SUBJ: SIMPLE AND COMPLEX ELECTRONIC HARDWARE APPROVAL GUIDANCE

1.   **Purpose.** This purpose of this change is to correct an editorial error that separated the definition of Simple Hardware Item from its applicable Note.

2.   **Who this change affects.** Managers and staff of the FAA Aircraft Certification Service, including any persons designated by the administrator, and organizations associated with the certification process required by Title 14 of the Code of Federal Regulations (14 CFR).

3.   **Disposition of Transmittal Paragraph.** Retain this transmittal sheet until this directive is cancelled by a new directive.

PAGE CHANGE CONTROL CHART

Remove Pages	Dated	Insert Pages	Dated
1 and 2	**7/16/08**	**1 and 2**	**9/23/08**

4.   **Administrative Information.** You can find this order on the FAA Regulatory and Guidance Library (RGL) website at http://rgl.faa.gov.

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Chapter 1. Introduction

1-1. Purpose of this Order.

　　a. We've written this order to supplement RTCA/DO-254, and give you guidance for approving both simple and complex custom micro-coded components. This guidance applies to airborne systems and equipment, and the airborne electronic hardware of those systems when you work in a certification project (type, supplemental, amended, and amended supplemental) or technical standard order authorization. This order accepts RTCA/DO-254 as the means by which an applicant can seek FAA approval. If an applicant proposes another means, including achieving acceptable design assurance for these components by using verification and/or architectural strategies at the system or equipment level, we may need to develop more guidance (such as issue papers) on a project-by-project basis.

　　b. If an applicant follows RTCA/DO-254 for level D components, we don't need to review the life cycle data. However, we will review it if the applicant chooses to use their existing design assurance practices, as allowed by Advisory Circular (AC) 20-152, *RTCA, Inc., Document RTCA/DO-254, Design Assurance Guidance For Airborne Electronic Hardware,* Paragraph 1.b. Refer to FAA part- specific policy for exceptions.

1-2. Audience. Managers and staff of the FAA Aircraft Certification Service, including any persons designated by the administrator, and organizations associated with the certification process required by Title 14 of the Code of Federal Regulations (14 CFR).

1-3. Where to Find this Order. You can find this order on the FAA Regulatory and Guidance Library (RGL) website at http://rgl.faa.gov.

1-4. Some Useful Definitions.

- Simple Hardware Item –Item with a comprehensive combination of deterministic tests and analyses appropriate to the design assurance level that ensures correct functional performance under all foreseeable operating conditions, with no anomalous behavior. *--Source: RTCA/DO-254, paragraph 1.6*

> **Note:** We use the definition above from the body of RTCA/DO-254, *not* the definition in Appendix C that leaves out the words "appropriate to the design assurance level."

- Custom micro-coded component: A component that includes application specific integrated circuits (ASIC), programmable logic devices (PLD), field programmable gate arrays (FPGA) and other similar electronic components used in the design of aircraft systems and equipment. *-- Source: AC 20-152*

> **Note:** A custom micro-coded component is normally packaged as a single integrated circuit based device for mounting on a circuit board, or a higher level assembly. "Component" doesn't mean surface mounted

resistors, capacitors or other individual electronic components. "Component" also doesn't mean circuit board assemblies, line replaceable units (LRUs) and other higher-level items.

- Complex hardware item – All items that are not simple are considered to be complex. See definition of simple hardware item.
-- S*ource: RTCA/DO-254, Appendix C*

- Design Assurance – All of these planned and systematic actions used to substantiate, at an adequate level of confidence, that design errors have been identified and corrected, such that the hardware satisfies the application certification basis.
--*Source: RTCA/DO-254, Appendix C*

- Design Process –Creating a hardware item from a set of requirements using the following processes: requirements capture, conceptual design, detailed design, implementation and production transition.
--*Source: RTCA/DO-254, Appendix C*

1-5. Simple and Complex Hardware Topics Covered.

a. AC 20-152 explains to applicants that if they follow RTCA/DO-254, they'll demonstrate compliance to regulations and gain FAA approval for *complex* custom micro-coded components of airborne systems and equipment. The AC, however, doesn't recognize RTCA/DO-254 as a way to demonstrate compliance to regulations for *simple* custom micro-coded components.

b. RTCA/DO-254 explains that a hardware item can be an LRU, a circuit board assembly, or a component. Further, Section 5 states that design processes may be applied at any hierarchical level of the LRU, circuit board assembly, or component. Components include commercial off the shelf (COTS) components, integrated technology components like hybrid and multi-chip modules, and custom micro-coded components. From here on, we call custom micro-coded components either *simple* electronic hardware (SEH) or *complex* electronic hardware (CEH). This order applies only to SEH and CEH, not the broader scope of hardware items defined in RTCA/DO-254.

c. In this order we supplement RTCA/DO-254, explaining---

- How to review SEH and CEH (chapter 2), and

- How much FAA involvement we should apply to hardware projects (chapter 3).

d. In the latter part of this order, we clarify RTCA/DO-254 for both SEH and CEH on the following:

- Modifiable components (paragraph 4-2).

- Certification plan (paragraph 4-3).