

Deviation Request #117 for an ETSO approval for CS-ETSO applicable to Airborne Navigation Sensors Using the Global Positioning System Augmented by the Satellite Based Augmentation System (ETSO-C145c) and Stand-Alone Airborne Navigation Equipment Using the Global Positioning System Augmented by the Satellite Based Augmentation System(ETSO-C146c) 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 Deviation Request

2.1 ETSO-C145c#4 -Airborne Navigation Sensors Using the Global Positioning System Augmented by the Satellite Based Augmentation System & ETSO-C146c#11 -Stand-Alone Airborne Navigation Equipment Using the Global Positioning System Augmented by the Satellite Based Augmentation System

2.1.1 Summary of Deviation

Deviate from RTCA DO-229D that refers to “Navstar GPS Space Segment / Navigation User Interfaces” document to use IS-GPS-200G (September 2012) instead of IS-GPS-200D (December 2004).

2.1.2 Original Requirement

IS-GPS-200D is called in the following sections of DO-229D:

§1.2.2.1 and §1.8.1.1: “Detailed GPS Standard Positioning Service (SPS) information is provided in the GPS SPS Performance Standard, October 2001, and IS-GPS-200D, “Navstar GPS Space Segment / Navigation User Interfaces”, December 2004.”

§2.1.1.2: “The equipment shall be designed to process the GPS signals and necessary data described in the latest GPS SPS Performance Standard, October 2001, and IS-GPS-200D, “Navstar GPS Space Segment / Navigation User Interfaces”, December 2004, under interference conditions described in Appendix C and under the minimum signal conditions defined in Section 2.1.1.10.”

§2.1.1.2, §2.1.1.3.1, §2.1.1.3.3: “If the ionospheric corrections provided by the SBAS are not applied to a pseudorange, then the equipment shall decode the ionospheric coefficients in the GPS navigation message and apply the ionospheric corrections described in the IS-GPS-200D, “Navstar GPS Space Segment / Navigation User Interfaces”, December 2004”

§2.1.1.5.5: “The equipment shall designate any GPS satellite as GPS UNHEALTHY if the GPS satellite navigation message meets any of the following conditions:

- a) 6 bit health word in subframe 1: all cases where MSB=“1” (ref. 20.3.3.3.1.4 and 20.3.3.5.1.3 of IS-GPS-200D, “Navstar GPS Space Segment / Navigation User Interfaces”, December 2004, [...]
- d) Bit 18 of the HOW set to 1 (Ref. 20.3.2 of IS-GPS-200D, “Navstar GPS Space Segment / Navigation User Interfaces”, December 2004.);[...]
- f) Default navigation data [alternating one’s and zero’s] is being transmitted in subframes 1, 2, or 3 (ref. 20.3.2 of IS-GPS-200D, “Navstar GPS Space Segment / Navigation User Interfaces”, December 2004);”

§2.1.2.2.2.2: “Note 1: The nominal URA index in IS-GPS-200D, “Navstar GPS Space Segment / Navigation User Interfaces”, December 2004, paragraph 20.3.3.3.1.3 can be used to determine range-domain uncertainty by assuming the URA maps into the near-Gaussian distribution”

§2.5: “The GPS/SBAS simulator shall operate in accordance with the GPS SPS Performance Standard, Navstar GPS Interface Specification (IS-GPS-200D), specification for Wide Area Augmentation System (FAA-E-2892B, Change 2), and Appendix A.”

§2.5.9.2: “The term *vert* is obtained from IS-GPS-200D and its derivation is repeated below:[...]”

2.1.3 Industry

Interface Specification IS-GPS-200 defines the requirements related to the interface between the space segment of the Global Positioning System and the navigation user segment of the GPS for radio frequency link 1 (L1) and link 2 (L2).

This document is published by the GPS Directorate and is regularly updated to take into account document improvements and evolutions of GNSS signals. The GPS Directorate recommends to use the latest version of IS-GPS-200.

It is proposed to use IS-GPS-200G dated September 2012 instead of IS-GPS-200D dated December 2004 as applicable on the entire DO-229D for a new GPS receiver design, because it reflects the up-to-date interfaces of the GNSS signals, including signals which are planned to be available to users in the coming years.

For the use of IS-GPS-200G, equivalent level of safety is demonstrated since the definition and processing algorithms of the GPS L1 C/A signal are unchanged. In particular the ionospheric model defined in Figure 20-4 of IS-GPS-200, and called in DO-229D §2.1.1.2, §2.1.1.3.1, §2.1.1.3.3.

The main changes between issue D and issue G of IS-GPS-200 are related to:

- PRN codes sequences expansion (PRN 38 to 63), applicable to GPS III and subsequent blocks. In the IS-GPS-200G, these “PRNs 38-63 are required per this Table if a manufacturer chooses to include these PRNs in their receiver design”. It is not foreseen for our GPS receiver.
- Planned evolutions of the GNSS signal without impact on the current GPS L1 C/A signal (e.g. GPS IIIA and CNAV data) that are not taken into account by the GPS receiver.

2.1.4 Equivalent Level of Safety

An equivalent level of safety is provided by using the latest revision of the “Navstar GPS Space Segment / Navigation User Interfaces” document.

2.1.5 EASA position

We accept the deviation.