



U.S. Department
of Transportation
**Federal Aviation
Administration**

Memorandum

Subject: **ACTION**: Review and Concurrence,
Equivalent Level of Safety

Date: December 13, 2002

From: Manager, Boston Aircraft Certification
Office

Reply to
Attn. of:

To: Manager, Rotorcraft Directorate, ASW-
100

Sikorsky S-92A Helicopter Type Certification Project TC0309BO-R

Background:

The APU installation proposed does not provide for a dedicated APU compartment that would be classified as a “Fire Zone” per §29.1181(a)(4), nor is the APU completely isolated from the rest of the rotorcraft by firewalls, shrouds, or equivalent means per §29.1191(b).

The APU design is not of the “typical” turbine engine design configuration as envisioned by the regulations. As such the APU is not installed in a “typical” enclosure, with the “typical” fire detection and fire suppression systems for the entire APU compartment. The design of the APU is such that the compressor, turbine, combustor and tailpipe are in close proximity and separated from the accessories by the air inlet. The proposed design incorporates a fireproof enclosure around the APU compressor, combustor, turbine and tailpipe. This enclosure includes provisions for the fire detector and fire suppression installation.

The APU accessory section containing the fuel control unit and lubrication pump, the sources of flammable fluids, is not directly attached to the compressor section as in a typical installation. A fireproof enclosure is used to contain the fuel control and lubrication pump. In addition, the air inlet is between the accessories and the APU’s compressor, turbine and combustor, further isolating them from these potential ignition sources. This auxiliary unit enclosure is equipped with an independent overboard drain. The high pressure fuel line connecting the FCU and the fuel atomizers is a solid line running unprotected from the APU accessory section to the fireproof enclosure of the compressor, combustor, turbine and tailpipe.

The S-92 APU installation does not incorporate a “designated fire zone compartment” per §29.1181(a)(4) nor does the installation provide complete isolation of the APU from the

rest of the rotorcraft by firewalls, shrouds, or equivalent means as required by §29.1191(b).

This firewall configuration has been certified for main engine installation on other helicopters with similarly configured turbine main engines. In addition, this firewall configuration also exists for several similarly configured turbo-prop and turbo-fan airplanes wherein an equivalent level of safety was established for compliance with similar requirements. As such, this design concept is neither novel or unique nor new to the FAA. The service history of these aircraft has validated this philosophy over a broad range of aircraft types and models.

In order to provide an equivalent level of safety, Sikorsky addressed the following:

1. The design eliminates the exposure of flammable fluid carrying lines in the APU area to the maximum extent possible. (i.e. when a line must transit the area, it must be outside the compartment to maximum extent possible.)
2. Effects of flammable fluid leakage in the APU accessory zone were addressed and found acceptable.
3. Effective isolation of all ignition sources inside the APU accessory section were demonstrated
4. The surface temperatures of all components (including any bleed air lines) within the area, even under failure mode conditions such as internal compressor seals etc., are below the auto-ignition temperature of any flammable fluids/vapors.
5. All electrical components within this area are properly designed and installed to prevent their being an ignition source.
6. The design reduces the possibility of any flammable fluid leakage. If leakage should occur, no contact with potential ignition sources will be made.
7. A fire originating within the APU hot section will not propagate into the accessory section.
8. No hazardous quantity of air, fluid, or flame can pass through the accessory gearbox from the APU fire zone.
9. Fittings on the APU high pressure fuel line coming out of the fuel control to the atomizers are contained within the fuel control box. History shows fuel line failures are typically fitting failures, not line failures. In addition there have been only 3 fuel line failures in 44 million hours of APU operation.

Due to the isolation and drainage of the flammable fluid components and their location outside of the firewall system enclosing the compressor, combustor and turbine (fire zone), use of double shrouded flammable fluid carrying lines is not required in the low pressure fuel line (feed lines) to the accessory area.

The Boston Aircraft Certification Office recommends the Rotorcraft Directorate approve this Equivalent Level of Safety finding for §29.1181(a)(4) and §29.1191(b) in accordance with 21.21(b)(1).

Robert G. Mann

Concur

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Signature: _____

Signature:

Manager, Rotorcraft Standard Staff, ASW-110
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Manager, Rotorcraft Directorate, ASW-

Date: _____

Date: _____

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