

Certification Authorities Software Team (CAST)

Position Paper CAST-28

FREQUENTLY ASKED QUESTIONS (FAQs) ON THE USE OF RTCA DOCUMENT DO-254 AND EUROCAE DOCUMENT ED-80, *DESIGN ASSURANCE GUIDANCE FOR AIRBORNE ELECTRONIC HARDWARE*

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Frequently Asked Questions (FAQs) on the use of RTCA Document DO-254 and EUROCAE Document ED-80, *Design Assurance Guidance for Airborne Electronic Hardware*

1. Purpose

This CAST paper provides responses to some questions that are frequently asked by industry concerning the application of DO-254/ED-80 for certification projects.

2. Background

RTCA document DO-254 and EUROCAE document ED-80, *Design Assurance Guidance for Airborne Electronic Hardware*, was published in April 19, 2000, but has only been recently recognized by some of the certification authorities as an acceptable means of compliance for satisfying the relevant regulations, when custom micro-coded components/devices (such as Application Specific Integrated Circuits (ASICs), Field Programmable Gate Arrays (FPGAs) and Programmable Logic Devices (PLDs)) are used in avionics and aircraft/engine systems. Since the date of publication, the aviation community has gained experience using DO-254/ED-80 and has raised a number of frequently asked questions (FAQs) regarding the document's application. While RTCA SC-180 and EUROCAE WG-46 are no longer chartered to respond to FAQs on the application of DO-254/ED-80, CAST has identified a need to provide some information in this area.

3. References

- a. RTCA/DO-254 (EUROCAE/ED-80), *Design Assurance Guidance For Airborne Electronic Hardware*;
- b. FAA AC 20-152, RTCA, Inc., *Document RTCA/DO-254, Design Assurance Guidance For Airborne Electronic Hardware*;
- c. CAST 27, Clarifications on the use of RTCA Document DO-254 and EUROCAE Document ED-80, *Design Assurance Guidance for Airborne Electronic Hardware*;
- d. SAE ARP 4754, *Certification Considerations for Highly-Integrated or Complex Aircraft Systems*.

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4. Frequently Asked Questions (FAQs)

This section provides responses to DO-254/ED-80 FAQs. The purpose of a FAQ is to provide a concise response to a question that is frequently asked by industry to certification authorities or others who provide interpretation of DO-254/ED-80. A FAQ contains no new or additional guidance material.

4.1 FAQ #1: Is it necessary to repeat all the information from the Plan for Hardware Aspects of Certification (PHAC) in the Hardware Accomplishment Summary (HAS)?

Reference: DO-254/ED-80: Sections 10.1.1 and 10.9

Keywords: PHAC, HAS, Hardware Aspects of Certification, Hardware Accomplishment Summary

Answer:

As stated in section 10.1.1 of DO-254/ED-80, “The PHAC defines the processes, procedures, methods, and standards to be used to achieve the objectives of this document and obtain certification authority approval for certification of the system containing hardware items.” Whereas section 10.9 states, “The Hardware Accomplishment Summary is the primary data item for showing compliance to the PHAC and demonstrating to the certification authority that the objectives of this document have been achieved for the hardware items.”

Therefore, the Hardware Accomplishment Summary (HAS) is the gathering of compliance and completion data relative to the PHAC (plans and standards) and describes the level of design assurance achieved at the completion of the hardware development. Although the PHAC and HAS will include similar data as described in DO-254/ED-80, the Note at the end of section 10.9 states, “The data included in the PHAC does not necessarily need to be repeated in the Hardware Accomplishment Summary, however, doing so may expedite the certification process.” Also, the HAS should identify any differences or deviations from the approved PHAC (including differences or deviations from other plans or hardware standards).

In addition, section 10.9 lists four additional items that should be addressed in the HAS. These items include hardware identification, change history, hardware status, and compliance statement. For the hardware identification, the HAS can reference a separate document describing the hardware configuration index, which identifies the specific hardware configuration, part number, revision

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number, version, build instructions, schematics, top-level or detailed design drawings, development and verification tools, and other configuration information required to produce the hardware item. Also, the hardware status should contain a summary of open problem reports with the hardware item and include assessments of their impact on safety, functionality, performance, and operation.

4.2 FAQ #2: What are the certification authorities' expectations for a Top-Level Drawing?

Reference: DO-254/ED-80: Section 10.3.2.2.1; CAST 27: Sections 10b and 10c.; DO-178B/ED-12B: Sections 9.3, 11.15, and 11.16; SAE ARP 4754: Sections 4.4.2

Keywords: HCI, HECI, Top-level drawing, Hardware Configuration Index, Hardware Life Cycle Environment Configuration Index

Answer:

For complex electronic hardware such as Programmable Logic Devices (PLD), Field Programmable Gate Arrays (FPGA), Application Specific Integrated Circuit (ASIC), and other custom micro-coded devices, the term "Top-Level Drawing" may not be a standard or commonly understood data term for these types of hardware items. Actually, the description of a top-level drawing as discussed in section 10.3.2.2.1 of DO-254/ED-80 is more in line with a configuration index as defined and described in other industry guidance such as RTCA/DO-178B, *Software Considerations in Airborne Systems and Equipment Certification*, and Society of Automotive Engineers (SAE) Aerospace Recommended Practice (ARP), ARP 4754, *Certification Considerations for Highly-Integrated or Complex Aircraft Systems*. Since Section 10 of CAST 27 already addresses similar configuration issues, the clarifications from sections 10.b and 10.c of CAST 27 are included below for this FAQ:

- 10.b. "Although DO-254/ED-80 does not explicitly specify a hardware configuration index (HCI), other documented design assurance guidance such as ARP 4754 Section 4.4.2, and DO-178B Sections 9.3 and 11.16 specify either a system or software configuration index to be submitted to the certification authorities. DO-254/ED-80 Section 10.3.2.2.1 does specify submission to the certification authorities [of] a top-level drawing that uniquely identifies the hardware item and relevant documentation that defines the hardware item; however, it is not clear if a top-level drawing will include configuration information to completely identify the configuration of the hardware and the embedded logic for a specific custom micro-coded device. Therefore, appropriate configuration

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documentation[,] either in the top-level drawing or a HCI[,] should be submitted to the certification authorities to completely identify the configuration of the hardware and the embedded logic.”

- 10.c. “Furthermore, a hardware life cycle environment configuration index (HECI), which identifies the configuration of the hardware life cycle environment for the hardware and embedded logic, should be available for review by the certification authorities. Similar to the software life cycle environment configuration index as described in DO-178B Section 11.15, the HECI is written to aid reproduction of the hardware and embedded logic life cycle environment, embedded logic regeneration, reverification, or embedded logic modification.”

5. Certification Authorities Software Team (CAST) Position

This paper provides information to questions frequently posed to the certification authorities on the application of DO-254/ED-80 in certification projects. The responses to the FAQs presented in this paper do not constitute new policy or guidance by the certification authorities. CAST recognizes the need to continue clarifying and addressing other and emerging FAQs when using DO-254/ED-80. The intent is to revise this paper to address other FAQs as needed.

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