U.S. DEPARTMENT OF TRANSPORTATION
FEDERAL AVIATION ADMINISTRATION

National Policy

**ORDER
8110.105B**

Effective Date:

02/20/2024

SUBJ: Airborne Electronic Hardware Approval Guidelines

This order explains how the Federal Aviation Administration (FAA) Aircraft Certification Service (AIR) personnel can use and apply RTCA, Inc., document RTCA/DO-254, *Design Assurance Guidance for Airborne Electronic Hardware*, and the additional guidance and clarifications in FAA advisory circular (AC) 20-152A, *Development Assurance for Airborne Electronic Hardware*, when working on certification projects. Because it is impractical to cover all situations or conditions, supplement these instructions with good judgment when handling problems.

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Director, Policy and Standards Division
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Chapter 1. General Information

1. **Purpose of This Order.** This order contains guidance for FAA Aircraft Certification Service (AIR) personnel on how to apply RTCA/DO-254. Additional guidance and clarifications are provided in AC 20-152A. These guidelines are applicable to the electronic hardware aspects of airborne systems and equipment in type certification and technical standard order authorization.

2. **Audience.** All FAA AIR personnel, including any persons designated by the Administrator, and organizations associated with the certification process.

3. **Where Can I Find This Order?** You can find this order on the Dynamic Regulatory System (DRS) at https://drs.faa.gov/browse and the FAA website at https://www.faa.gov/regulations_policies/orders_notices/.

4. **What This Order Cancels.** This order cancels FAA Order 8110.105A, *Airborne Electronic Hardware Approval Guidelines,* dated April 5, 2017.

5. **Explanation of Policy Changes.** This revision includes the following changes:

   a.   Removes chapters 3 through 6 to eliminate duplication or conflict with AC 20-152A or AC 00-72, *Best Practices for Airborne Electronic Hardware Design Assurance Using EUROCAE ED-80( )* and RTCA DO 254( ).

   b.   Revises appendix B to include the use of complex commercial off the shelf (COTS) devices and COTS intellectual properties (COTS IP) as factors in the determination of the level of certification authority involvement in an airborne electronic hardware (AEH) project.

6. **Airborne Electronic Hardware Topics Covered.**

   a.   This order assumes RTCA/DO-254 and the additional guidance and clarifications provided in AC 20-152A are used as a means of compliance proposed by the applicant for AEH approval. If the applicant proposes any other means, additional policy and FAA guidance may be needed on a project-by-project basis.

   b.   This order addresses the AEH review process and is supplemental to RTCA/DO-254.

Chapter 2. Airborne Electronic Hardware Review Process

1.   Applying RTCA/DO-254. RTCA/DO-254 section 9 describes the certification liaison process as the vehicle to establish communication and understanding between the applicant and the certification authority. Section 9.2 suggests that the certification authority may review the hardware design life cycle processes and data at the applicant's facilities or the applicant's supplier's facilities. This chapter does not change the intent of RTCA/DO-254.

2.   AEH Review Process.

   a.   The FAA may use both on-site and desk reviews to review AEH. Additionally, the FAA can delegate both on-site and desk reviews to designees. This chapter focuses on on-site reviews since they give better access to hardware personnel, to all automation, and test setup. When preparing for an on-site review, the certification authority should do the following with the applicant and/or hardware developer:

   (1)   Agree on the scope of review(s) that will be conducted,

   (2)   Agree on date(s) and location(s) of the review(s),

   (3)   Identify the certification authority's personnel involved,

   (4)   Identify any designees involved,

   (5)   Develop the agenda(s) and expectations,

   (6)   List the hardware data to be made available (both before and at the review(s)),

   (7)   Clarify how the review(s) will be conducted,

   (8)   Identify any required resources, and

   (9)   Specify when and how review results will be communicated. This may include corrective actions and other post-review activities.

   b.   The certification authority may review the hardware lifecycle processes and associated data to obtain assurance that a product submitted as part of a certification application complies with the certification basis and satisfies the applicable objectives of RTCA/DO-254 and AC 20-152A. The AEH review process assists both the certification authority and the applicant to determine if a particular project will meet the certification basis, applicable guidance, and RTCA/DO-254 and AC 20-152A objectives by providing:

(1)   Timely technical explanation of the certification basis RTCA/DO-254 objectives, AC 20-152A objectives, FAA guidance, issue papers, and other applicable certification requirements,

(2)   Visibility into how the applicant implemented their processes and generated the resulting data,

(3)   Objective evidence that the AEH development adheres to approved hardware plans and procedures, and

(4)   Opportunity to monitor designee activities, if applicable.

   c.   The level of certification authority involvement in an AEH project should be determined and documented as soon as possible in the project lifecycle. Appendix C provides examples that may be used to determine the level of involvement. The scope and number of reviews, if any, will depend on several factors including the project's hardware level, applicant (or hardware developer) experience and history, service difficulty history, designee support, and other factors such as the use of complex COTS devices and COTS IP.

Appendix A. Acronym List

AC   Advisory Circular
AEH   Airborne Electronic Hardware
AIR   Aircraft Certification Service
CFR   Code of Federal Regulations
COTS   Commercial Off the Shelf
FAA   Federal Aviation Administration
IP   Intellectual Property
TSR   Total Score Result

Appendix B. Level of Involvement Worksheets

This appendix contains three worksheets that may be used to help the certification authority or designee determine an appropriate level of involvement in hardware projects. The worksheets are provided as examples only and their use, individually or in combination, is not mandatory.

Worksheet 1 indicates a level of involvement based on the hardware level of the project. Worksheet 2 allows for additional refinement of involvement based on more specific criteria. Worksheet 3 uses the total score result from Worksheet 2 to indicate a level of involvement.

Worksheet 1: Level of Involvement Based on Hardware Level

RTCA/DO-254 Hardware Level	Level of Involvement
A	Medium or High
B	Medium or High
C	Low or Medium
D	Low

Worksheet 2: Level of Involvement Based on Other Relevant Project Criteria

	Criteria	Scale	MIN.		MAX.	Score
1.	**Applicant/Developer Hardware Certification Experience**					
1.1	Experience with civil aircraft or engine certification.	Scale: No. projects:	0 0	5 3-5	10 6+	
1.2	Experience with RTCA/DO-254.	Scale: No. projects:	0 0	5 2-4	10 5+	
1.3	Experience with other process assurance standards (other than RTCA/DO-254).	Scale: No. projects:	0 0	2 4-6	4 7+	
2.	**Applicant/Developer Demonstrated Hardware Development Capability**					
2.1	Ability to consistently produce RTCA/DO-254 hardware items.	Scale: Ability:	0 Low	5 Med	10 High	
2.2	Cooperation, openness, and resource commitments.	Scale: Ability:	0 Low	5 Med	10 High	
2.3	Ability to manage hardware development and sub-contractors.	Scale: Ability:	0 Low	5 Med	10 High	
2.4	Capability assessments	Scale: Ability:	0 Low	2 Med	4 High	
2.5	Development team average based on relevant hardware development experience.	Scale: Experience: yrs.	0 < 2 yrs.	5 2-4 yrs.	10 > 4	
3.	**Applicant/Developer Hardware Service History**					
3.1	Incidents of hardware-related problems (% of affected hardware items).	Scale: Incidents:	0 > 25%	5 > 10%	10 None	
3.2	Company management's support of designees.	Scale: Quality:	0 Weak	5 Med	10 Strong	
3.3	Company hardware process assurance organization and configuration management process.	Scale: Quality:	0 Low	5 Med	10 High	
3.4	Company stability and commitment to safety.	Scale: Stability:	0 Weak	3 Med	6 Strong	
3.5	Success of past company certification efforts.	Scale: Success:	0 None	3 > 50%	6 All	

	Criteria	Scale	MIN.		MAX.	Score
4.	**The Current System and Hardware Application**					
4.1	Complexity of the system architecture, functions, and interfaces.	Scale: Complex:	0 High	5 Med	10 Low	
4.2	Complexity and size of the hardware and safety features including the use of complex COTS devices.	Scale: Complex:	0 High	5 Med	10 Low	
4.3	Novelty of design and use of new technology including the use of COTS intellectual properties within custom devices.	Scale: Newness:	0 Much	5 Some	10 None	
4.4	Hardware development and verification environment.	Scale: Environ:	0 None	3 Old	6 Modern	
4.5	Use of alternative methods or additional considerations.	Scale: Standard:	0 Many	3 Few	6 None	
5.	**Designee Capabilities**					
5.1	Experience of designee(s) with RTCA/DO-254.	Scale: Projects:	0 < 5	5 5-10	10 >10	
5.2	Designee authority, autonomy, and independence.	Scale: Autonomy:	0 Little	5 Some	10 Full	
5.3	Designee cooperation, openness, and issue resolution effectiveness.	Scale: Effectiveness:	0 Non-Responsive	Responsive	Cooperative	
5.4	Relevance of assigned designees' experience.	Scale: Related:	0 None	5 Somewhat	10 Exact	
5.5	Designees' current workload.	Scale: Workload:	0 High	5 Medium	10 Low	
5.6	Experience of designees with other process assurance standards (other than RTCA/DO-254).	Scale: Projects:	0 < 5	3 5-10	5 >10	

Total Score Result (TSR):_____

Worksheet 3: Level of Involvement Combining Results of Worksheet 2 with Hardware Level

Total Score Result	Level A	Level B	Level C	Level D
TSR < 80	High	High	Medium	Low
80 ≤ TSR ≤ 130	High	Medium	Medium	Low
130 < TSR	Medium	Medium	Low	Low

Appendix C. Administrative Information

1. **Distribution.** This order is distributed to all AIR personnel, including any persons designated by the Administrator, and organizations associated with the certification process.

2. **Authority to Change This Order.** The Policy and Standards Division (AIR-600) is responsible for issuing, revising, or canceling the material in this order.

3. **Related Publications.** The latest amendments of the following publications are the primary reference materials for this order. The following regulations and other documents referenced in this order are available on DRS at https://drs.faa.gov/browse.

    a. Title 14, Code of Federal Regulations (14 CFR).

    Part 21, *Certification Procedures for Products and Articles*.

    b. Advisory Circulars.

    (1) AC 20-152A, *Development Assurance for Airborne Electronic Hardware*.

    (2) AC 00-72, *Best Practices for Airborne Electronic Hardware Design Assurance Using EUROCAE ED-80( ) and RTCA DO-254( )*.

    c. Industry Documents.

    RTCA/DO-254, *Design Assurance Guidance for Airborne Electronic Hardware*, may be purchased from RTCA, Inc., at 1150 18th Street, NW, Suite 910, Washington, DC 20036. Alternatively, copies may be purchased online at https://www.rtca.org.

4. **Suggestions for Improvement.** Your suggestions are welcome. FAA Form 1320-19, *Directive Feedback Information*, is located in appendix D of this order for your convenience. Please forward all comments on deficiencies, clarifications, or improvements regarding the contents of this order to the AIR Directives Management Officer at 9-AWA-AVS-AIR-DMO@faa.gov.

5. **Records Management.** Refer to the current General Records Schedule or FAA Records Retention and Disposition Schedule or contact your respective service office records coordinator or file custodian for guidance regarding the retention/disposition of records.

Appendix D. Directive Feedback Information

Please submit any written comments or recommendations for improving this directive or suggest new items or subjects to be added to it. Also, if you find an error, please tell us about it.

Subject: Order _____ To: Directive Management Officer, _____
(Please mark all appropriate line items)

☐ An error (procedural or typographical) has been noted in paragraph on page_____.

☐ Recommend paragraph _____on page _____be changed as follows:
(attached separate sheet if necessary)

☐ In a future change to this order, please include coverage on the following subject:
(briefly describe what you want added):

☐ Other comments:

☐ I would like to discuss the above. Please contact me.

Submitted by: _____ Date: _____

Telephone Number: _____ Routing Symbol: _____

FAA Form 1320-19 (11/23) Supersedes Previous Edition