European Aviation Safety Agency

EXECUTIVE SUMMARY

CS-25 Amendment 12 incorporates the outcome of rulemaking tasks 25.039 ('Passenger emergency exits, emergency features and escape routes - Harmonisation with FAA'), 25.055 ('Large Aeroplanes protection against fuel low level and fuel exhaustion'), RMT.0273 (MDM.071) ('Halon — Update of CSs in order to comply with EC regulations') and also some editorial changes/corrections.

The first rulemaking task enhances the cabin safety standards incorporated in CS-25 based on previously adopted standards in FAR Part 25, in the field of emergency exits and escape routes.

The second rulemaking task introduces new fuel indication system(s) standards. This is the outcome of the work of an international working group led by the Agency and including major airframe and engine manufacturers (Boeing, Airbus, ATR, Embraer, Rolls Royce), and civil aviation authorities (FAA, TCCA, EASA). This effort was made as a reaction to accidents and incidents involving engine fuel starvation, fuel exhaustion or fuel low level.

Finally, the third rulemaking task amends CS-25 to make it compliant with legislation of the European Union and with Amendment 103 to ICAO Annex 8 on the progressive phasing out of Halon, which contributes to depleting the ozone layer. This Amendment removes all the references to 'Halon' from the Book 1, so that Halon will no longer be recommended for new designs.

EXPLANATORY NOTE

CS-25 Amendment 12

Table of contents

1. GENERAL

Executive Director Decision 2012/008/R amends Decision 2003/02/RM of 17 October 2003 (CS-25 Initial Issue) as last amended by Executive Director Decision 2011/004/R of 27 June 2011 (CS-25 Amendment 11). It represents Amendment 12 of CS-25 and incorporates the output from the following EASA rulemaking tasks and editorial changes:

Rulemaking Task No.	TITLE	NPA No.
25.039	Passenger emergency exits, emergency features and escape routes - Harmonisation with FAA	2010-11
25.055	Large Aeroplanes protection against fuel low level and fuel exhaustion	2011-13
RMT.0273	Halon — Update of CSs in order to comply with EC regulations	2011-14

The above Notices of Proposed Amendment (NPA) have been subject to consultation in accordance with Article 52 of the Basic Regulation[1] and Article 6 of the Rulemaking Procedure established by the Management Board[2]. For detailed information on the proposed changes and their justification, please consult the above NPAs which are available on the Agency's website.

The Agency has addressed and responded to the comments received on the NPAs. The responses are contained in a Comment-Response Document (CRD) which has been produced for each NPA (NPA 2010-11, NPA 2011-13 and NPA 2011-14). The CRDs are available on the Agency's website.

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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, 19.03.2008, p. 1). Regulation as last amended by Regulation (EC) No 1108/2009 of the European Parliament and of the Council of 21 October 2009 (OJ L 309, 24.11.2009, p. 51).

2 Management Board Decision concerning the procedure to be applied by the Agency for the issuing of opinions, certification specifications and guidance material ('Rulemaking Procedure'), EASA MB 08-2007, 13.6.2007. MB Decision as last amended and replaced by MB Decision 01-2012, 13.3.2012.

2. CRD REACTIONS

2.1 In response to CRD 2010-11 and 2011-14, the Agency received no substantive reactions.

2.2 In response to CRD 2011-13, the Agency received the following substantive reaction, which is reproduced below together with the Agency's response:

CRD Comment No.	Commenter	Comment	EASA Response
General reaction	FAA	The United States Department of Transportation, Federal Aviation Administration would like to commend the European Aviation Safety Agency (EASA) for undertaking this important safety initiative. We agree there is a need for such regulatory action and strongly support the overall stated objectives and, for the most part, the resulting proposal. We would like to thank EASA for considering our comments to Notice of Proposed Amendment (NPA) 2011-13 and for the opportunity to review the subsequent comment response document (CRD). We wish to make two clarifications in response to the CRD. In response to our comment on Certification Specification CS 25.1305(a)(2)(iv) and the associated acceptable means of compliance (AMC) material to add the phrase "but is not necessarily limited to" after the word "includes," EASA did not accept this suggestion stating "the word 'includes' already suggests that the following list of items may not be exhaustive." We would like to clarify that our experience has been that applicants and, in some cases, even regulators have interpreted such a proposed list after the word "includes" as an exclusive list. Without including the suggested additional phrase "but is not necessarily limited to" after the word "includes" people tend to look no further than the defined list in the regulation. We did not find an EASA response to	1) The first part of the paragraph CS 25.1305(a)(2) (iii) requires "to indicate <u>any</u> fuel system condition", "that, if not corrected, would result in no fuel being supplied to one or more engine(s)". Moreover, the word "includes" clearly mean that what is following is not exhaustive, and this was the intent of the drafting Group. The list of failure cases was made based on the review of accidents and incidents, but the applicants have to investigate any other applicable failure case that would present a risk of fuel not being supplied to an engine. Furthermore, the AMC paragraph 2.c confirms that the items of the list are to be considered as a minimum: "The fuel indication system(s) alerts <u>as a minimum</u> inform the flight crew of: - any abnormal fuel transfer; - a trapped fuel situation; - the existence of a fuel leak; - a low fuel level situation." 2) The FAA proposal to change the text in the AMC paragraph related to "abnormal fuel transfer" was the following: "Abnormal fuel transfer

		our final comment on the NPA regarding the description of "abnormal fuel transfer" within the associated AMC. We stated that the AMC may be too specific with regard to the associated hazards and causes. EASA included this comment with the rest of the FAA comments in the CRD but does not appear to have responded to it specifically.	between tanks is a fuel transfer that - if no corrective action is taken - can lead to no fuel becoming ~~un~~available to an engine, ~~and/or~~ fuel imbalance, ~~causing aeroplane control difficulties~~ and/or any other hazard to the airplane. This ~~It~~ may result ~~either~~ from a ~~fuel management system~~ failure or from inappropriate flight crew action." We accept the first change "no fuel becoming available". The Agency considered the further explanation by FAA that fuel imbalance may not only create aeroplane control difficulties, but that it may also create some structural overloads on those aircraft certified with fuel imbalance limitations based on structural loads. Therefore, we deleted the term "causing aeroplane difficulties" as proposed. However, we do not accept to add the term "any other hazard to the airplane" or to extend the "fuel management system failure" to any "failure". Additional examples provided by FAA were leading either to a fuel exhaustion which is included in the "no fuel becoming available to an engine" or to trapped fuel situations (e.g. from internal tank structural failures) which is identified as a separate item in the new rule. Finally the changed paragraph reads: "Abnormal fuel transfer between tanks is a fuel transfer that - if no corrective action is taken - can lead to no fuel becoming ~~un~~available to an engine, and/or fuel imbalance ~~causing aeroplane~~

			~~control difficulties~~. This ~~It~~ may result either from a fuel management system failure or from inappropriate flight crew action."

3. EDITORIAL CHANGES

Apart from the changes that resulted from the above NPAs, this Amendment 12 of CS-25 also incorporates several changes aiming to correct certain editorial errors or inconsistencies and to update some references to documents. Their description/justification is as follows:

Book 1

CS 25.341(a)(4): Correct an error in the formula for design gust velocity. The formula was originally made for H values in feet. As in CS-25, H is considered in metres, the value 350 of the denominator must be converted to 350*0.3048=106.68.

CS 25.951(c): Add the conversion between US gallon and litre which was forgotten; replace "liter" (US) by "litre" (UK); correct the "coma" style used for numbers with decimal:

CS 25.1445: delete the unwanted "spaces" in the title of the paragraph.

Book 2

AMC 25.703
Take-off Configuration Warning Systems:

In paragraph 3.a.(7), amend the references to retain a single reference to AMC 20-115 (which will recognise the new ED-12C/DO178C):
"EASA AMC 20-115~~()~~ (~~Recognition of EUROCAE ED-12()/RTCA DO-178() Software~~ Considerations for Airborne Systems and Equipment Certification)"

In paragraph 3.b.(2), amend the references to retain a single reference to AMC 20-115 (which will recognise the new ED-12C/DO178C):

"EUROCAE ED-14D/RTCA document DO-160D or latest version, Environmental Conditions and Test Procedures for Airborne Equipment; ~~EUROCAE ED-12()/RTCA document DO-178() as recognized by EASA~~ AMC 20-115~~()~~, Software Considerations ~~in~~ for Airborne Systems and Equipment Certification. RTCA documents can be obtained from the RTCA, One McPherson Square, Suite 500, 1425 K Street Northwest, Washington, D.C. 20005."

In paragraph 5.b.(4), amend the references to retain a single reference to AMC 20-115 (which will recognise the new ED-12C/DO178C), and add the correct term "DAL":

"If such systems use digital electronic technology, a software Development Assurance ~~l~~Level (DAL) should be used, in accordance with ~~the applicable version of EUROCAE ED-12()/RTCA document DO-178(), as recognized by~~ AMC 20-115~~()~~, which is compatible with the system integrity determined by the AMC 25.1309 analysis."

AMC 25.729 Retracting mechanism:

Changes to update the references to ED-14/DO-160 according to revision G, and replacement of the reference to ED-12B/DO-178B by reference to AMC 20-115 which will recognise the new ED-12C/DO178C:

…

2.e. I*ndustry Documents.*

"(1) EUROCAE ED-14~~D~~G/RTCA, Inc., Document No. DO-160~~D~~G, Environmental Conditions and Test Procedures for Airborne Equipment.

(2) ~~EUROCAE ED-12B/RTCA, Inc., Document No. DO-178B,~~ AMC 20-115, Software Considerations in Airborne Systems and Equipment Certification."

AMC 25.735
Brakes and Braking Systems Certification Tests and Analysis

Amend the reference to AMC 20-115 (which will recognise the new ED-12C/DO178C) and update the references to ED-14/DO-160 according to revision G:

2.b.(ii)

"AMC 20-115~~()~~ ~~Recognition of EUROCAE ED-12()/RTCA DO-178()~~ Software Considerations for Airborne Systems and Equipment Certification"

2.b.(vi)

"The European Organisation for Civil Aviation Equipment Documents
ED-14~~ D~~G /RTCA DO-160~~ D~~G Environmental Conditions and Test Procedures for Airborne Equipment. ~~Issued 29 July 1997~~
~~ED-12()/RTCA DO-178()~~ AMC 20-115 Software Considerations ~~in~~ for Airborne Systems and Equipment Certification~~, as recognized by AMC 20-115()~~"

AMC 25.803
Emergency evacuation

Update the reference to FAA AC 25.803-1 which has been revised to version -1A:

"Relevant part of the FAA Advisory Circular 25-17A Transport Airplane Cabin Interiors Crashworthiness Handbook, dated 05/18/09 and AC 25.803-1A Emergency Evacuation Demonstrations, dated ~~13/11/89~~ 03/12/12 are accepted by the Agency as providing acceptable means of compliance with CS 25.803."

AMC 25.1309

Amend the reference to AMC 20-115 (which will recognise the new ED-12C/DO178C) and update the references to ED-14/DO-160 according to revision G:

3.a

"(3) AMC 20-115~~()~~ ~~Recognition of EUROCAE ED-12()/RTCA DO-178()~~ Software Considerations for Airborne Systems and Equipment Certification"

3.b

"(1) RTCA, Inc., Document No. DO-160~~ D~~G/EUROCAE ED-14~~ D~~G, Environmental Conditions and Test Procedures for Airborne Equipment.

~~(2) RTCA, Inc., Document No. DO-178()/EUROCAE ED-12(), Software Considerations in Airborne Systems and Equipment Certification, as recognized by AMC 20-115().~~

(~~3~~2) Society of Automotive Engineers (SAE) Aerospace Recommended Practice (ARP) 4754A/EUROCAE ED-79A, Guidelines for development of civil aircraft and systems.

(~~4~~3) Society of Automotive Engineers (SAE) Aerospace Recommended Practice (ARP) 4761, Guidelines and Methods for Conducting the Safety Assessment Process on Civil Airborne Systems and Equipment."

AMC 25.1322 Appendix 3

At the last line of the table on page 2-F–88: correct an error in a reference to a paragraph. CS 25.1517(3) is replaced by CS 25.1517.

AMC No. 1 to CS 25.1329
Flight Guidance System

Amend the reference to AMC 20-115 (which will recognise the new ED-12C/DO178C) and update the references to ED-14/DO-160 according to revision G:

3. Related advisory material
AMC 20-115~~B~~ ~~Recognition of EUROCAE ED-12B / RTCA DO-178B~~ Software Considerations for Airborne Systems and Equipment Certification

4. Related documents

~~RTCA DO-178B/~~
~~EUROCAE ED-12B Software Considerations in Airborne Systems and Equipment~~

RTCA DO-160~~D~~G/
EUROCAE ED-14~~D~~G Environmental Conditions and Test Procedures for Airborne Equipment

AMC 25.1435
Hydraulic Systems - Design, Test, Analysis and Certification

Update the references to ED-14/DO-160 according to revision G:

2.b.(vi) The European Organisation for Civil Aviation Equipment Documents
ED-14~~D~~G/RTCA DO-160~~D~~G, Environmental Conditions and Test Procedures for Airborne Equipment

3.a.(5)
…
For further guidance on environmental testing, suitable references include, but are not limited to, Military Standard, MIL-STD-810 "Environmental Test Methods and Engineering Guidelines", The European Organisation for Civil Aviation Equipment Document ED-14~~D~~G "Environmental Conditions and Test Procedures for Airborne Equipment" or International Organisation for Standardisation Document No. ISO 7137 "Environmental Conditions and Test Procedures for Airborne Equipment".

AMC 25.1581, Appendix 1 Computerised aeroplane flight manual

Amend the reference to AMC 20-115 (which will recognise the new ED-12C/DO178C):

6.b *Software development*

(1) The applicant should propose the software development process in the plan for software aspects of certification. The application should document the methods, parameters and allowable range of conditions contained in the computerised AFM. The results obtained from the computerised AFM should be shown to meet all applicable CS-25 requirements. This compliance may be shown using substantiation documentation, demonstrations, or other means mutually agreed to by the Agency and the applicant. The software development process described in AMC 20-115~~()~~ (~~Recognition of EUROCAE ED-12()/RTCA DO-178()~~Software

Considerations for Airborne Systems and Equipment Certification) is valid, in general, for developing either airborne or ground-based software. It represents one acceptable approach, but not the only acceptable approach, for developing software for the computerised AFM. Some of the specific guidance provided in AMC 20-115~~()~~, however, may not apply to the computerised AFM.

AMC 25.11

Page 2-GEN–17: replacement of the reference to ED-12B/DO-178B by reference to AMC 20-115 which will recognise the new ED-12C/DO178C:

"(9) For those systems that integrate windowing architecture into the display system, a means should be provided to control the information shown on the displays, such that the integrity of the display system as a whole will not be adversely impacted by anomalies in the functions being integrated. This means of controlling the display of information, called window manager in this AMC, should be developed to the software assurance level at least as high as the highest integrity function of any window. For example, a window manager should be level "A" if the information displayed in any window is level "A" (see ~~EUROCAE ED-12B~~ AMC 20-115 Software Considerations for Airborne Systems and Equipment Certification). SAE ARP 4754A/EUROCAE ED-79A, Guidelines for development of civil aircraft and systems, provides a recommended practice for system development assurance."

Page 2-GEN–47, § 1.2 in the text, correct the following error in the references used:

"In showing compliance with the specifications of CS 25.1301(a~~d~~), CS 25.1309(a), CS 25.1309 (b), and CS 25.1309 (c), ~~and CS 25.1309 (d)~~…"

Reason: CS 25.1301(d) does not exist. CS 25.1309(d) is not appropriate (copy-paste of a reference to FAR Part 25).