European Aviation Safety Agency

# Explanatory Note to Decision 2017/020/R

## Regular update of AMC-20 — update of AMC 20-115C

RELATED NPA/CRD 2017-02 — RMT.0643


**EXECUTIVE SUMMARY**

The objective of this Decision is to update AMC-20 in order to provide state-of-the-art means for showing compliance with the applicable airworthiness regulations with regard to the software aspects of airborne systems and equipment in the domain of product certification or European technical standard orders (ETSOs) authorisation.

This Decision amends AMC 20-115C and aligns it with Federal Aviation Administration (FAA) Advisory Circular (AC) 20-115, based on a joint proposal by the European Aviation Safety Agency (EASA) and the FAA.

The amendments are expected to significantly increase harmonisation with the FAA, have no safety, social or environmental impacts, and provide economic benefits by streamlining the certification process.


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| **Action area:** | Regular updates | | |
| **Affected rules:** | AMC-20 | | |
| **Affected stakeholders:** | Aircraft and equipment designers and manufacturers | | |
| **Driver:** | Efficiency/proportionality | **Rulemaking group:** | No |
| **Impact assessment:** | Light | **Rulemaking Procedure:** | Standard |

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# 1. About this decision

EASA developed ED Decision 2017/020/R in line with Regulation (EC) No 216/2008[1] (hereinafter referred to as the 'Basic Regulation') and the Rulemaking Procedure[2].

This rulemaking activity is included in the EASA 5-year Rulemaking Programme[3] under rulemaking task (RMT).0643. The scope and timescales of the task were defined in the related Terms of Reference [4].

The draft text of this decision has been developed by EASA in cooperation with the FAA. All interested parties were consulted through NPA 2017-02[5]. 124 comments were received from interested parties, including industry, national aviation authorities (NAAs), and social partners.

EASA and FAA reviewed the comments received during the consultation. The comments received as well as EASA's and the FAA's responses thereto are presented in Comment-Response Document (CRD) 2017-02[6].

The final text of this Decision with AMC-20 Amendment 14 (AMC 20-115, Revision D) has been developed by EASA in cooperation with the FAA, considering the 124 comments received.

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

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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 http://www.easa.europa.eu/system/files/dfu/ToR%20RMT.0643%20Issue%201.pdf

5 In accordance with Article 52 of the Basic Regulation and 6(3) and 7 of the Rulemaking Procedure.
https://www.easa.europa.eu/system/files/dfu/NPA%202017-02.pdf

6 https://www.easa.europa.eu/document-library/comment-response-documents

# 2. In summary — why and what

## 2.1. Why we need to change AMC 20-115C

EASA AMC 20-115C *Software Considerations for Certification of Airborne Systems and Equipment*, and FAA AC 20-115C *Airborne Software Assurance* are similar in their intent, but in some aspects, they are not fully aligned with each other. Moreover, they call upon two identical standards (European Organisation for Civil Aviation Equipment (EUROCAE) ED-12C and Radio Technical Commission for Aeronautics (RTCA) DO-178C, *Software Considerations in Airborne Systems and Equipment Certification*). A number of industry associations have requested more harmonisation between the AMC-20 and the related AC material, particularly on the following topics:

— the conditions under which ED-12B/DO-178B processes can be used for new developments; and

— the guidance on tool qualification in the AMC-20 material.

The current situation may create unnecessary additional workload and certification delays both for EASA and the FAA, which has a negative impact on applicants.

The current level of safety provided by AMC 20-115C and the FAA AC is considered to be adequate, which is expected to remain the same with AMC 20-115D.

## 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 Section 2.1.

The specific objective of this proposal are to improve the cost-efficiency of the software certification process between EASA and the FAA, and in particular to:

— clarify the conditions under which ED-12B/DO-178B processes can be used for new developments;

— harmonise AMC 20-115C, Section 8 with AC 20-115C, Section 9, regarding the conditions under which a legacy software product can be further developed by reusing an already approved development process;

— allow developers to continue using an existing approved development process even when they introduce new configuration data files (called ‘parameter data items’ (PDIs) in the new ED-12C/DO-178C standard);

— harmonise the guidance on tool qualification in the AMC 20-115C material with that of the FAA; and

— compile as well as streamline the existing acceptable means of compliance (AMC) and guidance material (GM) pertaining to software development assurance (i.e. from EASA Certification Memorandum CM-SWCEH-002 *Software Aspects of Certification*, Issue 1, Revision 1, and from FAA Order 8110.49 *Software Approval Guidelines*, Change 2) in order to create a single document for software-related guidance.

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

### 2.3.1 Definition of the criteria for using ED-12B/DO-178B processes for new developments

AC 20-115C introduced the possibility for applicants to reuse previously approved processes, but without providing criteria under which this is possible. AMC 20-115C did not explicitly introduce this possibility.

To resolve this inconsistency, Section 5 has been created in the new AMC and AC to precisely define the conditions under which ED-12B/DO-178B processes can be used for new developments.

### 2.3.2 Harmonisation of AMC 20-115C, Section 8 with AC 20-115C, Section 9

In said documents, the conditions under which a legacy software product could be further developed by reusing an already approved development process were similar in their intent, but were not fully aligned with each other.

AC 20-115C, Section 9 has been taken as the basis for the new text and some portions of the text and of the flow chart (Figure 1) of AC 20-115C have been reworked to provide a fully harmonised set of conditions for the reuse of a legacy process when reusing or modifying an existing legacy software product.

### 2.3.3 Introduction of the possibility to use ED-12C/DO-178C PDI guidance together with ED-12B/DO-178B processes

In both AMC 20-115C and AC 20-115C, the introduction of new configuration data files (called 'PDIs' in ED-12C/DO-178C) into an existing software program triggered the need to transition to an ED-12C/DO-178C software development process.

Following requests from industry to permit the use of the ED-12C/DO-178C PDI guidance together with ED-12B/DO-178B processes, modifications have been introduced in Sections 5 and 9 of both AMC 20-115C and AC 20-115C.

### 2.3.4 Harmonisation of guidance on tool qualification

AC 20-115C, Section 10 contained specific guidance related to tool qualification. AMC 20-115C did not contain any specific tool qualification guidance.

AC 20-115C, Section 10 has been maintained in AC 20-115D and also introduced into AMC 20-115D.

### 2.3.5 Compilation and streamlining of material pertaining to software development assurance

The available EASA and FAA software development assurance material (other than that contained in AMC 20-115C and AC 20-115C) has been reviewed and analysed in order to identify material that should be embedded in the updated AMC 20-115D/AC 20-115D.

Guidance on field-loadable software (FLS) and on user-modifiable software (UMS) has been streamlined and included in Section 8 of both AMC 20-115D and AC 20-115D. The rationale behind this guidance is as follows: EUROCAE ED-12C/RTCA DO-178C, Section 2 is admittedly not considered as guidance as it pertains to system-level objectives and activities; there are, however, implicit objectives applicable to a software developer that need to be identified in the updated

AMC 20-115D/AC 20-115D. Existing material from CM-SWCEH-002, Issue 1, Revision 1, and Order 8110.49, Change 2 has been streamlined as minimal guidance for software developers only.

Moreover, GM has been created (GM to AMC 20-115D on the EASA side, and AC 00-SW on the FAA side) in order to keep and streamline best-practices topics that were considered to be important clarifications:

— Clarification on software change impact analyses (CIAs)
Rationale: the expectations in terms of scope and content of a CIA are not clarified anywhere in the existing software development assurance material. Existing material from Order 8110.49, Change 2 has been reused and streamlined.

— Clarification on data coupling and control coupling
Rationale: Objective A-7 (8) of ED-12C/DO-178C and ED-12B/DO-178B may lead to typical pitfalls that should be clarified from the beginning of a software development. Existing material from CM-SWCEH-002, Issue 1, Revision 1 has been streamlined as a minimal set of clarifications.

— Clarification on error-handling at design level
Rationale: Section 6.3.4.f. of ED-12C/DO-178C and ED-12B/DO-178B identifies potential sources of errors that require specific activities focused at source code review level; however, in order to protect against foreseeable unintended software behaviour, it is beneficial to handle these sources of error at design level. Existing material from CM-SWCEH-002, Issue 1, Revision 1 has been reworked to clarify the expectations regarding these ED-12C/DO-178C and ED-12B/DO-178B activities.

## 2.4. What are the stakeholders' views

124 comments were received by 24 stakeholders, including NAAs and organisations (Eurocontrol, as well as the civil aviation authorities of Brazil, Canada, France, Germany, the Netherlands, and the United Kingdom), industry and associations (Aerospace and Defence Industries Association of Europe (ASD), Airbus Helicopters, Astronautics Corporation of America, Bell Helicopter, Bombardier Aerospace, Dassault Aviation, European Council of General Aviation Support (ECOGAS), Embraer S.A., GE Aviation, General Aircraft Manufacturers Association (GAMA), Leonardo Helicopters, Rolls-Royce Corporation, THALES Avionics, The Boeing Company, Zodiac Aerospace), as well as certification service providers (ACG-Solutions, Worldwide Certification Services).

The commentators were in general supportive of the proposed amendment to the existing AMC 20-115C and AC 20-115C, as well as of the harmonisation effort.

None of the comments were against the proposal or gave rise to any controversy.

Further to the comments received, some parts of the NPA 2017-02 proposed text were modified for improvement or clarification purposes.

The individual comments and the response thereto are contained in Chapter 2 of CRD 2017-02.

## 2.5. What are the benefits and drawbacks

Overall, AMC 20-115D is expected to significantly increase the harmonisation of the EASA software guidance with that of the FAA, have no safety, social or environmental impacts, and provide economic benefits by streamlining the certification process.

No drawbacks are expected.

## 2.6. How do we monitor and evaluate the rules

This RMT on the update of AMC 20-115C is a result of EASA's monitoring and evaluation activity. EASA continuously monitors the implementation of CS/AMC/GM through feedback from stakeholders and via the EASA Advisory Bodies (ABs).

AMC 20-115D will be subject to future monitoring activities, for which a robust framework is currently being developed.

In addition, the updated AMC 20-115D might be subject to an interim/ex-post evaluation. The evaluation would assess the performance of AMC 20-115D, taking into account predictions made in the impact assessment (IA) of NPA 2017-02. The decision as to whether an evaluation is necessary will depend on the monitoring results.

# 3. References

## 3.1. Related regulations

N/a

## 3.2. Affected decisions

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

— EASA CM-SWCEH-002 *Software Aspects of Certification*, Issue 1, Revision 1, 9 March 2012

— FAA Order 8110.49 *Software Approval Guidelines,* Change 2, 10 April 2017

# 4. Appendix

Appendix to Decision 2017/020/R ‘Regular update of AMC-20: update of EASA AMC 20-115C (AMC-20 Amendment 14)’ — CRD 2017-02.