



Explanatory Note of Decision 2015/017/R

AMC-20 — AMENDMENT 13

RELATED NPA/CRD 2014-16 — RMT.0223 (MDM.024) — 15.7.2015

EXECUTIVE SUMMARY

This Decision addresses a safety and regulatory coordination issue related to the type certification of electrical and electronic systems susceptible to the effects of High-Intensity Radiated Fields (HIRF) and Lightning.

The specific objectives are to maintain a high uniform level of safety, to reflect the state of the art in current certification practice, and to cooperate with third countries in order to provide cost-efficient rules.

This Decision proposes the introduction of two new subjects into AMC-20:

- AMC 20-136 Aircraft Electrical and Electronic System Lightning Protection,
- AMC 20-158 Aircraft Electrical and Electronic System High-Intensity Radiated Fields (HIRF) Protection.

The proposed changes are expected to maintain safety, reduce regulatory burden, and improve harmonisation.

Applicability		Process map	
Affected regulations and decisions:	Decision 2003/012/RM (AMC-20)	Concept Paper:	No
Affected stakeholders:	Applicants for Type Certificates (TC) /Supplemental Type Certificates (STC) (or changes thereto)	Rulemaking group:	10.2.2012
Driver/origin:	Safety; regulatory coordination	Terms of Reference:	No
Reference:	JAA INT/POLs 23/1, 23/3, 25/2, 25/4, 27&29/1	RIA type:	Light
		Technical consultation during NPA drafting:	No
		Publication date of the NPA:	3 months
		Duration of NPA consultation:	No
		Review group:	No
		Focussed consultation:	No
		Publication date of the Decision:	2015/Q3



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1. Procedural information

1.1. The rule development procedure

The European Aviation Safety Agency (hereinafter referred to as the 'Agency') developed this ED Decision 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 Agency's [4-year Rulemaking Programme](#) under RMT.0223 (MDM.024)³. The scope and timescale of the task were defined in the related Terms of Reference (see process map on the title page).

The draft text of this Decision has been developed by the Agency. All interested parties were consulted through NPA 2014-16⁴. 28 comments were received from interested parties, including industry and national aviation authorities.

The Agency has reviewed the comments received on the NPA. The comments received and the Agency's responses thereto are presented in the Comment-Response Document (CRD) 2014-16⁵.

The final text of this Decision, including Amendment 13 of AMC-20, has been developed by the Agency, taking into account the 28 comments received.

The process map on the title page summarises the major milestones of this rulemaking activity.

1.2. Structure of the related documents

Chapter 1 contains the procedural information related to this task. Chapter 2 explains the core technical content of the task. The newly introduced AMC 20-136 and AMC 20-158 are annexed to the ED Decision.

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).

² The Agency is bound to follow a structured rulemaking process as required by Article 52(1) of the Basic Regulation. Such process has been adopted by the Agency's Management Board and is referred to as the 'Rulemaking Procedure'. See 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 Decision No 01-2012 of 13 March 2012.

³ <http://www.easa.europa.eu/document-library/rulemaking-programmes/revised-2014-2017-rulemaking-programme>

⁴ In accordance with Article 52 of the Basic Regulation and Articles 5(3) and 6 of the Rulemaking Procedure.

⁵ See http://easa.europa.eu/document-library/terms-of-reference-and-group-compositions?search=mdm.024&date_filter%5Bmin%5D%5Bdate%5D-&date_filter%5Bmax%5D%5Bdate%5D-&Apply



2. Explanatory note

2.1. Overview of the issues to be addressed

Aircraft electrical and electronic equipment can be susceptible to adverse effects from electromagnetic radiation and lightning. With the increased use of critical and essential electrical/electronic systems on aircraft, coupled with the development and use of non-metallic structural materials that are more 'transparent' to electromagnetic radiation and have low electrical conductivity, it has been recognised for many years that High-Intensity Radiated Field (HIRF) and Lightning standards must be enhanced to counter the growing threat.

2.2. 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. The specific objectives of this proposal are:

- (1) To amend AMC-20 by introducing new Acceptable Means of Compliance for HIRF & Lightning. This will enable the Agency to fulfil its obligation under Article 19 of the Basic Regulation to reflect the state of the art and best practice.
- (2) To establish consistent Acceptable Means of Compliance for HIRF & Lightning protection for electrical and electronic systems across different aircraft categories.
- (3) To provide greater harmonisation between the FAA and EASA in matters of HIRF & Lightning protection.

2.3. Outcome of the consultation

28 comments were received from 14 commentators on NPA 2014-16 and the individual responses to each of them were published in CRD 2014-16.

As NPA 2014-16 proposed changes to multiple CSs as well as to AMC-20, not all comments and responses are directly linked to this Decision.

Those accepted or partially accepted have resulted in changes to the AMC text.

2.4. Summary of the Regulatory Impact Assessment (RIA)

The following four options were considered in the RIA:

- (0) **Do nothing.** The baseline option, where existing certification practices would continue.
- (1) **Amend Special Conditions.** Amend the Special Conditions to allow the use of more recent standards.
- (2) **Amend CS-25 and publish AMC 25.1316 and AMC 25.1317.** Create CS 25.1317 and publish AMC material in Book 2 of CS-25 to introduce Guidance Material for HIRF & Lightning Protection.
- (3) **Amend CS-23, CS-25, CS-27, CS-29 & AMC-20.** Amend and add new requirements for all the products and publish AMC 20-136 and AMC 20-158 applicable to all products.



The four options were comparatively assessed using the Multi-Criteria Analysis (MCA) methodology. Of the four options, Option 3 provided the largest positive benefit from a safety, economic, proportionality and harmonisation standpoint. No negative impacts were identified.

The absence of harmonised regulations between the Agency and the FAA could lead to an increase of costs and time for the applicants/authority in validating type certificates and supplemental type certificates. Furthermore, the reference in a type certification basis to Agency standard Certification Review Items (CRIs), dated in excess of 10 years ago, increases the risk of obsolescence.

2.5. Overview of the amendments

AMC 20-136

This AMC provides Acceptable Means of Compliance and Guidance Material related to lightning protection and the demonstration of compliance with CS 23.1306, CS 25.1316, CS 27.1316, and CS 29.1316. It addresses the functional aspects of aircraft electrical and electronic equipment, components, or wiring as a result of lightning effects. A lightning certification plan should form part of the overall certification plan required by Part-21 (21.A.20(b)).

Seven steps are identified in AMC 20-136 in order to demonstrate compliance with the associated rule:

- (1) Identify the systems to be assessed.

A safety assessment related to lightning effects should be performed to establish and classify the system failure condition. Based on the failure condition classification, the systems should be assigned appropriate lightning certification levels (A, B or C).

- (2) Determine the lightning strike zones for the aircraft.

The purpose of lightning zoning is to determine those areas of the aircraft likely to experience lightning channel attachment and those structures that may conduct lightning current between lightning attachment points.

- (3) Establish the aircraft lightning environment for each zone.

Reference to EUROCAE ED-84A is provided to select the appropriate lightning waveforms and their applications.

- (4) Determine the lightning transient environment associated with the systems.

- (5) Establish Equipment Transient Design Levels (ETDLs) and aircraft Actual Transient Levels (ATLs).

This can be through aircraft test, analysis or similarity. It will be necessary to show a margin for ETDLs above the ATL. This margin should account for any uncertainties in the verification technique.

- (6) Verify compliance with the requirements.

The robustness of the verification process will depend on the system level established in (1).

- (7) Take corrective measures, if needed.



AMC 20-158

This AMC provides Acceptable Means of Compliance and Guidance Material related to High-Intensity Radiated Fields (HIRF) protection and the demonstration of compliance with CS 23.1308, CS 25.1317, CS 27.1317, and CS 29.1317. The electromagnetic HIRF environment exists because of the transmission of electromagnetic radio frequency (RF) energy from radar, radio, television, and other ground-based, shipborne or airborne RF transmitters, and concern for the protection of aircraft electrical and electronic systems has increased substantially in recent years.

The AMC addresses the following elements that need to be considered in an HIRF certification programme:

- (1) to identify the systems to be assessed;
- (2) to establish the applicable aircraft external HIRF environment;
- (3) to establish the test environment for installed systems;
- (4) to apply the appropriate method of HIRF compliance verification; and
- (5) to verify HIRF protection effectiveness.



3. References

3.1. Related regulations

Regulation (EC) No 216/2008 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/E (OJ L 79, 19.3.2008, p. 1).

Commission Regulation (EU) No 748/2012 of 3 August 2012 laying down implementing rules for the airworthiness and environmental certification of aircraft and related products, parts and appliances, as well as for the certification of design and production organisations (OJ L 224, 21.8.2012, p. 1).

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. Reference documents

JAA INT/POLs 23/1, 23/3, 25/2, 25/4, 27&29/1

