



U.S. Department
of Transportation
**Federal Aviation
Administration**

Advisory Circular

Subject: Development of Civil Aircraft and
Systems

Date: 09/30/2011

AC No: 20-174

Initiated by: AIR-120

Change:

1. Purpose of this Advisory Circular (AC).

a. This advisory circular (AC) recognizes the Society of Automotive Engineers (SAE) Aerospace Recommended Practice (ARP) 4754A, *Guidelines for Development of Civil Aircraft and Systems*, dated December 21, 2010, as an acceptable method for establishing a development assurance process. SAE ARP 4754A discusses the development of aircraft and systems taking into account the overall aircraft operating environment and functions. This includes validation of requirements and verification of the design implementation for certification and process assurance.

b. The guidelines in ARP 4754A were developed in the context of Title 14 of the Code of Federal Regulations (14 CFR) part 25. It may be applicable to other regulations, such as 14 CFR parts 23, 27, 29, 33, and 35.

c. This AC is not mandatory, and is not a regulation. This AC describes an acceptable means, but not the only means, for showing compliance with 14 CFR.

d. While these guidelines are not mandatory, they are derived from FAA and industry experience in determining compliance with the relevant regulations. On the other hand, if we become aware of circumstances that convince us that following this AC would not result in compliance with the applicable regulations, we will not be bound by the terms of this AC, and we may require additional substantiation or design changes as a basis for finding compliance.

e. AC 23.1309-1, *System Safety Analysis and Assessment for Part 23 Airplanes*, may differ from and will take precedence over this AC with regards to development assurance levels. SAE ARP 4754A may be used as an optional method of compliance for part 23 airplanes but should not be used to assign an assurance level lower than what is specified in AC 23.1309-1

2. Audience. We wrote this AC for manufacturers who are seeking certification of their aircraft or aircraft system including Line Replaceable Units (LRU) and components.

3. Background. This AC addresses the concern of possible development errors due to the ever increasing complexity of modern aircraft and systems. In order to address this concern, a more structured methodology to mitigate development errors is described in SAE ARP 4754A.

However, it is not intended to require that the more structured techniques described in ARP 4754A be applied where traditional techniques have been shown to be acceptable for more traditional systems designs.

3. Guidance for the use of SAE ARP 4754A.

a. SAE ARP 4754A describes the aircraft and/or system development assurance process. Coordinate the use of ARP 4754A with the FAA early in your program planning.

b. You should propose and document in your certification plan the functional development assurance level (FDAL), item development assurance level (IDAL) and justification for the levels and the processes and associated objectives of the ARP 4754A that you will use to show compliance to applicable regulations. The plan requires FAA concurrence.

c. The FDAL and IDAL assignments in other ACs should take precedence over the application of SAE ARP 4754A, Section 5.2.

d. Guidance specific to modifications are highlighted in section 6.

4. Related Regulatory, Advisory and Industry Material.

a. 14 CFR Applicable Sections. Title 14 CFR 23.1301, 23.1309, 25.1301, 25.1309, 27.1301, 27.1309, 29.1301, 29.1309, 33.28, 33.75, 35.23, and 35.15.

b. ACs:

(1) AC 20-115B, *Radio Technical Commission for Aeronautics Inc., RTCA/DO-178B.*

(2) AC 20-152, *RTCA, Inc., Document RTCA/DO-254, Design Assurance Guidance for Airborne Electronic Hardware.*

(3) AC 20-170, *Integrated Modular Avionics Development, Verification, Integration and Approval using RTCA/DO-297 and Technical Standard Order C-153.*

(4) AC 21-50, *Installation of TSOA Articles and LODA Appliances.*

(5) AC 23.1309-1, *System Safety Analysis and Assessment for Part 23 Airplanes.*

(6) AC 25.1309-1, *System Design and Analysis.*

(7) AC 27-1309, *Equipment, Systems, and Installations*, (included in AC 27-1, *Certification of Normal Category Rotorcraft*).

(8) AC 29-1309, *Equipment, Systems, and Installations*, (included in AC 29-2C, *Certification of Transport Category Rotorcraft*).

(9) AC 33.28-1, *Compliance Criteria for 14 CFR § 33.28, Aircraft Engines, Electrical and Electronic Engine Control Systems.*

(10) AC 33.75-1, *Guidance Material for 14 CFR § 33.75, Safety Analysis.*

c. Industry standards:

(1) SAE, International ARP 4761, *Guidelines and Methods for Conducting the Safety Assessment Process on Civil Airborne Systems and Equipment*, dated December 1, 1996.

(2) RTCA/DO-178B, *Software Considerations in Airborne Systems and Equipment Certification*, dated December 1, 1992.

(3) RTCA/DO-254, *Design Assurance Guidance for Airborne Electronic Hardware*, dated April 19, 2000.

(4) RTCA/DO297, *Integrated Modular Avionics (IMA) Development Guidance and Certification Considerations*, dated November 8, 2005.

5. Where to Get Referenced Documents.

a. Order SAE documents from SAE World Headquarters, 400 Commonwealth Drive, Warrendale, PA, 15096-0001. Telephone (724) 776-4970, fax (724) 776-0790. You can also order copies through the SAE website at www.sae.org.

b. Order copies of RTCA documents from RTCA, Inc., 1150 18th Street, NW, Suite 910 Washington, DC 20036, Telephone (202) 833-9339, fax (202) 833-9434. You can also order copies on the RTCA website at www.rtca.org.

c. Order copies of 14 CFR parts from the Superintendent of Documents, Government Printing Office, P.O. Box 37154, Pittsburgh, PA, 15250-7954. You can order copies through the Government Printing Office website at http://ecfr.gpoaccess.gov/cgi/t/text/text-idx?c=ecfr&tpl=/ecfrbrowse/Title14/14tab_02.tpl. Select "Access" then "Online Bookstore." Select "Aviation," then "Code of Federal Regulations."

d. Order copies of AC's online at:
http://www.faa.gov/regulations_policies/advisory_circulars/.


for David W. Hempe
Manager, Aircraft Engineering Division
Aircraft Certification Service