

Deviation Request ETSO-C159d#1 for an ETSO approval for CS-ETSO applicable to Next Generation Satellite Systems (NGSS) Equipment (ETSO-C159d)

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 12-2007](#) 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-C159d#1 Next Generation Satellite Systems (NGSS) Equipment

2.1 Summary of Deviation

Deviates from ETSO C159d §3.1.1 and use RTCA DO262D dated April 2019 instead of EUROCAE ED-243 dated April, 2017.

2.2 Original Requirement

Original requirement is described in ETSO C159d §3.1.1 :

3.1.1 Minimum Performance Standard

The standards are those provided in EUROCAE ED-243 ‘Minimum Operational Performance Standards for Avionics Supporting Next Generation Satellite Systems (NGSS)’, dated April, 2017.

Note: *There are no MPS security requirements for NGSS equipment. However, a security risk assessment may be required at the time of installation, and if needed, security controls may be implemented in connected aircraft systems or addressed by flight crew procedures*

Note: EUROCAE ED-243 is identical to RTCA DO-262 issue C, reference used throughout the rest of the document.

2.3 Industry

2.3.1 Difference

DO-262D version Appendix F lists all the differences compared to the previous DO-262C version. Refer to the table below.

Difference number	Changes in Revision D of DO-262 (given in appendix F of DO-262D)
#1	App.E, 1.1, Figure E1-2: Distinguished CS and PS voice and indicated PS voice as going through the optional security gateway.
#2	App.E, 1.3.2.1.4: Added sentence on optional use of VPN for VoIP.
#3	App.E, 1.3.4, Figure E1-6: Distinguished CS and PS voice and indicated PS voice as going through the optional security gateway.
#4	App. E, 2.2.1.3, Table E2-2: Added columns for "Standard PS Voice" and Enhanced PS voice and changed E1 and E2 definition so that they include Enhanced PS voice with VPN
#5	App. E, 2.2.1.3: Note 2 added under the table, explaining that E1 and E2 definition was revised from ED-243 / DO-262C.
#6	App.E, 1.3.4: Revised description of the Security Gateway and Voice to address use of VPN for Enhanced PS voice service.
#7	App.E, 1.3.8: Second paragraph from the bottom revised to address enhanced PS voice service.
#8	App.E, 2.2.1.3: Revised Note 1 under the table to refer DO-262B instead of previous version of this appendix.
#9	App. E, 2.2.3.3.1: Revised the first paragraph to correctly describe with APN's need to be configurable.
#10	App. E, 2.2.3.5.1: Revised to distinguish standard and enhanced PS voice and added description of the enhanced PS voice.
#11	App. E, 2.2.3.7.1: Minor change in 4th paragraph to include VPN for the enhanced PS voice.
#12	App. E, 1.2.1: Added DC-410303 reference (SB-Safety Voice Latency Tool User's Guide). (Referred from App.E, 2.4.3.7.7). Updated version numbers for all MTRs and SDM.
#13	App. E, 2.4.2.5: Added BPLT, BNE, VTP and ground security gateway simulator to the test equipment.
#14	App.E, 2.4.3.5.1: Minor wording change to explicitly address standard and enhanced PS voice. For PS voice added explicit requirement on testing with VPN.
#15	App. E, 2.2.3.3.6: Added requirement on voice quality in the presence of data exchanges.
#16	App. E, 2.4.3.3.4: Added test to verify voice quality in the presence of the data exchanges.
#17	App. E, 2.4.3.3.1: Replaced "priority IP" by "all the AES functions requiring airground IP link over BGAN.
#18	App. E, 2.2.3.7.2.7: Completely revised the Voice latency requirement.
#19	App. E, 2.4.3.7.7: Completely revised the voice latency test procedure definition.
#20	App. E, section 2.2.3.3: Revised the introductory text and the figure E2-7 to better explain what is the point of contention and what is are the priority enforcing functions.
#21	All document: - All numbered lists are now set to a correctly defined "MOPS Body Numbered" style. All captions now use unified caption style and references to table and figure captions are fixed.
#22	App.E, 2.2.3.10: Added note 4 addressing the system level security requirements defined in Appendix B of MASPS.

In comparison with DO-262 issue C, the main new material in DO-262D version deals with security gateway and security requirements. Indeed, this new material concerns differences #1 to #4, #6, #7, #9 to #11 and #13 to #20. Differences #5, #8, #12, #21 and #22 concerns only wording modifications without impact on the MOPS content; the aim is to clarify, not to modify. Consequently, the rest of this paragraph only focuses on the new PS Voice way through the Security Gateway.

As stated just above and in comparison with DO-262 issue C, the main new material in DO-262D version deals with security gateway and security requirements. The purpose of using the security gateway is to ensure integrity and provide authentication of the Aircraft (CSDU) and Ground station (Inmarsat secure AeroRack) transparently for the services.

DO-262D version introduces Enhanced PS Voice through the Security Gateway, in addition to the Datalink services (ACARS, ATN/OSI ...) already defined in DO-262C. The schematic below, extracted from DO-262D Appendix E Section 1.3.8 illustrates the new material (Note: PS Voice mentioned on the below figure deals with Enhanced PS Voice, not standard PS Voice as stated in Appendix E Section 2.2.1.3).

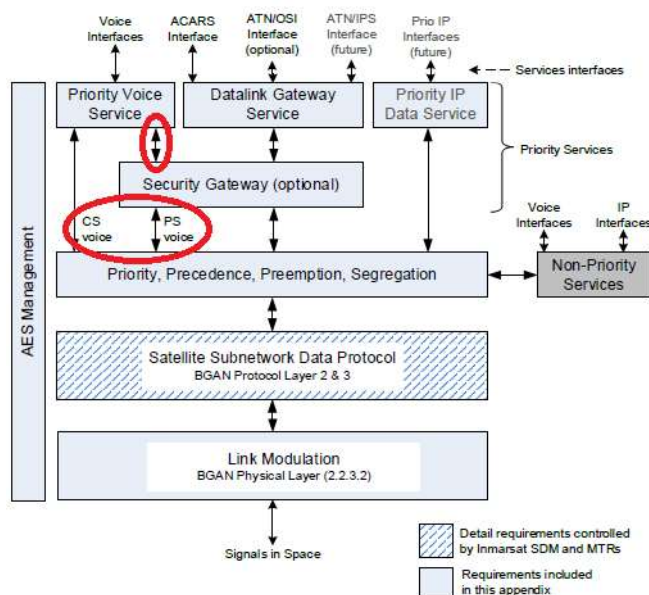


Figure E1-2: AES Requirements Map

In comparison with DO-262C where PS Voices are processed with a VOIP function that packetize the call to IP packets, the DO-262D configuration transmits VOIP packets to security gateway. Then, the security gateway adds a VPN encapsulation header to the IP packets and transmit it to the Inmarsat network. As explained in DO-262D Appendix E Section 1.3.4, Enhanced PS voice service is added to the security gateway, CS call is not impacted since it cannot be routed through the security gateway. PS Voice traffic definition is the same from DO-262C to DO-262D, just adding the Enhanced PS Voice to the Security Gateway. Additionally, the Enhanced PS Voice service is protected by the IPSec/IKE authentication on the Security Gateway (same as ACARS). Routing the Enhanced PS Voice through the Airborne Security Gateway (ASGW), named Security Gateway in Figure E1-2, has no impact on the traffic definition as the ASGW functions are authentication only. ASGW does not impact traffic types, it is transparent at this level.

CS call is managed outside the security gateway and Datalink uses a dedicated traffic flow since data packets containing ADGW messages are sent through a dedicated priority background PDP context. Both services, CS call and datalink, are managed on the same way as DO-262C requirements and DO-262D only affects the Enhanced PS Voice. CS and datalink services are not impacted due to this change.

2.3.2 Impact

As demonstrated in paragraph 2.3.1, DO-262D changes the routing of the Enhanced PS Voice, IP packets, over the security gateway (For information, standard PS Voice path remains identical to DO-262C as stated in Appendix E Section 2.2.1.3). That can imply:

- Impact on PS Voice Service's availability in case security gateway is not available
- Impact on latency
- Impact on unit calculation performances

Impact on PS Voice availability in case security gateway is not available (Quality of Service):

Due to the difference between DO-262C and DO-262D, the PS Voice will be unavailable in case of security gateway failure. Consequently, users on ground and on board the aircraft must be informed that PS Voice is no more operative. Both DO-262 revisions have the same Appendix E paragraph 4.1.3 requirement regarding system operational indication.

In order to ensure, at least, the same level of safety, the applicant shall add an additional requirement demonstrating that SATCOM users are well informed in case of PS Voice unavailability.

Due to the difference between DO-262C and DO-262D, the PS Voice will be unavailable in case of security gateway failure. In case of PS Voice unavailability, "Loss of Voice" safety objective shall remain achievable. For clarification, loss of voice capability means loss of both CS Voice and PS Voice.

In order to ensure, at least, the same level of safety, the applicant shall add an additional requirement demonstrating the "Loss of Voice" safety objective.

Impact on latency:

Adding the PS Voice to the security gateway, the IP packet processing time for the PS Voice is increased. The IP packet size increases since the IP packets for the PS Voice are encapsulated to provide the authentication required on the security gateway. The latency for performing the IP packet including the VPN header processing is sub milliseconds.

Moreover, latency measurement for verification is different between both standards, as described in Appendix E Section 2.2.3.7.2.7 "Voice latency". In DO-262D, time is no longer measured from receiving the 1st symbol of the frame containing voice samples, but from receiving the LAST symbol. The differences between 5 ms, 20 ms and 80 ms FEC blocks is thereby removed. Scheduling delay is also removed by clarifying text. This difference only have impact in the verification campaign for DO-262D. Additionally, DO-262D introduces a unique tool developed by Inmarsat for latency measurement as listed in Appendix E Section 1.2.1, Table E1-3. This new tool clarifies and simplifies voice latency measurements and harmonizes the practices in comparison with DO-262C.

In conclusion, the measurement of voice latency between DO-262C and DO-262D has been modified and it is not comparable. Method of testing of voice latency between DO-262C and DO-262D has been modified and it is not comparable. Whatever the DO-262 issues, the approval from Inmarsat guarantees that Voice Latency requirements are fulfilled. In order to ensure, at least, the same level of safety, the applicant shall add an additional requirement demonstrating that system latency for PS Voice is compliant to the Inmarsat SDM requirement.

Impact on unit processing performance:

Adding the PS Voice to the security gateway has an impact on the unit processing performances as the security gateway shall support new VPN encapsulation for PS Voice in addition to the original Datalink traffic flow.

In order to ensure, at least, the same level of safety, the applicant shall add an additional requirement demonstrating that the system has sufficient provisions to support the new functionality (total cycle time/memory/resources).

2.3.3 Additional requirements

As demonstrated in paragraph 2.3.2, the additional requirements shall be added to DO-262 issue D to justify the discrepancies regarding DO-262C:

- Demonstrate that SATCOM users are well informed in case of PS Voice unavailability,
- Demonstrate the “Loss of Voice” safety objective,
- Demonstrate the system latency for PS Voice is in accordance with Inmarsat SDM requirement,
- Demonstrate that the system has sufficient provisions (total cycle time/memory/resources).

2.4 Equivalent Level of Safety

An equivalent level of safety is provided by using the latest version of RTCA DO-262D, which incorporates more security for PS Voice complemented by the additional requirements developed in paragraph 2.3.3.

2.5 EASA position

We accept the deviation.