
Issues involved with invoking RTCA/DO-297 as an Acceptable Means of Compliance for IMA development and approval

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By: Gregg Bartley ANM-111/AIR-120
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Overview

• RTCA/DO-297, Integrated Modular Avionics (IMA) Development Guidance and Certification Considerations, was published on November 8th, 2005.

• FAA AIR-120 has a Business Plan Item to publish an AC (currently referred to as AC 20.IMA) that would invoke DO-297 as an acceptable means of compliance.

• However, there are a number of issues that need to be resolved before this can occur.
Definitions of “Acceptance” and “Incremental Acceptance”

Acceptance: Acknowledgement by a certification authority that the module, application, or system meets its defined requirements.

Incremental acceptance: A process for obtaining credit toward approval and certification by accepting or finding that an IMA module, application, and/or off-aircraft IMA system complies with specific requirements. Credit granted for individual tasks contributes to the overall certification goal.

Source: RTCA/DO-297, glossary
Issue: How should concept of “Incremental Acceptance Process” be used?

• Should “acceptance” be an integral part of the IMA approval process that must be done** at each of the four different “tasks” defined in DO-297 for system installation on the aircraft being certified?
  – Would this, then, require** every organization/company involved in an IMA project to use DO-297?
  – When is “acceptance” of any particular component granted?

• Or should it be an optional process whose main benefit involves reuse of a previously accepted component on a future application?
  – Can individual companies/organizations opt in/opt out of using DO-297 as an acceptable means of compliance?

• Comparison to Reusable Software Component (RSC) AC 20-148.

** “Must be done” and “require” refers to when AC 20.IMA/DO-297 is agreed upon by all parties to be the acceptable means of compliance used on any particular project.
DO-297: Figure 1, Chapters and their relationships

Chapter 1: Introduction
Chapter 2: IMA Overview
Chapter 3: General Design Considerations
Task 1: Module Acceptance
Task 2: Application Acceptance
Chapter 4: Certification Tasks
Task 3: System-level Acceptance
Task 4: Aircraft-level Acceptance
Task 5: Change
Task 6: Reuse
Chapter 5: Integral Processes
Chapter 6: Continued Airworthiness
Issue: “Incremental Acceptance” process and installation approval

- What is the relationship between the “incremental acceptance” of IMA components ((module (hardware and software), application, aircraft level IMA system)) and the final IMA system installation approval for aircraft certification?
  - 100% “Incremental acceptance” at all four levels = “approval at installation, ready for aircraft certification”?
Issue: Change process for previously accepted IMA components not 100% defined in DO-297

• Can changes be made to a previously accepted part without FAA involvement?
  – Is there a major change/minor change distinction for changes to accepted components?

• What is the process for acceptance if the changes are made through an FAA ACO different than the one that originally issued the acceptance?

• What if the change is required for an article seeking TSO approval?
Issue: Acceptance letter process used to document Incremental Acceptance

- Author of original acceptance letter not defined.
- Ownership of acceptance letter not defined.
- Process for use of acceptance letter, after it is issued by FAA, is not defined.
- Who keeps the original letter is not defined.
- Change process for previously issued acceptance letter not defined.
  - Is an acceptance letter associated with a particular component (e.g., autopilot software), or a *specific version* of that component?
- This process, when defined, may require new FAA policy.
Issue: DO-297 invokes both ARP 4754 and 4761

• In numerous places, DO-297 states that ARP 4754 and 4761 “should be used” or activities should be “in accordance with”.
  – These documents are not referenced in FAA published guidance, other than AC 23.1309-1C and unpublished AC 25.1309-Arsenal draft version.
  – Should the FAA make these documents (all or partial) an explicit part of AC 20-IMA, thereby invoking them formally as a part of the acceptable means of compliance when using DO-297?
  – What is the recommended acceptable means of compliance when applying DO-297 if the ARP documents are not specified?
Issue: IMA acceptance process not defined when used in conjunction with TSO’s

• How do these two different, very complex, yet overlapping processes work together seamlessly?
  – TSO’s are governed by Order 8110.1, IMA component acceptance would be advisory material.

• A distinction is not made between software only IMA component acceptance and “functional software” TSO approval (discussed in AC 20-145).
  – Are the activities and documentation required for both identical? If not, what is different?

• Is acceptance letter approval granted from program certification ACO or TSO authorization ACO?
  – What if a foreign Cert Authority is involved as the aircraft certification office?
**Issue: Existing AC 20-145 (IMA approval for TSO C-153 IMA hardware)**

- **Releasing AC 20-IMA would result in two AC’s essentially about the same subject.**
  - Cannot have unclear guidance about which should be used.

- **DO-297 and AC 20-145 overlap in many areas, conflict in others and each contains information that the other does not.**
  - Proposal is to revise AC 20-145 to only contain information regarding hardware TSO approval and move all IMA system level information into DO-IMA.
  - Cannot invalidate what was done with previous certifications that used AC 20-145. The FAA should allow applicants and IMA suppliers to continue that process in the future.
Issue: Miscellaneous

• When should a IMA component acceptance per DO-297 be used vs. Reusable Software Component (AC 20-148)?
  – IMA component acceptance may consist of compliance to many more items than does an RSC, which is only regarding compliance to DO-178B.
  – However, for some items (such as an operating system), the findings of compliance and the data needed to support such findings may be one and the same.
Conclusions

• Many issues remain to be resolved within the FAA regarding the invocation of DO-297 for IMA approval.
  – Several aspects of this overall process may not be able to handled by an AC alone, new FAA policy may be required.
  – An AC is intended to show a complete (as much as can reasonably be expected) “acceptable means of compliance”.
  – Leaving these issue unresolved will likely result in much confusion and uneven application of guidance.
Questions?

Open Discussion