



Explanatory Note to Decision 2018/008/R

Integrated modular avionics — Phase 2 CS-ETSO Amendment 14 and AMC-20 Amendment 15

RELATED NPA/CRD: 2017-11 — RMT.0456 (RMT.0621, RMT.0622)

EXECUTIVE SUMMARY

This Decision amends CS-ETSO and AMC-20 in order to:

- offer to integrators of aircraft functions on already authorised integrated modular avionics (IMA) platforms the possibility to obtain ETSO authorisations, independent from any aircraft on which the platforms might be installed (refer to ETSO-C214);
- provide guidance for the incremental certification of IMA, starting from platform modules, culminating with the installation of the IMA on an aircraft, and covering all the related aspects (refer to AMC 20-170).

The objective of this Decision is to maintain a high level of safety, while promoting a level playing field in the certification and use of IMA.

Additionally, this new concept will allow recurrent development and maintenance cost savings, which could be tailored to the needs of the type certificate/supplemental type certificate (TC/STC) holders and aircraft operators. Furthermore, it is expected that the new concept will generate indirect cost savings due to the reduction in aircraft weight and power consumption.

The amendments are expected to contribute to more efficient and transparent certification processes (e.g. by maximising the credit given to ETSO authorisations in the context of the IMA system), while bringing positive impacts, in particular with their economic, social and environmental benefits.

Action area:	Efficiency/proportionality		
Affected rules:	AMC-20: General Acceptable Means of Compliance for Airworthiness of Products, Parts and Appliances CS-ETSO: European Technical Standard Orders		
Affected stakeholders:	Manufacturers (IMA system integrators, application suppliers, platform and module suppliers)		
Driver:	Efficiency/proportionality	Rulemaking group:	No
Impact assessment:	Light	Rulemaking Procedure:	Standard

IMA Phase 2

● EASA rulemaking process



IMA Phase 1

● EASA rulemaking process

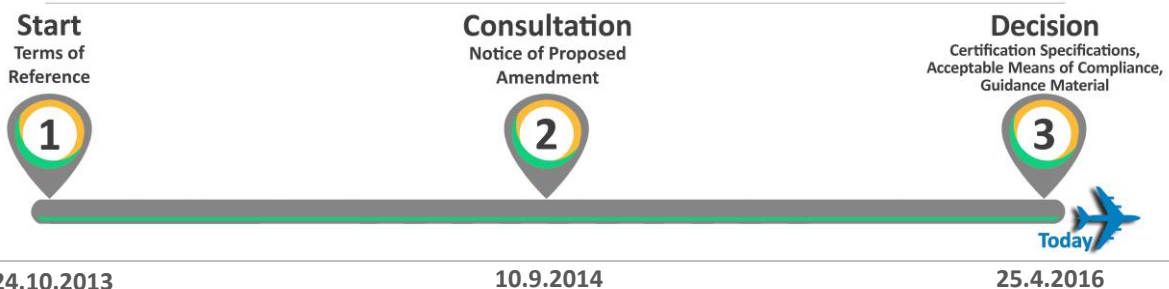


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1. About this Decision

The European Aviation Safety Agency (EASA) developed ED Decision 2018/008/R in line with Regulation (EC) No 216/2008¹ (hereinafter referred to as the 'Basic Regulation') and the Rulemaking Procedure².

This rulemaking activity is included in the EASA 5-year Rulemaking Programme³ under rulemaking task RMT.0456 (previous RMT.0621 and RMT.0622 have been merged with this RMT). The scope and timescales of the task were defined in the related Terms of Reference⁴.

In April 2016, EASA issued ETSO-2C153⁵ on IMA platforms (refer to CS-ETSO Amendment 10⁶) and modules, offering to IMA platform/module manufacturers the possibility to obtain ETSO authorisations at the platform/module level, independent of the aircraft on which the IMA may be installed.

This Decision covers the remaining aspects of IMA certification.

The text of this Decision has been developed by EASA.

All interested parties were consulted through Notice of Proposed Amendment (NPA) 2017-11⁷. 135 comments were received from 19 commentators, including industry, national aviation authorities, bilateral partners and other associations.

EASA reviewed the comments received during the public consultation process. The comments received and EASA's responses to them are presented in Comment-Response Document (CRD) 2017-11⁸.

The final text of this Decision with the certification specifications (CSs) and acceptable means of compliance (AMC) has been developed by EASA based on the comments received during the public consultation.

The major milestones of this rulemaking activity are presented on the title page.

1.1. Structure of the document

Chapter 1 contains the procedural information related to this task.

Chapter 2 explains the core technical content.

The text of the amended CS-ETSO is annexed to the Decision as follows:

- Annex I (Preamble) lists the CS-ETSO Subparts and Indexes affected by this amendment.

¹ Regulation (EC) No 216/2008 of the European Parliament and of the Council of 20 February 2008 on common rules in the field of civil aviation and establishing a European Aviation Safety Agency, and repealing Council Directive 91/670/EEC, Regulation (EC) No 1592/2002 and Directive 2004/36/EC (OJ L 79, 19.3.2008, p. 1) (<http://eur-lex.europa.eu/legal-content/EN/TXT/?qid=1467719701894&uri=CELEX:32008R0216>).

² EASA is bound to follow a structured rulemaking process as required by Article 52(1) of Regulation (EC) No 216/2008. Such a process has been adopted by the EASA Management Board (MB) and is referred to as the 'Rulemaking Procedure'. See MB Decision No 18-2015 of 15 December 2015 replacing Decision 01/2012 concerning the procedure to be applied by EASA for the issuing of opinions, certification specifications and guidance material (<http://www.easa.europa.eu/the-agency/management-board/decisions/easa-mb-decision-18-2015-rulemaking-procedure>).

³ <http://easa.europa.eu/rulemaking/annual-programme-and-planning.php>

⁴ <https://www.easa.europa.eu/document-library/terms-of-reference/tor-rmt0456-rmt0621-and-rmt0622-issue-2#group-easa-downloads>

⁵ https://www.easa.europa.eu/download/etso/ETSO-2C153_CS-ETSO_10.pdf

⁶ <https://www.easa.europa.eu/document-library/agency-decisions/ed-decision-2016006r>

⁷ <https://www.easa.europa.eu/document-library/notices-of-proposed-amendment/npa-2017-11>

⁸ <https://www.easa.europa.eu/document-library/comment-response-documents>



- Annex II contains the updated and complete CS-ETSO Indexes as well as the newly introduced ETSO-C214 article.

The text of the amended AMC-20 is annexed to the Decision as follows:

- Annex I (Preamble) lists the AMC-20 paragraphs affected by this amendment.
- Annex II contains the newly introduced AMC 20-170.



2. In summary — why and what

2.1. Why we need to change the CS and the AMC

The use of IMA has expanded in the last two decades and is expected to grow even more in the future. Nowadays, IMA can be found in all categories of aircraft.

IMA is commonly defined as a shared set of flexible, reusable and interoperable hardware and software resources that, when integrated, form a 'system' that provides computing resources and services, designed and verified to meet a defined set of functional, safety and performance requirements, as well as to host applications that perform aircraft functions.

The concept 'one computer, one function' is nowadays replaced by a set of non-system-specific and highly configurable computers. Multiple system applications are executed on the same platform and network.

Additionally, a step-by-step approach, in which modules can be qualified independently from each other, is possible.

As there were no specific requirements (in CS-ETSO or the AMC-20 series) for the certification of IMA in Europe, rulemaking task RMT.0456 was initiated in 2012. The purpose of this RMT was to consider the issue of provisions to address the various aspects of IMA certification at:

- (a) platform level (i.e. the design and production of the IMA platform integrating hardware and software, but not yet including applications performing aircraft functions);
- (b) system level (i.e. when applications performing aircraft functions are integrated on the IMA platform, but not yet in the aircraft); and
- (c) aircraft level (i.e. when the IMA platform and all the aircraft functions hosted by it are installed and integrated on the airframe).

The objective of this new concept is to allow recurrent development and maintenance cost savings, which could be tailored to the needs of the TC/STC holders and aircraft operators. Furthermore, it is expected that the new concept will generate indirect cost savings due to reduction in aircraft weight and power consumption.

In April 2016, EASA issued ETSO-2C153⁹ on IMA platforms (refer to CS-ETSO Amendment 10¹⁰) and modules, offering to IMA platform/module manufacturers the possibility to obtain ETSO authorisations at the platform/module level, independent of the aircraft on which the IMA may be installed (aspect (a) above). This has contributed to improving the efficiency and the transparency of the certification process and has partially reduced the disadvantage of European manufacturers compared to US manufacturers.

With this Decision, EASA addresses points (b) and (c) listed above.

⁹ https://www.easa.europa.eu/download/etso/ETSO-2C153_CS-ETSO_10.pdf

¹⁰ <https://www.easa.europa.eu/document-library/agency-decisions/ed-decision-2016006r>

2.2. What we want to achieve — objectives

The overall objectives of the EASA system are defined in Article 2 of the Basic Regulation. This proposal will contribute to the achievement of the overall objectives by addressing the issues outlined in Chapter 2.1.

The specific objectives of this Decision are to:

- ensure the periodical updating of rules, taking into account worldwide in-service aircraft experience, and scientific and technological progress, as required by Article 5(6)(b) of the Basic Regulation, including CS-ETSO for parts and appliances;
- contribute to more cost-efficient and transparent certification processes covering IMA certification at the system and aircraft levels;
- cover the regulatory ‘gap’ on the EASA side in comparison with the US FAA that would continue to penalise industry and require more effort from both EASA and industry during the certification process. However, it is to be noted that with this Decision, the EASA approach goes further than the current FAA approach by introducing ETSO-C214, which allows the use of incremental steps in certification. This provides a new framework for IMA system certification that is consistent with the IMA guidance at the aircraft level (covered by AMC 20-170).

2.3. How we want to achieve it — overview of the amendments

2.3.1 Proposed amendments to CS-ETSO

The amendments introduced to CS-ETSO are intended to offer to integrators of aircraft functions on already authorised IMA platforms the possibility to obtain ETSO authorisations, independently from the aircraft on which the platforms will be installed (covered in ETSO-C214).

In more detail, it has been decided to:

- amend CS-ETSO Subpart A in order to introduce the concept of a functional ETSO article, which is applicable to equipment implementing applications on an ETSO-2C153-authorised IMA platform/module; and
- introduce the new ETSO-C214, which is applicable to any equipment presented for an ETSO authorisation to a functional ETSO standard, where the equipment implements applications on an ETSO-2C153-authorised IMA platform/module and from which the applicant seeks compliance credit from these ETSO authorisations to demonstrate compliance with a functional ETSO.

The newly introduced ETSO-C214 is an incremental step between ETSO-2C153 and the complete IMA systems certified during aircraft type certification.

Depending on the approach selected by the applicant regarding the future evolutions of the F-ETSO equipment¹¹, two classes have been defined by EASA:

- ‘open’ class, and
- ‘closed’ class.

¹¹ ‘F-ETSO equipment’ is the integrated equipment for which the applicant is seeking this ETSO standard approval, using ETSO-2C153 platform(s)/module(s).

‘Open’ class refers to equipment that has been integrated so as to take into account the provisions for future evolution of the ETSO article in an IMA context. That means that there are still shared resources available after the integration of all functions of the F-ETSO article, and that the performance and usage constraints of the remaining resources have been characterised. Additional provisions for ‘open’ class equipment are provided in Appendix 1 of ETSO-C214.

‘Closed’ class refers to equipment that has been integrated, and for which no evolution is anticipated, with all IMA-related activities considered closed. The performance of the remaining resources is not characterised. The F-ETSO ‘closed’ class article no longer offers any capability for IMA development. Design changes may still be performed in accordance with the Part 21 provisions, as for other ETSO articles.

The approach described above is completely new in the (E)TSO context.

After the public consultation of NPA 2017-11, the proposed ETSO-2C516 has been renamed to ‘ETSO-C214’ since the FAA agreed to introduce an equivalent TSO into their system.

2.3.2 Proposed amendments to AMC-20

The amendments introduced into AMC-20 are intended to provide guidance to support IMA system certification, starting from platform modules and culminating with installation of the IMA on aircraft and covering all the connected aspects. In order to achieve this objective, the new AMC 20-170 ‘IMA’ has been developed.

The newly introduced AMC provides a means that can be used to demonstrate that the safety aspects of IMA systems and equipment comply with the airworthiness requirements when such systems are integrated in a product, a part, or an appliance submitted to EASA for approval.

In more detail, the proposed AMC 20-170 document:

- provides an overview and background information on IMA systems and on concerns related to their certification (refer to AMC 20-170 Section 2);
- presents the EASA policy for IMA certification by recognising the use of EUROCAE document ED-124, Integrated Modular Avionics (IMA) Development Guidance and Certification Considerations, as an acceptable means of compliance for the development and certification of IMA systems, or permits the use of alternative means of compliance instead of that document;
- clarifies and amends the intent, scope, and use of ED-124 (refer to AMC 20-170 Section 3), and additionally highlights some significant differences between the EASA and the FAA systems;
- introduces the incremental certification approach, and introduces the link to ETSO authorisations (refer to AMC 20-170 Section 4);
- complements ED-124 with additional considerations on dedicated topics, such as OPRs, and configuration files (refer to AMC 20-170 Section 5).

2.4. What are the stakeholders’ views

The commentators were in general supportive of the proposed amendments to CS-ETSO and AMC-20.



The nature of the comments received ranged from specific technical comments to observations intended to improve the wording.

Hereafter is a summary of the main changes introduced as a result of the consultation of the initial proposal contained in the NPA; however, it does not represent an exhaustive list.

ETSO-C214

Definition of classes

Paragraph 3.1.1 has been reworded to improve the definition of functional ETSO classes.

With reference to the 'closed' class, it has been clarified that although further IMA development is not possible, design changes may still be performed in accordance with the Part 21 provisions, as for any other ETSO articles.

AMC 20-170

New paragraph 2.4 'Functional isolation and independence'

A dedicated paragraph has been introduced in AMC 20-170 to provide better clarifications regarding the concerns about functional isolation and independence between the aircraft functions hosted in the IMA.

Incremental component qualification

Paragraph 4.1 has been extensively reworded to provide further explanations and considerations regarding the modular approach which can be used to support an incremental component qualification process.

Cybersecurity

The proposed paragraph 5.6 addressing cybersecurity has been deleted, since it has been recognised that it did not provide any additional clarifications. It has been confirmed that the cybersecurity aspects contained in Chapter 5.1.5.8 of ED-124 'Integrated Modular Avionics (IMA) Development Guidance and Certification Considerations' cannot be considered to be adequate. They should be superseded by the applicable cybersecurity standards as defined in the project certification basis.

ETSO compliance credit

A new paragraph (4.3.3) has been introduced to summarise the credit that can be claimed from ETSO-2C153 and ETSO-C214.

Additionally, this paragraph provides the list of the remaining activities to be usually conducted in each typical scenario.

Management of problem reports

Paragraph 5.5 'Management of problem reports' has been extensively reworded to provide more clarity regarding the typical activities to be organised and conducted by applicants in the specific context of an IMA system.

Additionally, EASA is preparing a generic AMC-20 related to open problem report management, which will be also applicable to IMA.



2.5. What are the benefits and drawbacks

Overall, CS-ETSO Amendment 14 and AMC-20 Amendment 15 would provide for a more efficient and transparent certification process, bringing positive impacts, in particular with their economic, social and environmental benefits, and contributing to safety thanks to the exploitation of state-of-the-art technologies. This is the outcome of the impact assessment (IA) performed as part of NPA 2017-11¹².

The stakeholder consultation did not highlight the need to modify the IA. The changes introduced as a result of the consultation reinforce the positive outcome of the IA.

2.6. How do we monitor and evaluate the rules

EASA has created a specific link within the EASA internet page¹³ in order to simplify the identification and the download of the current ETSOs.

For consultation purposes, EASA has also created a specific webpage¹⁴ listing all (current and historic) ETSOs.

The number of applications for ETSO-C214 will represent an indicator of the added value introduced by the new EASA concept on IMA.

A small number of requests to deviate from the new ETSO-C214 would also represent a quality indicator for this ETSO.

Regarding AMC 20-170, a small number of requests for dedicated Certification Review Items (CRIs) would represent a quality indicator for this AMC.

¹² <https://www.easa.europa.eu/sites/default/files/dfu/NPA%202017-11.pdf>

¹³ <https://www.easa.europa.eu/easa-and-you/aircraft-products/etso-authorisations/list-of-current-etso>

¹⁴ <https://www.easa.europa.eu/easa-and-you/aircraft-products/etso-authorisations/list-of-all-etso>

3. References

3.1. Related regulations

- n/a

3.2. Affected decisions

- Decision No. 2003/10/RM of the Executive Director of the Agency of 24 October 2003 on certification specifications, including airworthiness codes and acceptable means of compliance, for European Technical Standard Orders (« CS-ETSO »)
- Decision No. 2003/12/RM of the Executive Director of the Agency of 5 November 2003 on general acceptable means of compliance for airworthiness of products, parts and appliances (« AMC-20 »)

3.3. Other reference documents

- n/a

