications along with overall capacity margin on the frequency spectrum ensure that an Equivalent Level of Safety will be maintained. It is also anticipated that new Hybrid Surveillance techniques being implemented in TCAS/ACAS and the introduction of ADS-B Out into the airspace will further reduce the number of Mode S interrogations and thus reduce the potential for spurious ATCRBS replies.

EASA:
The current ETSO-C112c refers to EUROCAE ED-73C and that document does have already the requirement as well. The requirement is not only applicable to ED-73E but exist already in ED-73C and is endorsed by ETSO-C112c applicable since 21.12.2010.

ICAO Annex 10 Volume IV amendment 85 has a corresponding requirement in paragraph 3.1.2.10.1.1.5.2. That requirement is applicable to equipment certified after 1 January 2011.

The ICAO requirement per se is not aiming for retrofit action of the existing fleet but wants to ensure that new designs are respecting the requirement to solve observed issues and to reduce channel load to allow further traffic growth.

As the ICAO is talking about equipment certification and not aircraft certification we consider that even existing transponder designs may be selected for new installation and

certification on board aircraft. This would allow even for upgrades of old designs with new software under the provision of the aircraft certification process.

The ETSO certification is the only equipment certification process in the EASA system. When doing a major change to an existing equipment under the provisions of 21A.611 this leads automatically to a new application and a new authorisation. The date of application is setting the applicable certification basis. Equipment certification is considered a voluntary process as parts and appliances could always be certified as part of the aircraft.

Considering the need for an upgrade path for existing transponder design, based on the industry presentation, and the nonexistence of a mandate to update existing installations we accept the deviation as an Equivalent Level of Safety has been demonstrated under the following condition:
As regulation (EU) No 1207/2011 *Requirements for the Performance and the Interoperability of Surveillance for the Single European Sky* makes ICAO Annex 10 Volume IV amendment 85 paragraph 3.1.2.10 the applicant needs to identify in the Declaration of Design and Performance as well as in the installation and or operation manual that the transponder does not meet regulation (EU) No 1207/2011~~ and that an exemption must be asked for the affected aircraft model when flying into European airspace after 7 December 2017~~.

~~Note: EASA is not competent to grant exemptions to regulation (EU) No 1207/2011.~~

ETSO-C112c#6 - Air Traffic Control Radar Beacon System/Mode Select (ATCRBS/MODE S) Airborne Equipment
Deviate from ED-73E, paragraph 3.27.2.1/RTCA DO-181E 2.2.22.2.1 and do not discard the incoming message in case no reply is sent.

Requirement:
ED-73E, paragraph 3.27.2.1 (DO-181E, paragraph 2.2.22.2.1) states the following requirement:

"If the transponder recognizes a valid incoming ACAS Resolution Message but does not send a valid Coordination Reply Message, all data in the incoming message shall be discarded."

Industry:
During high interrogation rates it is possible to send the contents of the TCAS Coordination Message to the TCAS without a reply being generated.

The Mode S Reply Rate Limiting is accomplished via hardware (without software intervention or knowledge). Therefore, it is possible during high interrogation rates for the Mode S software to initiate a reply to a TCAS Coordination Message and send the contents of the TCAS Coordination Message to the TCAS, yet the hardware would cancel the reply from being transmitted.

The flight crew will not notice any effects due to the issue described above. If the Mode S Transponder sends the contents of the Coordination Message to TCAS, but does not send a reply to the transmitting TCAS, TCAS will be informed of the other TCAS's intent. That will ensure TCAS selects a complementary Resolution Advisory, which is the intent of the Coordination Message. In effect, the issue described above provides a better than equivalent level of safety for both aircraft involved.

To date there are over 7,000 production aircraft equipped with Mode S Transponders which have over 45 million flight hours and none of the OEMs using these transponders have observed field failures, attributed to this non-compliance. There have been no reported OEM or field rejections, nor any flight crew reports attributed to this non-compliance to date.

Note: The conclusion of the aircraft manufacturer's internal Safety Assessment Review Board was that this issue does not constitute a safety issue.
The FAA on 27 June 2011 approved this same deviation.

EASA: The same requirement exist in EUROCAE ED-73C called by the current ETSO-C112c as well as in the previous ED-73B called by the outdated ETSO-2C112b.
We accept the deviation.
The ACAS system is accounting for this kind of communication problems as it can anyhow not be guaranteed that each transponder transmission is passing through the communication channel shared non-coordinated by all participants.

This area of ED-73E is not directly addressed by regulation (EU) No 1207/2011 *Requirements for the Performance and the Interoperability of Surveillance for the Single European Sky* which makes reference only to dedicated sections of ICAO Annex 10 Volume IV amendment 85. Compliance to that regulation can still be achieved even having this deviation applied.

ETSO-C166a#7 - Extended Squitter Automatic Dependent Surveillance – Broadcast (ADS-B) and Traffic Information Services (TIS-B) Equipment Operating on the Radio Frequency of 1090 MHz
Deviate ETSO-C166a 3.1.1 to use of RTCA DO-260B with Corrigendum 1 / EUROCAE ED-102A with Corrigendum 1 in lieu of RTCA DO-260A.

Requirement:
ETSO C166a 3.1.1 requires the use of RTCA DO-260A, MOPS for 1090 MHz Extended Squitter Automatic Dependent Surveillance - Broadcast (ADS-B) & Traffic Information Services - Broadcast (TIS-B).

Industry:
Request to use DO-260B with Corrigendum 1 as the basis of compliance to ETSO C166a, in lieu of DO-260A.

RTCA DO-260A has been replaced by a newer version, RTCA DO-260B with Corrigendum 1, MOPS for 1090 MHz Extended Squitter Automatic Dependent Surveillance - Broadcast (ADS-B) & Traffic Information Services - Broadcast (TIS-B). The EUROCAE equivalent document is ED-102A, MOPS for 1090 MHz Extended Squitter Automatic Dependent Surveillance - Broadcast (ADS-B) & Traffic Information Services - Broadcast (TIS-B) with Corrigendum 1. DO-260B / ED-102A is the basis of compliance with the upcoming ETSO C166b, which will replace ETSO C166a.

DO-260B / ED-102A with Corrigendum 1 represent the current desired compliance standard for Mode S transponders with ADS-B OUT. The upcoming release of ETSO C166b will cause ETSO-166a and its reference to DO-260A to be obsolete. Therefore, DO-260B with Corrigendum 1 / ED-102A with Corrigendum 1 represent the appropriate Minimum Operational Performance Standard for ADS-B OUT compliance.

EASA: We accept the deviation. The update to ETSO-C166b is applicable for new applications from 5. July 2012 onwards. See the similar deviation to ETSO-C166b#1 below

which accepts the use of Corrigendum 1. DO-260B / ED-102A with Corrigendum 1 is compliant to Version 2 of the extended squitter ADS-B protocol as defined by ICAO document 9871 (second edition) and requested by regulation (EU) No 1207/2011 *Requirements for the Performance and the Interoperability of Surveillance for the Single European Sky*.

ETSO-C166a#8 - Extended Squitter Automatic Dependent Surveillance – Broadcast (ADS-B) and Traffic Information Services (TIS-B) Equipment Operating on the Radio Frequency of 1090 MHz
Deviate from ETSO-C166a 3.1.2 to use EUROCAE ED-14D / RTCA DO-160D change 3 for environmental test procedures.

Requirement:
ETSO C166a 3.1.2 specifies compliance to EUROCAE ED-14E / RTCA DO-160E, "Environmental Conditions and Test Procedures for Airborne Equipment".

Industry:
Request the use of previous tests to EUROCAE ED-14D / RTCA DO-160D, "Environmental Conditions and Test Procedures for Airborne Equipment", dated July 29, 1997 including change 1 to 3 is in line with CS-ETSO Subpart A 2.1 environmental requirements.

EASA: We accept the deviation. ETSO-C166b reference to CS-ETSO Subpart A 2.1 allowing the use of that revision of ED-14/DO-160.

ETSO-C166a#9/ETSO-C166b#2 - Extended Squitter Automatic Dependent Surveillance – Broadcast (ADS-B) and Traffic Information Services (TIS-B) Equipment Operating on the Radio Frequency of 1090 Megahertz (MHz)
When the latitude of the GPS position exceeds 87 degrees latitude North or South at any longitude (Polar Region), the ADS-B Transmitter shall encode the position as received from the GPS without extrapolating for latency or the required 200 ms updates.

Requirements:
Deviations are requested for the following sections of RTCA DO-260B with Corrigendum 1: ***2.2.3.2.3.7.3****, 2.2.3.2.3.8.3, 2.2.3.2.4.7.3, 2.2.3.2.4.8.3.*

The time of applicability to which the encoded latitude in an Airborne Position Message is computed shall be within ***100 milliseconds*** *of the time of transmission.*

Non-GPS/GNSS Time Mark Coupled Case ("TIME" (T) = "0"): For Mode S Transponder-based Transmitting Subsystems, the position register shall be reloaded with position data at intervals that are no more than 200 milliseconds apart. The position being loaded into the register shall have a time of applicability that is never more than 200 milliseconds different from any time during which the register holds that data.

Industry:
The transponder processor must use math functions that exceed the capabilities of the CPU, when calculating position fixes above 87° North latitude, or below 87° South latitude. Rather than calculate the new position, the transponder **shall** encode the position as received from the GPS without extrapolating for latency or the required 200 ms updates, and inflate the Navigation Accuracy Category for Position value (NACp) to accommodate the worst case position error.

A similar deviation to DO-260A was previously approved for the transponder which allowed the transponder to encode the position as received from the GPS without extrapolating for latency or the required 200 ms updates. Refer to Deviation ETSO-C166a#4 in ETSO.DevP.43.

The Transponder will inflate the NACp as described below to bound the reduced accuracy caused by this limitation.

Assuming the maximum cruise speed of 973 km/h, or 270 m/s, the worst case NACp in the polar regions would be 6, which equates to an Estimated Position Uncertainty (EPU) of less than 555.6 m (0.3 nmi). RTCA/DO-303, "Safety, Performance and Interoperability Requirements Document for the ADS-B Non-Radar-Airspace (NRA) Application", December 13, 2006, Table 2 states "For 3 NM separation, the 95% accuracy of the horizontal position measured at D [time of transmission] **shall** be less than 0.3 NM (i.e., NACp ≥ 6)". The NACp value will meet this requirement in the polar regions.

By limiting the NACp to 6 in the polar regions, the aircraft will be prevented from participating in more stringent applications where the uncompensated latency could have an undesirable effect on the performance of the application.

For these reasons, an equivalent level of safety is maintained.

For FAA AC 20-165 compliance the unit needs to be connected to a position source providing position information with an update rate of at least 5 Hz resulting in an average update of the position and loading into the registers within the required 200 ms.

EASA:
DO-260A and DO-260B certified systems can be distinguished by the receiver as there are differences in the coding being identified through a version bit in one register. It has been internationally agreed that the ADS-B data send in the DO-260A format is intended to be used only for applications providing up to 5 NM separation as defined for the ADS-B Non Radar (NRA) application e.g. by AMC 20-24. Contrary the DO-260B data format is intended to be used not only by the Non Radar Airspace (RAD) application but as well in the Radar airspace and especially the air to air applications where still new applications are developed.

When upgrading form DO-260A to DO-260B the timing requirement was strengthened in respect to the time difference between the estimated position applicability and time of transmission to be maximum 100 ms. The corrigendum 1 is not modifying these specific paragraphs.

Using a GNSS sensor providing a sufficient high update rate is an acceptable alternate to the computation of position estimates. In the end the high level expectation for compliance to the regulation (EU) No 1207/2011 *requirements for the performance and the interoperability of surveillance for the single European sky* or FAA AC 20-165 is to achieve a maximum uncompensated latency of 0.6 seconds - delay time between the time of applicability of the position measurement and the transmission of the position information. In the end the ADS-B system being composed by sensors and transponder has to demonstrate the required performance.

We accept the high position sensor update rate instead of performing compensation calculation for polar regions having a low traffic load in case information is provided to the installer explaining the installation limitations and the means needed to bring the system into full compliance with the 200 ms register update and the 0.6 second total latency

requirement. The limitation(s) need to be stated in the installation manual and the Declaration of Design and Performance (DDP).
Providing a more conservative fixed NACp value than dynamically justified is excluding the aircraft up front from participating in certain applications and is contra productive to the proposed method using a high update rate of the position sensor as an alternate means. Consequently the equipment behaviour needs to be precisely explained in respect to the NACp calculation as part of the ETSO compliance demonstration. The deviation will be granted for those equipment providing the required dynamic NACp calculation with an upper limit of 6 set in the Polar Regions. Dynamic calculation means in this context, that in case a lower NACp than 6 is calculated, that value will be transmitted.

Regulation (EU) No 1207/2011 *Requirements for the Performance and the Interoperability of Surveillance for the Single European Sky* demands that the transponder register and the transmitted data format is in compliance with ICAO Doc 9871 (2nd edition) but does not endorse the document in total. Further the total uncompensated position latency requirement of 0.6 seconds is applicable. We consider that equipment using the deviation is still able to meet the requirements of Regulation (EU) No 1207/2011 when properly installed.

ETSO-C166b#1 - Extended Squitter Automatic Dependent Surveillance - Broadcast (ADS-B) and Traffic Information Services (TIS-B) Equipment Operating on the Radio Frequency of 1090 Megahertz (MHz)
Deviate ETSO-C166b 3.1.1 to use of RTCA DO-260B with Corrigendum 1 / EUROCAE ED-102A with Corrigendum 1 in lieu of only RTCA DO-260B.

Requirement:
ETSO C166b 3.1.1 requires the use of RTCA DO-260B, MOPS for 1090 MHz Extended Squitter Automatic Dependent Surveillance - Broadcast (ADS-B) & Traffic Information Services - Broadcast (TIS-B) dated 02/12/2009.

Industry:
Request to use DO-260B with Corrigendum 1 as the basis of compliance to ETSO-C166b.

Corrigendum 1 was published 13 December 2011 to address inconsistencies in the document detected during initial certification activities.

EASA: We accept the deviation. We agree to allow Corrigendum 1 to RTCA DO-260B as well, not mentioned in the ETSO-C166b due to harmonisation with FAA TSO-C166b. DO-260B / ED-102A with Corrigendum 1 is expected to be compliant to Version 2 of the extended squitter ADS-B protocol as defined by ICAO document 9871 (second edition, currently only draft available) and requested by regulation (EU) No 1207/2011 *Requirements for the Performance and the Interoperability of Surveillance for the Single European Sky*.