Federal Aviation Administration

Memorandum

Date:	January 26, 2007
To:	SEE DISTRIBUTION
From:	Manager, Small Airplane Directorate, ACE-100 S/Kim Smith
Prepared by:	Robin L. Sova
Subject:	Final Policy Statement on Applying Advisory Circular 20-152, "RTCA, Inc., Document RTCA/DO-254, Design Assurance Guidance for Airborne Electronic Hardware," to Title 14 Code of Federal Regulations, Part 23 Aircraft; PS-ACE100-2005-50001

Summary

This final policy statement sets up Federal Aviation Administration (FAA) certification policy on applying Advisory Circular (AC) 20-152 to complex airborne electronic hardware (CEH) installed in part 23 aircraft or in airships. The specific issues addressed concern selecting and applying hardware design assurance levels (HDAL) to CEH.

Current Regulatory and Advisory Material

Part 23 aircraft CEH is subject to Title 14 of the US Code of Federal Regulations (14 CFR) sections (§§) 23.1301(a, d) and 23.1309(a) (1). These sections state equipment must be "…appropriate to its intended function…" to "…Function properly when installed…" and "…not adversely affect…safe operation." Although 14 CFR § 23.1309 does not exactly address development of software or CEH, RTCA, Incorporated has developed two documents the FAA recognizes in ACs 20-115B and 20-152 as acceptable means for showing compliance. These documents are: "RTCA/DO-178B, Software Considerations in Airborne Systems and Equipment Certification" and "RTCA/DO-254, Design Assurance Guidance for Airborne Electronic Hardware."

Figure 2 of AC 23.1309-1C allows a downward adjustment in the correlation between failure conditions and software development assurance levels (SDAL) from that identified in DO-178B. The adjustments allowed are dependent on both failure condition and airplane classification. A joint FAA, National Aeronautics and Space Administration (NASA), and industry team, in consideration of general aviation (GA) accident statistics, developed this variable adjustment approach. That team reasoned that wider availability of later technologies to GA, through better affordability gained by reducing SDAL-related certification costs, would yield significant safety

benefits. The FAA has since reasoned that allowing these same decreases to HDALs should yield the same expected benefits.

Relevant Past Practice

Like DO-178B, DO-254 does not consider variable host aircraft platforms or environments in assigning suitable HDALs, only failure condition classifications. The release of AC 23.1309-1C added the ability to reduce SDALs in consideration of these variables. Before the release of DO-254 and AC 20-152, the FAA used Issue Papers (IP) to address CEH compliance. These IPs required either comprehensive testing or analyses of CEH, or use of a development process acceptable to the FAA, such as DO-178B.

For part 23 projects using DO-178B (or later, DO-254), these IPs also allowed a downward HDAL adjustment based on the same logic used in AC 23.1309-1C for SDAL adjustments. The next update of AC 23.1309 will also include allowance of this HDAL adjustment. Meanwhile, this policy is required to continue to allow that downward adjustment of HDALs to preserve the consistency between part 23 equipment SDALs and HDALs in equivalent failure condition classifications.

The second reason for needing this policy is that AC 20-152 relieves the applicant from an FAA review of life cycle data for HDAL "D" CEH (having Minor failure conditions) if developed according to DO-254. This policy's allowance of reducing HDALs "B or C" to "D" combined with AC 20-152's exclusion from FAA review of HDAL "D" CEH could wrongly result in an inappropriate level of development oversight of devices having Major or Hazardous failure conditions. Therefore, this policy must prevent possible future problems by disallowing AC 20-152's HDAL "D" review exclusion for any CEH that originally (i.e., before this policy memorandum-based downward adjustment) would be classified as HDAL "B or C."

Policy

The Small Airplane Directorate previously determined and documented in AC 23.1309-1C that differing classes of aircraft or operations do not warrant the same SDALs. That same reasoning will also apply to selecting HDALs for part 23 projects.

Similarly, AC 20-152 provides an exclusion from FAA review for HDAL "D" CEH developed under DO-254. Therefore, because this policy will allow reducing higher HDALs to "D", the AC 20-152 exclusion will only be allowed for CEH originally classed as HDAL "D" without a downward adjustment based on this policy memo. Applicants and FAA certification authorities should follow this policy as summarized below for all Part 23 aircraft (or Airship) certification or related equipment approval projects.

> *"Certification/Approval of aircraft or airborne equipment containing complex electronic hardware (CEH) requires they perform their intended functions safely. One means of showing CEH complies to this requirement is to apply an FAA accepted development process such as one recognized by AC 20-152 (RTCA/DO-254). When assigning hardware design assurance levels (HDALs, "A-D") for CEH installed in Part 23 aircraft (or Airships), one may select the same levels used for software development assurance levels (SDALs) based on the guidance in AC 23.1309-1C, Figure 2. An HDAL assigned by this*

approach may be less stringent than one arrived at by applying the guidance contained in DO-254, Table 2-1. Additionally, AC 20-152's exclusion from FAA review of life cycle data for HDAL "D" CEH, will not apply to CEH that is classified as "D" because of this policy's downward adjustment allowance (i.e., CEH that have Major or Hazardous failure conditions). The AC's exclusion will only apply to CEH originally classed as "D" per DO-254 (i.e., having Minor failure conditions)."

Effect of Policy

The general policy stated in this document does not constitute a new regulation or create what the courts refer to as a "binding norm." The office that implements policy should follow this policy when applicable to the specific project. Whenever an applicant's proposed method of compliance is outside this established policy, it must be coordinated with the policy issuing office, for example, through the issue paper process or equivalent. Similarly, if the implementing office becomes aware of reasons that an applicant's proposal that meets this policy should not be approved, the office must coordinate its response with the Small Airplane Directorate.

Applicants should expect that the certificating officials would consider this information when making findings of compliance relevant to new certificate actions. Also, as with all advisory material, this policy statement identifies one means, but not the only means, of compliance.

Conclusion

Because of likenesses in software/hardware: guidance (i.e., DO-178B and DO-254), their failure condition classification definitions, development processes, and common safety goals; the rationale used by AC 23.1309-1C for reducing SDALs should also be applicable to CEH HDALs. Therefore, this policy statement allows decreases in the HDALs for CEH depending upon aircraft class and operating category. Also, to clarify AC 20-152's application to part 23 aircraft, only CEH initially classified as HDAL "D" per DO-254 prior to any HDAL reduction allowed by this policy are excluded from FAA review of life cycle data.

Contact

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