

ETSO-2C206*ED Decision 2020/011/R (applicable from 25.7.2020)***CIRCUIT CARD ASSEMBLY (CCA) FUNCTIONAL SENSORS USING THE AIRCRAFT-BASED AUGMENTATION FOR NAVIGATION AND NON-NAVIGATION POSITION/VELOCITY/TIME (PVT) OUTPUT****1 Applicability**

This ETSO provides the requirements which circuit card assembly (CCA) functional sensors using aircraft-based augmentation for navigation and non-navigation position/velocity/time (PVT) output, that are designed and manufactured on or after the date of this ETSO, must meet in order to be identified with the applicable ETSO marking.

ETSO-2C206 is intended as a means for manufacturers of end-use equipment that incorporates a GNSS CCA to rationalise their ETSO-C196b application for a GNSS PVT sensor by using an ETSO-authorised GNSS CCA for partial certification credit.

An ETSO-2C206 article has a limitation that requires the end-use equipment manufacturer to repeat selected detailed functional tests in the end-use equipment and complete the environmental qualification tests in RTCA document DO-316, Minimum Operational Performance Standards for Global Positioning System/Aircraft-Based Augmentation System Airborne Equipment, dated 14 April 2009 (see paragraphs 3.1.2.2 and 3.2.2 below).

This ETSO standard applies to equipment that is intended to provide PVT information for a navigation management unit application that outputs deviation commands keyed to a desired flight path, or a non-navigation application (such as automatic dependent surveillance — broadcast (ADS-B)). In navigation applications, pilots or autopilots will use the deviations output by the navigation management unit to guide the aircraft. In non-navigation applications, the PVT outputs will provide the necessary capability for the end-use equipment.

2 Procedures**2.1 General**

The applicable procedures are detailed in CS-ETSO, Subpart A.

2.2 Specific

None.

3 Technical Conditions**3.1 Basic****3.1.1 Minimum Performance Standard**

The applicable standards are those provided for functional sensors in RTCA document DO-316, Minimum Operational Performance Standards for Global Positioning System/Aircraft-Based Augmentation System Airborne Equipment, dated 14 April 2009, Section 2.

3.1.2 Environmental Testing and Test Procedures**3.1.2.1 Environmental Testing**

For the applicable environmental standards, see CS-ETSO, Subpart A, paragraph 2.1.

Nevertheless, not all types of environmental test are required for this ETSO standard, as the ETSO article for this ETSO standard is a CCA that will be later integrated into an item of ETSO equipment. Therefore, a minimal set of the environmental test conditions of EUROCAE ED-14/RTCA document DO-160 has been defined (refer to Table 1) in order to verify the performance of the ETSOA article under this minimal set of conditions. The required performance under a particular environmental test is defined in the related test section in RTCA document DO-316, Minimum Operational Performance Standards for Global Positioning System/Aircraft Based Augmentation System Airborne Equipment, dated 14 April 2009, Section 2.2.

This minimal set is defined in Table 1 below. The chosen test category, associated with the selectable parameters in the test conditions per EUROCAE ED-14/RTCA document DO-160 should be documented in the installation manual as limitations for the installation.

The test sections that are identified as optional are not required for an ETSO-2C206 application. Nevertheless, the ETSO CCA article can be subjected to these test conditions by the applicant on a voluntary basis. When optional sections are not tested, they shall be marked with 'X' in the environmental testing summary.

Table 1 — Environmental Qualification Testing minimum set for ETSO-2C206

Environmental Test	EUROCAE ED-14/RTCA DO-160 Section	Requirement for ETSO-2C206
Temperature	4.5	<p>Mandatory</p> <p>If the performance of the module under environmental conditions is dependent on the end-user equipment, it is the responsibility of the applicant to adapt the EUROCAE ED-14/RTCA DO-160 high and low temperature values and temperature variation cycles to the intended installation context.</p> <p>For example, in the case of temperature testing (Section 4.0 of EUROCAE ED-14/RTCA DO-160), the temperature of the environment of the CCA (inside an item of equipment) may be much higher or lower than the equipment level condition expressed in the aforementioned Section 4.0. Therefore, the applicant may qualify their CCA functional sensor based on a chosen intended environment, and, finally, indicate in the installation manual the temperature range for which the correct operation of the CCA is guaranteed.</p>

Environmental Test	EUROCAE ED-14/RTCA DO-160 Section	Requirement for ETSO-2C206
		The dissipation constraints required for the CCA and documented in the installation manual should be considered when establishing the temperature test set-up.
Altitude	4.6	Mandatory
Temperature Variation	5.0	<p>Mandatory</p> <p>As for Section 4.5, if the performance of the CCA under environmental conditions is dependent on the end-user equipment, it is the responsibility of the applicant to adapt the EUROCAE ED-14/RTCA DO-160 high and low temperature values and temperature variation cycles to the intended CCA installation context.</p> <p>As for Section 4.5, for example, in the case of temperature testing (Section 4.0 of EUROCAE ED-14/RTCA DO-160), where the temperature of the environment of the CCA (inside an item of equipment) may be much higher or lower than the equipment level condition as expressed in Section 4.0 of EUROCAE ED-14/RTCA DO-160, the applicant can qualify their CCA based on a chosen intended environment, and, finally, indicate in the installation manual the temperature range for which the correct operation of the CCA functional sensor is guaranteed.</p>
Humidity	6.0	Mandatory
Shock (operational)	7.2	Optional
Shock (Crash Safety)	7.3	Optional
Vibration	8.0	<p>Optional</p> <p>Note: The CCA <u>technology</u> should be assessed for further vibration qualification (ED-14/DO-160). This preliminary assessment could consider the technology diversity of the components of the CCA, as well as the integration density and number of layers of the circuit card. The assessment could be confirmed by tests conducted on a circuit card that is representative of the CCA <u>technology</u> used in the article under certification. This preliminary assessment of the CCA technology under vibration conditions does not constitute credit for the qualification testing of the CCA when it is integrated into the end-user equipment.</p>

Environmental Test	EUROCAE ED-14/RTCA DO-160 Section	Requirement for ETSO-2C206
Explosion Atmosphere	9.0	Optional
Waterproof	10.0	Optional
Fluids Susceptibility	11.0	Optional
Sand and Dust	12.0	Optional
Fungus Resistance	13.0	Optional
Salt Fog	14.0	Optional
Magnetic Effect	15.0	Optional
Power Input	16.0	Mandatory for CCA interfaces that are directly connected to the aircraft power distribution system.
Voltage Spike	17.0	Mandatory for CCA interfaces that are directly connected to the aircraft power distribution system. Note: CCA interfaces that are not directly connected to the aircraft power distribution system will be tested after the integration phase as part of the end-user ETSO application or as part of a type-certification programme.
Audio Frequency Conducted Susceptibility — Power Input	18.0	Mandatory for CCA interfaces that are directly connected to the aircraft power distribution system. Note: CCA interfaces that are not directly connected to the aircraft power distribution system will be tested after the integration phase as part of the end-user ETSO application or as part of a type-certification programme.
Induced-Signal Susceptibility	19.0	Mandatory for CCA interfaces that are directly connected to the aircraft wiring. Note: CCA interfaces that are not directly connected to the aircraft wiring will be tested after the integration phase as part of the end-user ETSO application or as part of a type-certification programme.
Radio Frequency Susceptibility (radiated and conducted)	20.0	Mandatory for the conducted susceptibility of CCA interfaces that are directly connected to the aircraft wiring. Note: CCA interfaces that are not directly connected to the aircraft wiring will be tested after the integration phase as

Environmental Test	EUROCAE ED-14/RTCA DO-160 Section	Requirement for ETSO-2C206
		part of the end-user ETSO application or as part of a type-certification programme.
Emission of Radio Frequency Energy	21.0	Mandatory for the conducted emission of CCA interfaces that are directly connected to the aircraft wiring. Note: CCA interfaces that are not directly connected to the aircraft wiring will be tested after the integration phase as part of the end-user ETSO application or as part of a type-certification programme.
Lightning-Induced Transient Susceptibility	22.0	Mandatory for CCA interfaces that are directly connected to the aircraft wiring. Note: CCA interfaces that are not directly connected to the aircraft wiring will be tested after the integration phase as part of the end-user ETSO application or as part of a type-certification programme.
Lightning Direct Effects	23.0	Optional
Icing	24.0	Optional
Electrostatic Discharge (ESD)	25.0	Optional
Fire, Flammability	26.0	Mandatory for flammability (ED-14/DO-160 Section 26, Category C).

3.1.2.2 Environmental Test Procedures for End User

The end user of this ETSO article will be required to complete the environmental qualification testing after integration of the ETSO-2C206 CCA. In order to allow the end user to properly test the functionality of the CCA functional sensor in environmental conditions, the applicant for a ‘CCA functional sensor’ shall provide the detailed functional test procedures to evaluate the required performance of the CCA functional sensor in compliance with RTCA document DO-316, Minimum Operational Performance Standards for Global Positioning System/Aircraft Based Augmentation System Airborne Equipment, dated 14 April 2009, Section 2.2.

3.1.3 Software

See CS-ETSO, Subpart A, paragraph 2.2.

3.1.4 Airborne Electronic Hardware

See CS-ETSO, Subpart A, paragraph 2.3.

3.2 — Specific

3.2.1 Failure Condition Classification

See CS-ETSO, Subpart A, paragraph 2.4.

A failure of the function defined in paragraph 3.1.1 of this ETSO is a:

- major failure condition for a malfunction of oceanic/remote, en route, terminal navigation and lateral navigation (LNAV) approaches;
- minor failure condition for a loss of navigation in oceanic/remote, en route, terminal navigation and lateral navigation (LNAV) approaches.

3.2.2 Additional Specific

Barometric-aiding fault detection and exclusion (FDE)

If the CCA functional sensor uses barometric-aiding to enhance the availability of FDE, then the equipment shall meet the requirements in RTCA document DO-316, Appendix G.

The applicant shall provide to the end user the detailed functional test procedures of the CCA functional sensor for the end user to complete the environmental testing.

The intended installation environment and the associated installation constraints should be documented in the installation manual.

Limitations

The following specific limitations shall be documented in the installation manual and in the declaration of design and performance (DDP) of the CCA functional sensor:

- ‘The manufacturer of the end-use equipment, using the <insert equipment model> CCA functional sensor, is required to perform the testing described in ETSO-C196<latest revision> Appendix 1 with the CCA functional sensor installed in the end-use equipment.’
- ‘The manufacturer of end-use equipment is required to complete full environmental qualification at the end-use equipment level.’

4 Marking

4.1 General

See CS-ETSO, Subpart A, paragraph 1.2.

4.2 Specific

None.

5 Availability of Referenced Documents

See CS-ETSO, Subpart A, paragraph 3.

[Amdt ETSO/16]