AMC 20 AMENDMENT 10 - CHANGE INFORMATION

The Agency publishes amendments to Certification Specifications-European Technical Standard Orders (CS-ETSO) as consolidated text for each constituent European Technical Standard Order (ETSO) individually.

Consequently, except for the revision indication letter and revised issue date in the header of the ETSO, the consolidated text of each individual ETSO does not allow readers to see the detailed changes introduced by the amendment. To allow readers to see these detailed changes this document has been created. The same format as for publication of Notices of Proposed Amendments has been used to show the changes:

1. deleted text is shown with a strike through: ~~deleted~~
2. new or amended text is highlighted with grey shading: new
3. ... indicates that remaining text is unchanged in front of or following the reflected amendment.
   ...

Annex II. AMC 20-115C — Software consideration for certification of airborne systems and equipment

Replace AMC 20-115B adopted through Decision 2003/12/RM of 05 November 2003, by the following AMC 20-115C:

AMC 20-115~~B~~C
~~Recognition of Eurocae ED-12B / RTCA DO-178B~~
Software Considerations for Certification of Airborne Systems and Equipment

1 PURPOSE

This Acceptable Means of Compliance (AMC) provides a means that can be used to demonstrate that the safety aspects of software hosted on airborne systems and equipment comply with requirements for initial airworthiness in order to obtain an airworthiness approval.

Compliance with this AMC is not mandatory and hence an applicant may elect to use an alternative means of compliance. However, those alternative means of compliance must meet the relevant requirements, ensure an equivalent level of software safety and be approved by the European Aviation Safety Agency on a product basis.

In particular, the purpose of this AMC is to provide guidelines for the production of software for airborne systems and equipment that performs its intended function with a level of confidence in safety that complies with airworthiness requirements.

2 SCOPE

This AMC discusses those aspects of airworthiness certification that pertain to the production of software for airborne systems and equipment used on aircraft, engines, propellers, APU or others parts.

In discussing those aspects, the system life cycle and its relationship with the software life cycle are considered to aid in the understanding of the certification process.

Other system and software life cycle processes are out of scope of the present AMC. For instance, out of scope are:

- system safety assessment and validation processes at product level, in the context of initial airworthiness certification of aircraft and engines;
- software considerations for the verification of ground and space systems and constituents of Air Traffic Management (ATM)/Air Navigation Services (ANS);
- software considerations for services consisting of the origination and processing of data and formatting and delivering data to general air traffic for the purpose of safety-critical air navigation;

Since certification issues for initial airworthiness are discussed only in relation to the software life cycle, the operational aspects of the resulting software are not discussed. For example, the certification, approval and management aspects of user-modifiable data are beyond the scope of this AMC.

This AMC does not provide guidelines concerning the structure of the applicant's organisation, the relationships between the applicant and its suppliers, or how the

responsibilities are divided.

Personnel qualification criteria are also beyond the scope of this AMC.

~~2~~ 3 PROCEDURES, METHODS AND TOOLS FOR SOFTWARE CONSIDERATIONS

This AMC ~~acceptable means of compliance calls attention to~~ recognises that the European Organisation for Civil Aviation Equipment (EUROCAE) document ED-12~~B~~C, 'Software Considerations in Airborne Systems and Equipment Certification', issued in January ~~December 1992~~ 2012, related guidance documents and supplements or equivalent RTCA Inc. documents, constitute an acceptable means of compliance for software (SW).

A~~a~~spects of certification that pertain to the production of software for airborne systems and equipment used on aircraft, engines, propellers and, by region, auxiliary power units. It discusses how the document may be applied to certification programmes administered by the European Aviation Safety Agency.

4 RELATED DOCUMENTS

4.1 EUROCAE document ED-12C, 'Software Considerations in Airborne Systems and Equipment Certification', describes the acceptable processes to develop and verify SW for airborne systems and equipment.

4.2 ~~2.1~~ EUROCAE document ED-12~~B~~C is technically equivalent to RTCA Inc. document DO-178~~B~~C. A reference to one document, at the same revision level, may be interpreted to mean either document.

4.3 ED-12C/DO-178C guidance is extended with the following related documents and supplements:

- ED-94C/DO-248C 'Supporting Information for ED-12C and ED-109A' ;
- ED-215/DO-330 'Software Tool Qualification Considerations';
- ED-216/DO-333 'Formal Methods Supplement to ED-12C and ED-109A';
- ED-217/DO-332 'Object-Oriented Technology and Related Techniques Supplement to ED-12C and ED-109A'; and
- ED-218/DO-331 'Model-based Development and Verification Supplement to ED-12C and ED-109A'.

~~2.2~~ 4.4 The technical content of this AMC is as far as practicable ~~possible based on~~ harmonised with the latest edition[1] of FAA AC 20-115~~() B~~, ~~dated 11 January 1993~~ equally based on ED-12/DO-178.

~~3~~ 5 RELATED CERTIFICATION SPECIFICATIONS (CSs)

Part 21, CS-22, CS-23, CS-25, CS-27, CS-29, CS-AWO, CS-E, CS-P, CS-APU, CS-ETSO and CS-VLA. Existing references to ED-12/DO-178, ~~and~~ ED-12A/DO-178A and ED-

[1] AC 20-115C of 19 July 2013: http://www.faa.gov/regulations_policies/advisory_circulars/index.cfm/go/document.information/documentID/1021710

12B/DO-178B in the above CSs will be ~~amended, at the next opportunity, to take into account the principles spelt out in paragraph 6. below~~ replaced by reference to this AMC to provide a single source of regulatory material on airborne software development for airborne systems and, equipment used on aircraft, engines, propellers and auxiliary power units.

~~4~~ 6 BACKGROUND

~~4.1~~EUROCAE document ED-12~~B~~C was developed to establish software considerations for ~~developers, installers and users when the~~ aircraft system or equipment developers ~~design is implemented~~ when the aircraft system and equipment design is developed using software based techniques. Current and future avionics designs ~~will~~ make extensive use of this technology. The EUROCAE document provides ~~guidelines~~ guidance for establishing software life cycle planning, development, verification, configuration management, quality assurance and certification liaison processes to be used in software based systems.

The guidance provided in ED-12C is in the form of:

- objectives for software life-cycle processes;
- Descriptions of activities and design considerations for achieving those objectives; and
- Descriptions of the evidence that indicates that the objectives have been satisfied.

ED-94C document was developed to provide supporting information and clarification of ED-12C.
ED-215 is a document that was developed to provide tool qualification guidance. ED-215 is invoked in ED-12C (section 12.2.3 Tool Qualification Process) and provides the objectives, activities, guidance, and life cycle data required for each Tool Qualification Level.
ED-216 is a supplement to ED-12C that was developed to provide specific guidance regarding Formal Methods.
ED-217 is a supplement to ED-12C that was developed to provide specific guidance regarding Object-Oriented Technology and Related Techniques.
ED-218 is a supplement to ED-12C that was developed to provide specific guidance regarding the techniques of Model-based Development and Verification.
Whenever one or more of the techniques addressed by these last three supplements is used in software based systems, the corresponding supplement or supplements to ED-12C should be applied in addition to ED-12C itself.

~~4.2~~~~The document~~ ED-12C and its related supplements ~~specifies~~ specify the information to be made available and/or delivered to the Agency. Guidance is also provided for dealing with software developed to earlier standards, tool qualification and alternative methods that may be used.

~~5~~ 7 USE OF EUROCAE ED-12~~B~~C AND RELATED DOCUMENTS AND SUPPLEMENTS ~~PROCEDURES~~

An applicant ~~for~~ to EASA ~~certification~~ for product certification or ETSO authorisation for any software–based equipment or system may use the considerations outlined in EUROCAE document ED-12~~B~~C and its related documents and applicable supplements, as a means, but not the only means, to secure approval. The Agency may publish acceptable means of compliance for specific CSs, stating the required relationship between the criticality of the software based systems and the software levels as defined in EUROCAE document ED-12~~B~~C. Such acceptable means of compliance will take precedence over the application of EUROCAE document ED-12~~B~~C.

~~6~~ 8 USE OF PREVIOUS VERSIONS

8.1 Previous ED-12 ~~ED-12A/DO-178A~~ versions may ~~will~~ continue to be accepted for modifications to the software of already approved systems and equipment or for reuse of already approved software components in new application for certification of products or part and appliances.

8.2 Paragraph 8.1 applies, provided that:

- The software level is not higher;
- The techniques described in the ED-12C supplements (MBD, OOTRT, Formal Methods) are not introduced into the new project; otherwise, ED-216 and/or ED-217 and/or ED-218 should be applied;
- the change to the ETSO authorized article is minor (see 21A.611);
- No new software criteria 1 or 2 tool qualification is needed; otherwise ED-215 should be applied only on the new software criteria 1 or 2 tools if the existing tools are not significantly changed;
- No new Parameter Data Item files are introduced, otherwise ED-12C should only be applied on the new Parameter Data Item files if the existing PDIs are not significantly changed and it should be demonstrated that software using the new Parameter Data Item files is compliant with the ED-12C sections related to Parameter Data Item;
- Software plans, processes, and life cycle environment, including process improvements have been maintained;

8.3 Where a modification is made to an existing software-based equipment or system, and the criteria in this section indicate the use of ED-12C and related supplements~~/DO-178C~~, they may apply, under justification, only to the software components affected by the modification.
For major changes to ETSO authorised articles, a previous version of ED-12 may continue to be accepted under justification.

Early coordination with EASA is strongly recommended to validate the above assumptions.

~~7~~ 9 AVAILABILITY OF EUROCAE DOCUMENTS ~~ED-12B~~

Copies may be purchased from EUROCAE, ~~17 rue Hamelin, 75783 PARIS Cedex 16,~~ 102 rue Étienne Dolet, 92240 Malakoff, France, (Fax : 33 1 46 55 62 65 ~~4505 7230~~).

Annex III. AMC 20-2A — Certification of Essential APUs Equipped with Electronic Controls

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4.3 *Precautions relating to APU control, protection and monitoring*

The software associated with APU control, protection and monitoring functions must have a ~~quality~~ software level and architecture appropriate to the criticality of those functions (see paragraph 4.2).

For digital systems, any residual errors not detected during the software development and verification processes could cause an unacceptable failure. ~~(RTCA DO178A (or the equivalent EUROCAE ED-12A)~~ The latest edition of AMC 20-115 constitutes an acceptable means of compliance for software development, verification and software aspects of certification. The APU software should be at least level ~~2~~ B according to ~~this~~ the industry documents referred in the latest edition of AMC 20-115. In some specific cases, level ~~1~~ A may be more appropriate.

It should be noted ~~however that the DO178A states in paragraph 3.3 – 'It is appreciated~~ that~~, with the current state of knowledge,~~ the software disciplines described in ~~this document~~ the latest edition of AMC 20-115 may not, in themselves, be sufficient to ensure that the overall system safety and reliability targets have been achieved. This is particularly true for certain critical systems, such as full authority ~~fly-by-wire~~ digital control systems, In such cases it is accepted that other measures, usually within the system, in addition to a high level of software discipline, may be necessary to achieve these safety objectives and demonstrate that they have been met.

It is outside the scope of ~~this document~~ the latest edition of AMC 20-115 to suggest or specify these measures, but in accepting that they may be necessary, it is also the intention to encourage the use of software techniques that could support meeting the overall system safety objectives.~~'~~

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Annex IV. AMC 20-3A — Certification of Engines Equipped with Electronic Engine Control Systems

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(3) RELEVANT SPECIFICATIONS AND REFERENCE DOCUMENTS

Although compliance with many CS-E specifications might be affected by the Engine Control System, the main paragraphs relevant to the certification of the Engine Control System itself are:

CS-E Specification	Turbine Engines	Piston Engines
CS-E 20 (Engine configuration and interfaces)	✓	✓
CS-E 25 (Instructions for Continued Airworthiness),	✓	✓
CS-E 30 (Assumptions),	✓	✓
CS-E 50 (Engine Control System)	✓	✓
CS-E 60 (Provision for instruments)	✓	✓
CS-E 80 (Equipment)	✓	✓
CS-E 110 (Drawing and marking of parts - Assembly of parts)	✓	✓
CS-E 130 (Fire prevention)	✓	✓
CS-E 140 (Tests-Engine configuration)	✓	✓
CS-E 170 (Engine systems and component verification)	✓	✓
CS-E 210 (Failure analysis)		✓
CS-E 250 (Fuel System)		✓
CS-E 390 (Acceleration tests)		✓
CS-E 500 (Functioning)	✓	
CS-E-510 (Safety analysis)	✓	
CS-E 560 (Fuel system)	✓	
CS-E 745 (Engine Acceleration)	✓	
CS-E 1030 (Time limited dispatch)	✓	✓

The following documents are referenced in this AMC 20-3:

- International Electrotechnical Commission (IEC), Central Office, 3, rue de Varembé, P.O. Box 131, CH - 1211 GENEVA 20, Switzerland
  - – IEC/PAS 62239, Electronic Component Management Plans, edition 1.0, dated April 2001.
  - – IEC/PAS 62240, Use of Semiconductor Devices Outside Manufacturers' Specified Temperature Ranges, edition 1.0, dated April 2001.
- RTCA, Inc. 1828 L Street, NW, Suite 805, Washington, DC 20036 or EUROCAE, 17, rue Hamelin, 75116 Paris, France
  - – ~~RTCA DO-178A/EUROCAE ED-12A, Software Considerations in Airborne Systems and Equipment Certification, dated March 1985~~
  - ~~– RTCA DO-178B/EUROCAE ED-12B, Software Considerations in Airborne Systems and Equipment Certification, dated December 1, 1992~~
  - – RTCA DO-254/ EUROCAE ED-80, Design Assurance Guidance for Airborne Electronic Hardware, dated April 19, 2000.

– RTCA DO-160/EUROCAE ED 14, Environmental Conditions and Test Procedures for Airborne Equipment.

- AMC 20-115 on software considerations for certification of airborne systems and equipment.

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(6) SYSTEM DESIGN AND VALIDATION

(a) Control Modes - General

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(e) Environmental conditions

…

(i) Declared levels

…

(ii) Test procedures

(A) General

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(B) Open loop and Closed loop Testing

HIRF and lightning tests should be conducted as system tests on closed loop or open loop laboratory set-ups.

The closed loop set-up is usually provided with hydraulic pressure to move actuators to close the inner actuating loops. A simplified Engine simulation may be used to close the outer Engine loop.

Testing should be conducted with the Engine Control System controlling at the most sensitive operating point as selected and detailed in the test plans by the applicant. The system should be exposed to the HIRF and lightning environmental threats while operating at the selected condition. There may be a different operating point for HIRF and lightning environmental threats.

For tests in open and closed loop set ups, the following factors should also be considered:

- If special EECS test software is used, that software should be developed and implemented by guidelines defined for software levels of at least ~~Level 2 in DO-178A,~~ software level C ~~in DO-178B, or equivalent~~ as defined in the industry documents referred in the latest edition of AMC 20-115. In some cases, the application code is modified to include the required test code features.
- The system test set-up should be capable of monitoring both the output drive signals and the input signals.
- Anomalies observed during open loop testing on inputs or outputs should be duplicated on the Engine simulation to determine whether the resulting power or thrust perturbations comply with the pass/fail criteria.

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(10) SOFTWARE DESIGN AND IMPLEMENTATION

(a) Objective

For Engine Control Systems that use software, the objective of CS-E 50 (f) is to prevent as far as possible software errors that would result in an unacceptable effect on power or thrust, or any unsafe condition.

It is understood that it may be impossible to establish with certainty that the software has been designed without errors. However, if the applicant uses the software level

appropriate for the criticality of the performed functions and uses ~~an~~ approved software development and verification processes, the Agency would consider the software to be compliant with the requirement to minimise errors. In multiple Engine installations, the possibility of software errors common to more than one Engine Control System may determine the criticality level of the software.

(b) Approved Methods

Methods for developing software, compliant with the guidelines contained in the latest edition of AMC 20-115 ~~documents RTCA DO-178A/EUROCAE ED-12A and RTCA DO-178B/EUROCAE ED-12B, hereafter referred to as DO-178A and DO-178B, respectively,~~ are acceptable methods. Alternative methods for developing and verifying software may be proposed by the applicant and are subject to approval by the Agency.

Software which ~~is~~ was not developed using ~~DO-178B~~ the version of ED-12 referenced in the latest edition of AMC 20-115 is referred to as legacy software. In general, changes made to legacy software applicable to its original installation are assured in the same manner as in the original certification. When legacy software is used in a new aircraft installation that requires ~~DO-178B~~ the latest edition of AMC 20-115, the original approval of the legacy software is still valid, assuming equivalence to the required software level can be ascertained. If the software equivalence is acceptable to the Agency taking into account the conditions defined the latest edition of AMC 20-115, the legacy software can be used in the new installation that requires ~~DO-178B~~ AMC 20-115 software. If equivalence cannot be substantiated, all the software changes should be assured through the use of ~~using DO-178B~~ the latest edition of AMC 20-115.

(c) Level of software design assurance

In multiple Engine installations, the design, implementation and verification of the software in accordance with ~~Level 1 (DO-178A) or~~ Level A (~~DO-178B~~ as defined in the industry documents referred in the latest edition of AMC 20-115) is normally needed to achieve the certification objectives for aircraft to be type certificated under CS-25, CS-27-Category A and CS-29-Category A.

The criticality of functions on other aircraft may be different, and therefore, a different level of software ~~design~~ development assurance may be acceptable. For example, in the case of a piston engine in a single-engine aircraft, level C (~~DO-178B~~ as defined in the industry documents referred in the latest edition of AMC 20-115) software has been found to be acceptable.

Determination of the appropriate software level may depend on the Failure modes and consequences of those Failures. For example, it is possible that Failures resulting in significant thrust or power increases or oscillations may be more severe than an Engine shutdown, and therefore, the possibility of these types of Failures should be considered when selecting a given software level.

It may be possible to partition non-critical software from the critical software and design and implement the non-critical software to a lower level as defined by the ~~RTCA~~ industry documents referred in the latest edition of AMC 20-115. The adequacy of the partitioning method should be demonstrated. This demonstration should consider whether the partitioned lower software levels are appropriate for any anticipated installations. Should the criticality level be higher in subsequent installations, it would be difficult to raise the software level.

(d) On-Board or Field Software Loading and Part Number Marking

The following guidelines should be followed when on-board or field loading of Electronic Engine Control software and associated Electronic Part Marking (EPM) is implemented.

For software changes, the software to be loaded should have been documented by an approved design change and released with a service bulletin.

For an EECS unit having separate part numbers for hardware and software, the software part number(s) need not be displayed on the unit as long as the software part number(s) is(are) embedded in the loaded software and can be verified by electronic means. When

new software is loaded into the unit, the same verification requirement applies and the proper software part number should be verified before the unit is returned to service.

For an EECS unit having only one part number, which represents a combination of a software and hardware build, the unit part number on the nameplate should be changed or updated when the new software is loaded. The software build or version number should be verified before the unit is returned to service.

The configuration control system for an EECS that will be on-board/field loaded and using electronic part marking should be approved. The drawing system should provide a compatibility table that tabulates the combinations of hardware part numbers and software versions that have been approved by the Agency. The top-level compatibility table should be under configuration control, and it should be updated for each change that affects hardware/software combinations. The applicable service bulletin should define the hardware configurations with which the new software version is compatible.

The loading system should be in compliance with the guidelines of ~~DO-178B~~ the latest edition of AMC 20-115.

If the applicant proposes more than one source for loading, (e.g., diskette, mass storage, Secure Disk card, USB stick flash, etc.), all sources should comply with these guidelines.

The service bulletin should require verification that the correct software version has been loaded after installation on the aircraft.

(e) Software Change Category

The processes and methods used to change software should not affect the ~~design assurance level~~ software level of that software. For classification of software changes, refer to §4 in Appendix A of GM 21A.91.

(f) Software Changes by Others than the TC Holder

There are two types of potential software changes that could be implemented by someone other than the original TC holder:

- option-selectable software, or
- user-modifiable software (UMS).

Option-selectable changes would have to be pre-certified utilising a method of selection which has been shown not to be capable of causing a control malfunction.

UMS is software intended for modification by the aircraft operator without review by the certification authority, the aircraft applicant, or the equipment vendor. For Engine Control Systems, UMS has generally not been applicable. However, approval of UMS, if required, would be addressed on a case-by-case basis.

~~The necessary guidance for UMS is contained in DO-178B, paragraph 2.4. In essence, it conveys the position that others~~ In principle, persons other than the TC holder may modify the software within the modification constraints defined by the TC holder, if the system has been certified with the provision for software user modifications. To certify an Electronic Engine Control System with the provision for software modification by persons other than the TC holder, the TC holder should (1) provide the necessary information for approval of the design and implementation of a software change, and (2) demonstrate that the necessary precautions have been taken to prevent the user modification from adversely affecting Engine airworthiness, ~~whether~~ especially if the user modification is incorrectly implemented ~~or not~~.

In the case where the software is changed in a manner not pre-allowed by the TC holder as 'user modifiable', the 'non-TC holder' applicant will have to comply with the requirements given in Part 21, subpart E.

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Annex V. AMC 20-4A — Airworthiness Approval and Operational Criteria for the Use of Navigation Systems in European Airspace Designated for Basic RNAV Operations

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2 SCOPE

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Related ~~navigation~~ documents

EASA Acceptable means of Compliance

AMC 25-11 Electronic Display Systems

AMC 20-5 Acceptable Means of Compliance for Airworthiness Approval and Operational Criteria for the use of the NAVSTAR Global Positioning System (GPS)

AMC 20-115(latest edition) Software considerations for certification of airborne systems and equipment

…

ANNEX 1

GPS Integrity Monitoring (RAIM) Prediction Program

Where a GPS Receiver Autonomous Integrity Monitoring (RAIM) Prediction Program is used as a means of compliance with paragraph 5.2(a) of this document, it should meet the following criteria:

1. The program should provide prediction of availability of the integrity monitoring (RAIM) function of the GPS equipment, suitable for conducting Basic RNAV operations in designated European airspace.
2. The prediction program software should be developed in accordance with at least ~~RTCA DO-178B/EUROCAE 12B,~~ level D guidelines as defined in the industry documents referred in the latest edition of AMC 20-115.
3. The program should use either a RAIM algorithm identical to that used in the airborne equipment, or an algorithm based on assumptions for RAIM prediction that give a more conservative result.

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Annex VI. AMC 20-27A — Airworthiness Approval and Operational Criteria for RNP APPROACH (RNP APCH) Operations Including APV BAROVNAV Operations

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4.2.2 EASA

AMC 25-11	Electronic Flight Deck Display
AMC 20-5	Airworthiness Approval and Operational Criteria for the use of the Navstar Global Positioning System (GPS)
AMC 20-115 (latest edition)	Software considerations for certification of airborne systems and equipment
ETSO-C115()	Airborne Area Navigation Equipment using Multi-Sensor Inputs
ETSO-C129()	Airborne Supplemental Navigation Equipment Using the Global Positioning System (GPS)
ETSO-C145()	Airborne Navigation Sensors Using the Global Positioning System (GPS) Augmented by the Wide Area Augmentation System (WAAS)
ETSO-C146()	Stand-Alone Airborne Navigation Equipment Using the Global Positioning System (GPS) Augmented by the Wide Area Augmentation System (WAAS)
ETSO-C106()	Air Data Computer
EASA OPINION	Nr. 01/2005 Conditions for Issuance of Letters of Acceptance for Navigation Database Suppliers by the Agency (i.e. an EASA Type 2 LoA). EASA OPINION Nr. 01/2005 on "The Acceptance of Navigation Database Suppliers" dated 14 Jan 05

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4.2.5 EUROCAE/RTCA, SAE and ARINC

ED 26	MPS for airborne Altitude measurements and coding systems
ED 72A	Minimum Operational Performance Specification for Airborne GPS Receiving Equipment
ED75()/DO236()	Minimum Aviation System Performance Standards: Required Navigation Performance for Area Navigation
ED76/DO200A	Standards for Processing Aeronautical Data
~~ED12()/DO178() Software considerations in airborne systems and equipment certification~~	
ED77/DO201A	Standards for Aeronautical Information
DO 88	Altimetry
DO 187	Minimum operational performances standards for airborne area navigation equipment using multi-sensor inputs
DO 208	Minimum Operational Performance Standards for Airborne Supplemental Navigation Equipment Using Global Positioning System (GPS)
DO229()	Minimum Operational Performance Standards for Global Positioning System/Wide Area Augmentation System Airborne equipment
ARINC 424	Navigation System Data Base

ARINC 706 Mark 5 Air Data System

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6.4 Integrity

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Note 4: Traditionally, this requirement has not specifically addressed the airborne system operational software or airborne system databases (e.g. navigation database). However, it is expected that where the RNAV airborne software has been previously shown compliant with the criteria of ~~ED12B/DO178B,~~ as a minimum Level C in the industry documents referred to in the latest edition of AMC 20-115, ~~as a minimum~~, it is acceptable for the operations associated with this AMC.

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