In this monthly column, Ric Peri of the AEA's Washington, D.C. office, informs members of the latest regulatory updates.

THE VIEW FROM WASHINGTON

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The Devil is in the Details

For years, the avionics industry has been defined by the details; the attention to details that define the best installations from the merely compliant installations; the attention to details the best sales teams exhibit when providing buyer consultations; and, the attention to details in the manufacturing of true avionics components rather than the mass-marketed "consumer" electronic components.

One of the first phone calls I received after joining the AEA team 10 years ago this month, was from an FAA inspector (who has since become a close personal friend) who was talking about the certification standards of an early generation multifunction display. It seems as though an AEA member repair station was attempting to install this general aviation component in a business category aircraft. This was one of the first light GA MFD applications to migrate "up" the aircraft. They had read the general certification data and proceeded to install the MFD only to find that their ASI read the details of the certification and found that while the component had indeed been TSOed and approved for Part 23 aircraft, the environmental testing had only been performed to 25,000 feet, and this particular aircraft was approved for flight-level 410; well above the certification level. The shop took great exception, as could be expected, but in modern avionics, this was my first lesson that "the devil is in the details."

The next demonstration of "attention to detail" came a few years later (from this same FAA inspector) in pointing out antenna installations on business aircraft. It seems that the first generation of business aircraft that were designed and certified before Amendment 25-45 to 14 CFR Part 25 had "special conditions" embedded in the Type Certificate Data Sheet regarding fuselage alterations.

NOTE: Amendment 25-45 to 14 CFR part 25 introduced the use of damage tolerance principles. This approach requires evaluating the structure to determine its crack growth and residual strength characteristics.

These special conditions placed enhanced maintenance inspections to the fuselage, but also placed strict requirements on the alteration (and cutting of holes) in the fuselage. Below is Note 47 listed on the Learjet TCDS and lists the special condition issued for the Learjet family of business aircraft:

NOTE 47: The airplane models listed below are the subjects of special condition related to operation at high altitude. This special condition includes pressurization system requirements, as well as damage tolerance requirements on the pressure vessel. Therefore, any changes to the pressurization system or modifications or repairs to the pressure vessel must be approved in accordance with the requirements defined in the special condition.

The majority of these types of special conditions were addressed by the FAA's actions to prohibit "field approval" alterations and repairs to pressurized aircraft fuselages. It could be argued that one of the reasons industry lost this valuable resource was that we failed to pay attention to details and fully comply with the TCDS and the special conditions on these aircraft. As a result, most field-level major alterations to pressurized fuselages require data to be approved by either an FAA designated engineering representative or STC, or approved service bulletin and must address damage tolerance.

Modern aircraft are introducing their own special conditions. The Eclipse Jet broke a number of traditional molds as they designed, manufactured and certified that aircraft. One of the areas that impacts the avionics industry is the design and certification of the advanced integrated avionics system. Combining some of the integration philosophy of much larger transport aircraft with the simplicity of modern computer integration technology allowed the Eclipse to pack a broad capability in a very small package. The result is that there are some significant limitations on alterations to the aircraft avionics suite as well as limitation to additional system installations. In response, the FAA published FAA Notice N 8900.84, Eclipse EA-500 Avionics Installation or Alteration Evaluation

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Requirements. While the notice provides a significant amount of background, the effect is simple: "To avoid a potential unsafe condition, ASIs who observe an alteration or modification which involves the EA500 airplane avionics, must contact the ACO in Fort Worth, Texas, for assistance in determining appropriate compliance requirements and approval methodology."

Now, why is this necessary and what makes this aircraft different? It is in the details of the type certificate data sheet. Contained toward the end of the data sheet is Note 5:

Note 5: The Eclipse EA500 incorporates integrated avionics systems using software-based line replaceable units which share a digital signal transmission bus. The avionics configuration of the Eclipse EA500 as delivered from production is critical to the proper operation of the cockpit instrumentation system. Modification to the LRU software supplied with the Eclipse EA500, replacement of an LRU with a different LRU, addition of new LRU, or alteration of an LRU interface could adversely affect the airworthiness of the certified product. Accordingly, no changes to the integrated avionics system may be made without coordination with the Certificate Management Aircraft Certification Office.

Looking at the details of the design and certification of the aircraft is only half of the equation. OK, maybe a bit more than half, but still, it's not all of the details. You still must know the intended use of the aircraft. As an example, when looking at the design and certification of Part 23 aircraft, you might be able to install some non-FAA approved equipment that meets the burn standards of FAR Part 23 Appendix F. But if your customer intends to fly the aircraft in Part 135 operations, you might be missing some important details, such as limitations in the interior materials.

§ 135.170 Materials for compartment interiors. (a) No person may operate an airplane that conforms to an amended or supplemental type certificate issued in accordance with SFAR No. 41 for a maximum certificated takeoff weight in excess of 12,500 pounds unless within one year after issuance of the initial airworthiness certificate under that SFAR, the airplane meets the compartment interior requirements set forth in §25.853(a) in effect March 6, 1995 (formerly §25.853 (a), (b), (b–1), (b–2), and (b–3) of this chapter in effect on Sept. 26, 1978).

However, the details may not be limited to just the operating rules of Parts 91 or 135. Recently, we have been educated on even more often-missed details while installing some modern avionics. This particular installation started on an otherwise normal CAR 3 aircraft weighing in a bit under 12,000 pounds with a seating capacity of more than nine passengers. By all physical indications the installation should have been a straightforward avionics upgrade. And all seemed pretty normal until the alteration went for final STC approval and was returned with some pretty severe limitations. Limitations that, on the surface, looked totally out of context. Then the research began.

The certification basis of the aircraft is Civil Aviation Regulations 3 dated May 15, 1956, and Amendments 3-1 to 3-8 inclusive, plus special conditions for multi- engine turbine powered aircraft dated Nov. 6, 1964. Type Certificate No. A9EA was issued June 22, 1966. The date of application for Type Certificate was April 2, 1964. The aircraft was certificated in the "normal category."

So, the initial design and certification of the alteration was based on this information. It wasn't until the National Aviation Authority introduced the limitations, that we began to thoroughly investigate the basis of their limitation. On the TCDS following the certification basis is a paragraph that reads: "For this model airplane intended for use in operations under FAR Part 135, the additional airworthiness requirements of Special Federal Aviation Regulation 23, dated Jan. 7, 1969, and Amendment 1 to SFAR 23, dated Dec. 24, 1969, also are included."

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So, what are the details we missed?

First, what is SFAR No. 23? The purpose of this Special Federal Aviation Regulation is to establish additional airworthiness standards for small airplanes that are to be certificated to carry more than 10 occupants and that are intended to be used in operations conducted under Part 135 of the Federal Aviation Regulations.

Prior to 1967, the FAA had applied special conditions in the type certification of airplanes capable of carrying more than 10 persons to ensure an adequate level of safety. However, rather than continue to apply detailed and complex special conditions on an individual basis, the FAA proposed to establish rules of general applicability for the type certification of airplanes capable of carrying more than 10 occupants that are intended for use in Part 135 operations. SFAR 23 was the result of this action.

In October 1978, the FAA proposed temporary rules for additional airworthiness requirements to provide for increased takeoff gross weight and passenger seating capacity of certain existing small, propeller-driven, multi-engine airplanes. The outcome of this proposal was the adoption of SFAR No. 41.

The November 1983, Notice of Proposed Rulemaking which introduced the "Airworthiness Standards and Operating Rules; Commuter Category Airplanes" drew a detailed history that begins with special conditions that migrated to SFAR 23, then superseded by SFAR 41, and the subsequent SFAR 41C, then coming to conclusion with the commuter category which we are all familiar with today.

As a result of finding the devil in the details, we found that the NAA's conclusion was based on the historical certification of the aircraft and in line with the "intended purpose" of commercial operations.

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