

2003 Seattle ACO DER Seminar

SFAR88 & 14 CFR Part 25 §25.981 Amendment 25-102

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SFAR88 & 14 CFR Part 25 §25.981 Amendment 25-102

Systems Aspects Regarding Fuel System Ignition Prevention

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- **What is SFAR88?**
 - **It is a Special Rule that requires design approval holders of certain turbine-powered transport category airplanes, and of any subsequent modifications to these airplanes, to substantiate that the design of the fuel tank system precludes the existence of ignition sources within the airplane fuel tanks**
 - **It also requires developing and implementing maintenance and inspection instructions to assure the safety of the fuel tank system**
 - **For new type designs it requires compliance to 14 CFR Part 25 § 25.981 Amendment 102**

SFAR88 & 14 CFR Part 25 §25.981

Amendment 25-102

- **SFAR88 Applicability**
 - **This SFAR applies to the holders of type certificates (TC), and supplemental type certificates (STC) that may affect the airplane fuel tank system, provided the TC/STC was issued after January 1, 1958, and**
 - **The airplane has either a maximum type certificated passenger capacity of 30 or more, or a maximum type certificated payload capacity of 7,500 pounds or more**
 - **The SFAR also applies to applicants for TC, amendments to a TC, and STC affecting the fuel tanks, if the application was filed before June 6, 2001 and the certificate was not issued before June 6, 2001.**

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- **SFAR88 Compliance time**
 - **No later than December 6, 2002 for TC and June 6, 2003 for STC Holders, complete Fuel tank safety assessments, develop all maintenance and inspection instructions and provide substantiation that the airplane fuel tank design meets the requirements of §§25.901 and 25.981(a) and (b)**
 - **Aircraft Operators**
 - **No later than December 6, 2004, incorporate instructions for maintenance and inspection of the fuel tank system for airplanes covered under this SFAR**

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- **§25.981 Amend. 25-102**
 - **Amendment 25-102, issued on April 18, 2001, renamed §25.981 as Fuel Tank Ignition Prevention, and added new requirements to address ignition sources in the fuel tanks. It also requires a safety assessment that includes the following:**
 - **Consideration of single failures,**
 - **Probable combinations of failures,**
 - **Development of long-term ICA, and**
 - **Maintainability of the airplane fuel tank system**

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- **§25.981 Amend. 25-102 Applicability**
 - **Applies to all Type Certificates and Supplemental Type Certificates with application date after June 6, 2001**

NOTE: while SFAR88 excludes a number of airplanes due to passenger or payload limit, this rule applies to all Airplanes/Airplane Type Certificates

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- **§25.981 Amend. 25-102 Requirements**
 - **§25.981 requires that a safety analysis be performed to demonstrate that a presence of an ignition source in the fuel tank system could not result from the following:**
 - **Any single failure**
 - **Any single failure in combination with any latent failure condition not shown to be extremely remote, or**
 - **Any combination of failures not shown to be extremely improbable**

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- **ICA Requirements under §25.1529**
 - **§25.981(b) requires that Critical Design Configuration Control Limitations, Inspections, or other procedures, be established as necessary to prevent development of ignition sources within the fuel tank system.**
 - **Appendix H to part 25, ICA, calls for mandatory fuel tank system inspections or maintenance actions in the limitations section of the ICA**

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- **§25.981 Means of Compliance**
 - **Use Advisory Circular (AC) 25.981-1C (Draft) for guidance to demonstrate compliance with the certification requirements for prevention of ignition sources within the fuel tanks of transport category airplanes**

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- **§25.981 Design Considerations**
 - **Fuel tank Systems**
 - **The design requirements of UL 913 are considered acceptable for Line Replaceable Units (LRU) provided the following issues are addressed.**
 - **Intrinsically safe signals should be separated from higher power signal and preferably be located on separate circuit boards**
 - **Safe side traces and wiring should be separated from higher power ones by adequate distance or physical barrier . Separation distance must be proposed to, and approved by the Aircraft Certification Office**

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- **§25.981 Design Considerations**
 - **Fuel Tank Systems (...continued)**
 - **Wiring entering the fuel tank should maintain intrinsically safe levels of electrical power**
 - **Wiring that is not intrinsically safe is considered higher energy wiring.**
 - **Adequate wire separation should be maintained between signal lines entering the fuel tank and other wiring.**
 - **Shielding of wiring is not considered a means of separation**
 - **Alternate means of separation could be proposed and utilized, such as protective sleeving and physical barriers**

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- **§25.981 Design Considerations**
 - **Impact on other systems**
 - **Amendment 25-102 addresses preventing fuel tank ignition from normal operation and failures, including operation and failures of systems or equipment that may not function as part of a fuel system**
 - **Type certificated installations with application date after June 6, 2001, that use wiring with higher energy, should maintain adequate separation from fuel tank system wiring, as detailed in AC 25.981-1C (Draft)**

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- **Guidance to Designees**
 - **Part 25 §25.981 is a propulsion rule. Systems and Equipment (Electrical) designees are authorized to find compliance to §25.981 (a) (b) by Recommending Approval of the safety assessments in their areas of responsibility. FAA Form 8110-3 should state that approval is recommended only for the Electrical Aspects of the Analysis.**
 - **Assessments shall be performed based on the guidance of AC 25.981-1C(Draft). Maximum allowable Electrical requirements for Energy, Voltage, Current and environmental conditions shall be considered.**

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- **Guidance to Designees (...continued)**
 - **Systems, other than “Fuel System”, with “higher energy” wiring, shall maintain adequate separation from wiring that enters the fuel tanks or installed along the fuel tank structure.**
 - **Where spatial separation is less than adequate, other means of protection should be considered such as sleeving, added clamping and physical barriers. Their applicability should be based on the system’s power characteristics, coupling distance, means of wire inspection, fuel system wiring characteristics, effects of wire bundle fires and aircraft location.**