European Aviation Safety Agency

Terms of Reference

for a rulemaking task

Update of AMC-20

'In-flight Entertainment (IFE), Lead-free soldering, Harmonisation of safety and software criteria'

RMT.0561 — ISSUE 3 — 20.7.2015

Applicability		Process map	
Affected regulations and decisions:	AMC-20, Part-CAT, Part-ORO ED Decision 2003/12/RM of 05 November 2003	Concept paper	No
		Rulemaking group	Yes
		RIA type	Light
Affected stakeholders:	Air operators, manufacturers of aircraft and equipment	Technical consultation during NPA drafting	No
		Publication date of the NPA	2015/Q4
Driver/origin:	Level playing field	Duration of NPA consultation	3 Months
Reference:	Regulation (EC) No 216/2008 of the European parliament and of the council of 20 February2008, Article 18, Paragraph c)	Review group	Yes
		Focussed consultation	No
		Publication date of the CRD	2017/Q1
		Publication date of the Opinion	N/A
		Publication date of the Decision	2017/Q1

1. Issue and reasoning for regulatory change

1.1. General

The series of AMC 20-XX groups provisions on airworthiness for various systems which can be installed on various aircraft categories. These provisions may therefore be labelled as 'horizontal'. Other certification specifications ('vertical') apply to a specific category or sub-category of aircraft (e.g. CS-27 ('small rotorcraft')). Other 'horizontal' specifications exist for aviation products which can be installed on different aircraft categories, or equipment. The current 'horizontal' and 'vertical' certification specifications applicable to aviation products, systems or equipment installed therein are depicted in Figure 1 below:

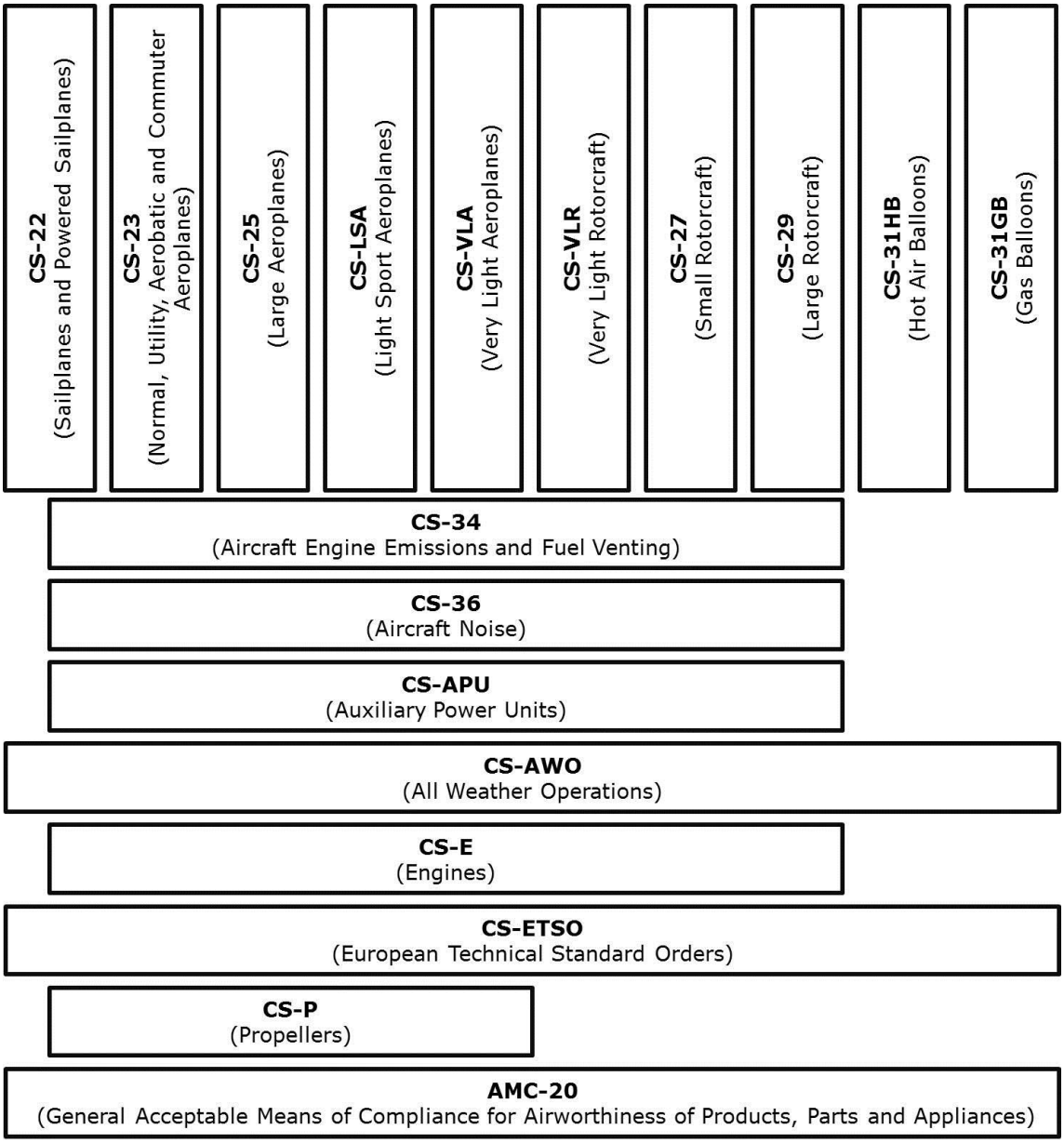

Figure 1

As the state-of-the-art is constantly evolving, the Executive Director of the Agency, after the initial Decision 2003/12/RM of 5 November 2003, has adopted, until 2012, subsequent nine Decisions, producing nine amendments

to the series of AMC 20-XX. To give more regularity to this amendment process, the Agency has introduced 'recurring' task RMT.0561 in the RMP 2013-16. Subsequent 'recurring' tasks, similar to RMT.0561, will be initiated on a regular basis to update AMC 20-XX to take into account the development of the state of the art.

1.2. Separating airworthiness provisions from operational criteria

When the Agency in 2003 produced the initial issue of specifications applicable to several systems, potentially installed on various categories of aircraft, they named the document 'AMC-20', referring to similar regulatory provisions issued by the US Federal Aviation Administration (FAA) who named them Advisory Circulars (AC) 20-XX. In the FAA tradition, AC 20 contain both provisions on airworthiness (under responsibility of manufacturers) and on operational aspects (under responsibility of aircraft operators).

At the time, the competence of the Agency was limited to design, production and maintenance of aviation products and systems and equipment installed therein. Nevertheless, the Agency decided to include operational criteria in the series of AMC 20-XX, as done in the ACs for ease of reference by stakeholders, but inevitably creating in few cases some confusion on the organisation responsible to apply a certain provision.

After the adoption of Regulation 216/2008[1], extending the competence of the Agency to air operations and the publication of the related implementing rules on AIR-OPS[2], it is the intention of the Agency to progressively uncouple the operational and the airworthiness aspects.

This activity is already in progress as presented in Annex II which contains the complete list of AMC-20 which have been published or amended so far, as well as information on the activities in progress.

From that list it can be observed that a number of AMC 20-XX are being updated, through several rulemaking tasks.

Therefore, the Agency proposes to cover in this update of AMC 20:

- In-flight Entertainment systems;
- Lead-free soldering; and
- Harmonisation of the safety assessment and software development criteria in AMC 20-1, 20-2 and 20-3.

1.3. In-flight Entertainment (IFE) systems

In-flight Entertainment (IFE) systems use, until today, the guidance provided by Temporary Guidance Leaflet (TGL) 17 developed by the former Joint Aviation Authorities (JAA). IFE fits into the AMC-20 framework as it is relevant to a broad scope of aircraft categories and operations.

Due to the wide use of IFE systems and the changing nature of technology in this field, it is appropriate to integrate IFE properly into the framework of common EU rules.

Entertainment systems in aircraft pose, due to their nature and the technologies used, few challenges which should be taken into account in order to minimise safety issues during certification as well as in the operation of these systems.

Entertainment systems, in fact, introduce additional weight, cables, heat and electromagnetic emissions. Furthermore, if malfunctions occur in these systems, they could lead to electric arcing events and therefore pose a fire hazard. Additional cables introduce more complexity into the system and might increase the chance of wire chaffing. Even if problems in the entertainment system are not directly impacting flight systems, they may nevertheless cause hazards to them.

---

[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 Commission Regulation (EU) No 6/2013 of 8 January 2013 (OJ L 4, 9.1.2013, p. 34).

[2] Commission Regulation (EU) No 965/2012 of 5 October 2012 laying down technical requirements and administrative procedures related to air operations pursuant to Regulation (EC) No 216/2008 of the European Parliament and of the Council (OJ L 296, 25.10.2012, p. 1).

The development of in-flight entertainment systems towards open platforms which interact with portable electronic devices (PEDs), either deployed by the operator or carried on-board by the passengers, also leads to more electromagnetic emissions than before.

Since the first inception of inflight entertainment, the technology has shifted from simple systems to more complex ones which are now in the process of becoming increasingly mobile and interactive. As the technology is evolving, the regulatory provisions should keep pace.

1.4. Lead-free soldering

In 2002, the European Union issued a directive (EU Directive 2002/95/EC) which required that new electrical and electronic equipment and systems put on the market after 1 July 2006 shall not contain lead (Pb) or other environmentally hazardous materials. Lead was used as surface plating for soldering purposes (e.g. tin/lead solder alloys) on discrete electrical and electronic components, including integrated circuits, semiconductors, capacitors, resistors, and other electronic circuitry, widely used on aircraft or aircraft equipment.

To date, no single lead-free alloy is a drop-in replacement for the tin-lead Sn-Pb eutectic alloys in widespread use in electronic and electrical industry over the last 50 plus years. Many of the proposed alternative materials have higher melting points than current eutectic Sn-Pb, while some of the lower temperature materials will not be able to withstand the extreme aerospace and aviation operating environments.

Pb-free solders and finishes may decrease the reliability of systems or subsystems. The following may impact safety and system performance:

- Pb-free solders may be common in commercial-off-the-shelf piece parts;
- SnPb solders and finishes on assembly piece parts may be difficult to procure;
- SnPb solders and finishes may not be available, regardless of contract or specification;
- SnPb versus Pb-free piece parts may be difficult to identify in pre-assembled subsystems;
- System production and maintenance personnel may inadvertently mix SnPb and Pb-free solders.

The need to offer more guidance to aircraft and equipment manufacturers was confirmed at an industry/EASA meeting on 6 May 2011 and by an accepted comment on NPA 2012-16.

The objective of this subtask is hence to provide guidance for the transition to lead-free soldering, considering both new projects and design changes. The concept of Lead-Free Control Plans (which may be considered either generic or project dedicated) could be introduced.

1.5. Airborne Electronic Hardware (AEH)

Most modern products, equipment or appliances incorporate Airborne Electronic Hardware (AEH) such as electronic boards, simple and complex custom micro-coded components (e.g. application specific integrated circuits (ASIC), programmable logic devices (PLD), field programmable gate arrays (FPGA), similar electronic components) and Commercial Off The Shelf (COTS) components used in the design of aircraft systems and equipment.

Specification for development of such AEH are hence necessary at both equipment level and aircraft level. In 2005 the Federal Aviation Administration (FAA) already published AC 20-152 on the matter (complemented in 2008 by the FAA Order 8110.105) to guide manufacturers and installers in showing that the equipment design and development are appropriate for its intended function.

ED Decision 2013/012/R of 15 July 2013, introduced mention of AEH in CS-ETSO Subpart A, making reference to 'EASA CM-SWCEH-001 Development Assurance of Airborne Electronic Hardware' Issue 01 revision 01, dated March 2012. Stakeholders rightly observed that no reference to a Certification Memo is appropriate in a CS. This reference needs, therefore, to be replaced by a reference to future AMC 20-152.

In order not to delay the NPA on this RMT, the Agency however, intends to develop AMC 20-152 in RMT.0643 on regular update of AMC 20.

1.6. Harmonisation of safety and software criteria

When commenting NPA 2012-11 (Recognition of ED-12C/DO-178C, following ToR RMT.0462) several stakeholders raised comments about safety considerations and software development level in AMC 20-1, 20-2, 20-3, 20-4 and 20-27. These comments were considered by the Agency out of the scope of RMT.0462. However, in the corresponding CRD the Agency envisaged possible subsequent changes in AMC-20 indeed in the frame of this RMT.0561.

However, the operational aspects of AMC 20-4 and 20-27 (both related to Performance Based Navigation – PBN) are covered by RMT.0257 currently in progress, while the technical aspects are covered by RMT.0520, equally in progress. The scope of this ToR is hence limited to harmonisation of safety assurance and software development criteria across AMC 20-1, 20-2 and 20-3, taking also into consideration AMC 20-115C.

1.7. Accessibility of AMC 20-XX

Finally, the present way of making the series of AMC 20-XX accessible to the public may not be optimal. In fact readers have to open at least 10 pages (initial issue plus nine amendments) to check when the AMC-20 they are looking for was first published and to check whether it is still valid, or replaced or amended. It is therefore appropriate to better facilitate the access to the AMCs 20-XX by making it possible to access them individually through a table. The table would be visible on the 'Certification Specifications' page on the Agency web site. Stakeholders may evaluate the effect of this approach by checking the CS-ETSO page which already implements accessibility to individual ETSOs (even when replaced by updates) through the ETSO Index[3], which has already been implemented.

2. Objectives

a) To maintain the airworthiness aspects in the series of AMC 20-XX, while progressively migrating the operational aspects into AMCs to AIR-OPS;

b) To develop AMC 20-19 on the airworthiness aspects of inflight entertainment (IFE) systems and provisions on crew training and instructions to passengers in AMC to AIR-OPS;

c) To develop AMC 20-30 on lead-free soldering at aircraft and equipment level;

d) To harmonise safety assessment criteria and software development level, across AMC 20-1, 20-2 and 20-3.

3. Specific tasks and deliverables

3.1. Tasks and deliverables

a) To develop AMC 20-19 on the initial and continuous airworthiness aspects of IFE, using as a starting point the material contained in JAA TGL 17;

b) To develop AMCs to AIR-OPS Part-ORO, Part-CAT and Part-NCC on the operational aspects of IFE, in particular AMC to rules for flight crew and cabin crew as well as to procedures to be established by operators (e.g. passenger briefing);

c) To develop AMC 20-30 on lead-free soldering at aircraft and equipment level;

d) To develop amendments to AMC 20-1, 20-2 and 20-3.

3.2. Focussed consultation

A focussed consultation is presently not deemed necessary.

Specific initiatives to discuss with stakeholders may be organised after the NPA consultation.

4. Profile and contribution of the rulemaking group

Experts on installation, use and maintenance of IFE.

[3] http://www.easa.europa.eu/agency-measures/certification-specifications.php#CS-ETSO

Experts on testing of lead-free soldering for aviation use.

Two sub-groups may be created, respectively for IFE and lead-free soldering, which are related to different domains of expertise.

No group is necessary to develop amendments to AMC 20-1, 20-2 and 20-3.

5. Annex I: Reference documents

5.1. Affected regulations

Not applicable

5.2. Affected decisions

- ED Decision 2003/12/RM on general acceptable means of compliance for airworthiness of products, parts and appliances (AMC-20);
- ED Decision 2012/016/R on acceptable means of compliance and guidance material to Part-CAT;
- ED Decision 2012/017/R on acceptable means of compliance and guidance material to Part-ORO.

5.3. Reference documents

a) CS-23, CS-25, CS-27, CS-29, Part 21, CS-ETSO and AIR-OPS

b) EASA CM-ES-001 Certification of Power Supply Systems for Portable Electronic Devices

c) EASA Annex to ED Decision 2012/018/R, Part-CAT, AMC1/GM1/GM2 CAT.GEN.MPA.140, Portable electronic devices

d) JAA Guidance Material, TGL Leaflet No. 17, Passenger Service and In-Flight Entertainment (IFE) Systems

e) UK CAA Airworthiness Notice No. 60 Issue 2 'Continuing Airworthiness and Safety Standards of Passenger Service and In-Flight Entertainment Systems'

f) Transport Canada Advisory Circular (AC) No. 500-022 Issue 1, 2006-08-11

g) FAA Memorandum — Interim Policy Guidance for Certification of In-Flight Entertainment Systems on Title 14 CFR Part 25 Aircraft (Policy Number 00-111-160), 2011-09-18

h) FAA Advisory Circular 91.21-1B — Use of Portable Electronic Devices Aboard Aircraft, 2006-08-25

i) FAA Memo No. AIR100-2011-120-003 Assessing the Reliability and Certification Procedures for Electrical and Electronic Equipment and Systems Using Lead-Free Solder and Lead-Free Finishes on Components, 2011-07-28

j) EUROCAE ED-14, RTCA DO-160 'Environmental Conditions and Test Procedures for Airborne Equipment'

k) RTCA DO-199 'Potential interference to aircraft electronic equipment from devices carried aboard', dated Sept 16th, 1988

l) RTCA DO-227, 'Minimum Operational Performance Standards for Lithium Batteries' dated, Sept 16th, 1995

m) RTCA DO-233, 'Portable Electronic Devices Carried on Board Aircraft', dated August 20th, 1996

n) ARINC 628 'Cabin Equipment Interfaces'

o) GEIA-STD-0005-1 'Standard for managing the use of Pb-free solder and finishes in Aerospace, defence and High Performance Electronic Systems'

p) GEIA-STD-0005-2 'Standard for mitigating the effects of tin whiskers in aerospace In high performance electronic systems'

q) GEIA-STD-0005-3 'Performance testing for aerospace In high performance electronic interconnects Containing Lead-Free Solder and Finishes'

r) IEC/TS 62647-1 'Process management for avionics – Aerospace and defence electronic systems containing lead-free solder – Part 1: Preparation of a lead-free control plan'

s) IEC/TS 62647-2 'Process management for avionics – Aerospace and defence electronic systems containing lead-free solder – Part 2: Mitigation of deleterious effects of tin'

t) CRD 2009-02b of 30 August 2011 on Part-NCC

u) FAA Advisory Circular 20-152 on Design Assurance Guidance for Airborne Electronic Hardware of 30 June 2005FAA Order 8110.105 on Simple And Complex Electronic Hardware Approval Guidance

v) EASA CM-SWCEH-001 Issue 1 revision 1 on Development Assurance of Airborne Electronic Hardware

w) Proposed Certification Memorandum on 'Airworthiness Considerations for Lead (Pb) Free Electronics in Airborne Systems' (EASA Proposed CM-AS-003 Issue 01).

6. Annex II: List of AMC 20-XX

No.	Title	Decision Number	Decision Date	AW	Ops	Applicable from	Applicable until	Plan
AMC 20-1	Certification of Aircraft Propulsion Systems Equipped with Electronic Controls	ED Decision 2003/12/RM	05/11/2003	Yes		05/11/2003	26/12/2007	Replaced by second issue (ED Decision 2007/019/R)
AMC 20-1 2nd Issue	Certification of Aircraft Propulsion Systems Equipped with Electronic Control Systems	ED Decision 2007/019/R	19/12/2007	Yes		26/12/2007	Still valid	To be replaced by AMC 20-1A developed through this RMT.0561.
AMC 20-2	Certification of Essential APU Equipped with Electronic Controls	ED Decision 2003/12/RM	05/11/2003	Yes		05/11/2003	Still valid	To be replaced by AMC 20-2A (ref. CRD to NPA 2012-11) And to be further amended through this RMT.0561
AMC 20-3	Certification of Engines Equipped with Electronic Engine Control Systems	ED Decision 2007/019/R	19/12/2007	Yes		26/12/2007	Still valid	To be replaced by AMC 20-3A (ref. CRD to NPA 2012-11) And to be further amended through this RMT.0561
AMC 20-4	Airworthiness Approval and Operational Criteria For the Use of Navigation Systems in European Airspace Designated For Basic RNAV Operations	ED Decision 2003/12/RM	05/11/2003	Yes	Yes	05/11/2003	Still valid	To be replaced by AMC 20-4A (ref. CRD to NPA 2012-11) in 2013. Later: Operational material to be removed from AMC 20-4 and incorporated into AMC to AIR-OPS (RMT.0257) Airworthiness material to be removed from AMC 20-4 and incorporated into CS ACNS (RMT.0519/20)

No.	Title	Decision Number	Decision Date	AW	Ops	Applicable from	Applicable until	Plan
AMC 20-5	Airworthiness Approval and Operational Criteria for the use of the Navstar Global Positioning System (GPS)	ED Decision 2003/12/RM	05/11/2003	Yes	Yes	05/11/2003	Still valid	AMC 20-5, since outdated, being considered for deletion in the context of RMT.0257
AMC 20-6	Extended Range Operation with Two-Engine Aeroplanes ETOPS Certification and Operation	ED Decision 2003/12/RM	05/11/2003	Yes	Yes	05/11/2003	23/12/2010	Replaced by second issue (ED Decision 2010/012/R)
AMC 20-6 2nd Issue	Extended Range Operation with Two-Engine Aeroplanes ETOPS Certification and Operation	ED Decision 2010/012/R	16/12/2010	Yes	Yes	23/12/2010	Still valid	To be reviewed through RMT.0578
AMC 20-7	*Reserved*							
AMC 20-8	Occurrence Reporting	ED Decision 2003/12/RM	05/11/2003		Yes	05/11/2003	Still valid	
AMC 20-9	Acceptable Means of Compliance for the Approval of Departure Clearance via Data Communications over ACARS	ED Decision 2006/12/R	22/12/2006	Yes	Yes	22/12/2006	Still valid	
AMC 20-10	Acceptable Means of Compliance for the Approval of Digital ATIS via Data Link over ACARS	ED Decision 2006/12/R	22/12/2006	Yes	Yes	22/12/2006	Still valid	
AMC 20-11	Acceptable Means of Compliance for the Approval of use of Initial Services for Air-Ground Data Link in Continental Airspace	ED Decision 2007/019/R	19/12/2007	Yes		26/12/2007	Still valid	Proposed for cancellation by NPA 2013-06 since incorporated in CS-ACNS
AMC 20-12	Recognition Of FAA Order 8400.12a For RNP-10 Operations.	ED Decision 2006/12/R	22/12/2006	Yes	Yes	22/12/2006	Still valid	Operational material to be removed from AMC 20-12 and incorporated into AMC to AIR-OPS (RMT.0257) Airworthiness material to be

No.	Title	Decision Number	Decision Date	AW	Ops	Applicable from	Applicable until	Plan
								removed from AMC 20-12 and incorporated into CS ACNS (RMT.0519/20)
AMC 20-13	Certification of Mode S Transponder Systems for Enhanced Surveillance	ED Decision 2006/12/R	22/12/2006	Yes		22/12/2006	Still valid	To be replaced by CS ACNS (ref. to NPA 2012-19)
AMC 20-14	*Operations with 8.33kHZ channel spacing VHF communication radios*							*To be introduced (ref. RMT.0099 (AMC 20.006b)), NPA 2013-6*
AMC 20-15	Airworthiness Certification Considerations for the Airborne Collision Avoidance System (ACAS II) with optional Hybrid Surveillance	ED Decision 2011/001/R	23/03/2011	Yes		30/03/2011	Still valid	
AMC 20-16	***Airworthiness and operational approval for Precision RNAV operations in designated European airspace***			***Yes***	***Yes***			***To be introduced (ref. RMT.0520, previously RMT.0099 (AMC 20.006))***
AMC 20-17	*Certification Considerations for the Terrain Awareness Warning System: TAWS*							*To be introduced (ref. RMT.0099 (AMC 20.006)), NPA 2013-6*
AMC 20-18	*Certification of Mode S Transponder Systems for Elementary Surveillance*							*To be introduced (ref. RMT.0559 (AMC 20.016))*
AMC 20-19	*Passenger service and in-flight entertainment (IFE) systems*							*To be introduced (ref. RMT.0561)*
AMC 20-21	Programme to enhance aeroplane Electrical Wiring Interconnection System (EWIS) maintenance	ED Decision 2008/007/R	29/08/2008	Yes		05/09/2008	Still valid	
AMC 20-22	Aeroplane Electrical Wiring Interconnection System Training Programme	ED Decision 2008/007/R	29/08/2008			05/09/2008	Still valid	
AMC 20-23	Development of Electrical	ED Decision	29/08/2008			05/09/2008	Still valid	

No.	Title	Decision Number	Decision Date	AW	Ops	Applicable from	Applicable until	Plan
	Standard Wiring Practices documentation	2008/007/R						
AMC 20-24	Certification Considerations for the Enhanced ATS in Non-Radar Areas using ADS-B Surveillance (ADS-B-NRA) Application via 1090 MHZ Extended Squitter.	ED Decision 2008/004/R	25/04/2008	Yes	Yes	02/05/2008	Still valid	
AMC 20-25	*Airworthiness and operational consideration for the approval of Electronic Flight Bags (EFBs)*			*Yes*	*Yes*			*To be introduced (ref. NPA 2012-02)(RMT.0001 (20.002))*
AMC 20-26	Airworthiness Approval and Operational Criteria for RNP Authorisation Required (RNP AR) Operations	ED Decision 2009/019/R	16/12/2009	Yes	Yes	23/12/2009	Still valid	Operational material to be removed from AMC 20-26 and incorporated into AMC to AIR-OPS (RMT.0257) Airworthiness material to be removed from AMC 20-26 and incorporated into CS ACNS (RMT.0519/20)
AMC 20-27	Airworthiness Approval and Operational Criteria for RNP APPROACH (RNP APCH) Operations Including APV BAROVNAV Operations	ED Decision 2009/019/R	16/12/2009	Yes	Yes	23/12/2009	Still valid	To be replaced by AMC 20-27 (ref. CRD to NPA 2012-11) in 2013. Later: Operational material to be removed from AMC 20-27 and incorporated into AMC to AIR-OPS (RMT.0257) Airworthiness material to be removed from AMC 20-27 and incorporated into CS-ACNS (RMT.0519/20)

No.	Title	Decision Number	Decision Date	AW	Ops	Applicable from	Applicable until	Plan
AMC 20-28	Airworthiness Approval and Operational Criteria related to Area Navigation for Global Navigation Satellite System approach operation to Localiser Performance with Vertical guidance minima using Satellite Based Augmentation System	ED Decision 2012/014/R	17/09/2012	Yes	Yes	24/09/2012	Still valid	Operational material to be removed from AMC 20-28 and incorporated into AMC to AIR-OPS (RMT.0257) Airworthiness material to be removed from AMC 20-28 and incorporated into CS-ACNS (RMT.0519/20)
AMC 20-29	Composite Aircraft Structure	ED Decision 2010/003/R	19/07/2010	Yes		26/07/2010	Still valid	
AMC 20-30	*Lead-free soldering at aircraft and equipment level*							*To be introduced (ref. RMT.0561)*
AMC 20-115B	Recognition of Eurocae ED-12B/RTCA DO-178B	ED Decision 2003/12/RM	05/11/2003	Yes		05/11/2003	Still valid	To be replaced by AMC 20-115C (ref. CRD to NPA 2012-11)
AMC 20-128A	Design Considerations for Minimizing Hazards Caused by Uncontained Turbine Engine and Auxiliary Power Unit Rotor Failure	ED Decision 2003/12/RM	05/11/2003	Yes		05/11/2003	Still valid	To be replaced by AMC 20-128 in order to account for open rotor engine designs (ref. ToR MDM.092)
AMC 20-170	*Integrated Modular Avionics (IMA)*			*Yes*				*To be introduced (ref. RMT.0456)*

AMCs highlighted in yellow are not yet developed; AMCs highlighted in grey have been replaced by a subsequent edition.