



# Federal Aviation Administration

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## Memorandum

Date: May 13, 2015

To: Manager, Boeing Aviation Safety Oversight Office, ANM-100B

From: Manager, Transport Airplane Directorate, ANM-100

Prepared by: Jim Cashdollar, ANM-100B

Subject: INFORMATION: Equivalent Level of Safety (ELOS) Finding for Engine Aft Fairing Compartment and Main Strut Fire Safety Requirements on a Boeing Model 767-2C Airplane, FAA Project # PS09-0863

ELOS Memo # PS09-0863-P-8

Regulatory Ref.: 14 CFR 21.21(b)(1), 25.1182(a), 25.1183(a), 25.1189(a), and 25.1189(d)

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This memorandum informs the certificate management aircraft certification office of an evaluation made by the Transport Airplane Directorate (TAD) on the establishment of an equivalent level of safety (ELOS) finding for the Boeing Model 767-2C airplane.

### Background

Title 14, Code of Federal Regulations (14 CFR) 25.1182(a) requires most of the requirements applied to fire zones defined by § 25.1181 to also be applied to nacelle areas behind firewalls and to each portion of engine pod attaching structures containing flammable fluid lines.

The intent of § 25.1182(a) is to set a level of required fire protection in areas adjacent to engine fire zones to limit the potential for engine fires to spread to those areas, and to limit the hazard if a fire does spread to those areas. In relationship to this ELOS finding, § 25.1182(a) requires that each portion of any engine pod attaching structure containing flammable fluid lines must meet the requirements of §§ 25.1183(a), 25.1189(a), and 25.1189(d).

Section 25.1183(a) requires that flammable fluid lines and components be fire resistant, and flammable fluid tanks be fireproof or otherwise protected. Section 25.1189(a) and (d) requires that each installation have a means to shutoff or otherwise prevent hazardous quantities of flammable fluids from flowing into, within, or through the zone; and the shutoff means must be fireproof or otherwise protected.

The Model 767-2C aft fairing and main strut compartments contain certain hydraulic system components which include non-metallic features that have not been shown to be fire resistant.

The aft fairing compartments also include a hydraulic system shutoff valve. These valves are designed to close to shut off hydraulic fluid flow through the main strut and engine core compartment fire zone in the event of an engine fire; however, the valves do not prevent continued flow through the aft fairing compartment, nor have they been shown to be fireproof. Therefore these designs do not directly comply with §§ 25.1183(a), 25.1189(a), and 25.1189(d).

### **Applicable regulation(s)**

14 CFR 21.21(b)(1), 25.1182(a), 25.1183(a), 25.1189(a), and 25.1189(d)

### **Regulation(s) requiring an ELOS finding**

14 CFR 25.1183(a), 25.1189(a), and 25.1189(d)

Although § 25.1182(a) is discussed above, the FAA determined an ELOS finding is not required for § 25.1182(a) because that regulation merely provides references to other requirements. ELOS findings are only required for the regulations that are referenced (i.e., not the regulation that provides the reference) in situations where an applicant cannot demonstrate direct compliance.

### **Description of compensating design features or alternative Methods of Compliance (MoC) which allow the granting of the ELOS (including design changes, limitations or equipment needed for equivalency)**

The compensating factors that provide an ELOS for the regulations not complied with are as follows:

- The aft fairing compartment is isolated from the engine fire zones by distance and intervening compartments.
- Flammable fluid carrying lines in the main strut that have not been shown to be fire resistant over their entire length are constructed in part of corrosion resistant steel, which is considered fireproof. The corrosion resistant steel portion extends for a minimum of 16 inches beyond the interface between the engine fire zone and strut firewall.

### **Explanation of how design features or alternative Methods of Compliance (MoC) provide an equivalent level of safety to the level of safety intended by the regulation**

- The degree of isolation of the aft fairing compartment from the engine fire zones provided by distance and intervening compartments compensates for the lack of direct compliance of the hydraulic metallic components in the compartment including the reservoir, pumps, shutoff valves, filter modules, pressure switches, and lines, as well as the non-metallic components including the pop-up indicator on the filters, seals within fittings joining hydraulic lines to components, and reservoir sight glasses with their respective fire resistance or fireproof requirements. The additional fire risk created by the features which do not directly comply is compensated for by the reduced risk of fires in the engine fire zones heating or progressing into the aft fairing compartment

due to separation of the aft strut fairing compartment from the engine fire zones by fire walls and intermediate dry bay zones.

- The main strut contains flammable fluid lines for fuel supply, hydraulic supply, and hydraulic pressure and case drain that are metallic but have not been shown to be fire-resistant as required by § 25.1183(a). The fluid lines within the main strut are isolated from the engine fire zone by fire walls, fire seals, and a fireproof system raceway that incorporates drains to allow any fluid leakage to drain safely overboard. In the raceway (which is in the area of exposure adjacent to the firezone), all lines are corrosion-resistant steel (i.e., fireproof) with no fittings for a minimum of 16" beyond the fire zone interface. Therefore, the area immediately adjacent to the fire zone has additional fire-hardening beyond what the rules require which the FAA considers would significantly reduce the risk of fire propagating from the engine core compartment to the main strut. The additional fire risk created by the components in the main strut which do not directly comply is compensated for by the reduced risk of fires in the engine fire zone progressing into this compartment due to these additional protective design features.

#### **FAA approval and documentation of the ELOS finding**

The FAA has approved the aforementioned ELOS finding in project issue paper P-8. This memorandum provides standardized documentation of the ELOS finding that is non-proprietary and can be made available to the public. The TAD has assigned a unique ELOS memorandum number (see front page) to facilitate archiving and retrieval of this ELOS finding. This ELOS memorandum number must be listed in the type certificate data sheet under the Certification Basis section. An example of an appropriate statement is provided below.

Equivalent Level of Safety Findings have been made for the following regulations:

14 CFR 25.1183(a) Flammable fluid-carrying components; and

14 CFR 25.1189(a) and (d) Shutoff means

(documented in TAD ELOS Memorandum PS09-0863-P-8)



Transport Airplane Directorate,  
Aircraft Certification Service

**MAY 13 2015**

Date

ELOS Originated by Boeing Aviation Safety Oversight Office	Program Manager Jim Cashdollar	ANM-100B
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