



Federal Aviation Administration

Memorandum

Date: February 3, 2011

To: Manager, Transport Standards Staff, International Branch, ANM-116

From: Manager, Transport Airplane Directorate, ANM-100

Prepared by: Douglas Bryant, ANM-112

Subject: INFORMATION: Equivalent Level of Safety (ELOS) Finding for the Airbus Model A350 airplane (FAA Project Number TC0544IB-T)

ELOS Memo#: TC0544IB-T-P-19

Reg. Ref.: § 25.1203(d)

This memorandum informs the certificate management aircraft certification office of an evaluation made by the Transport Airplane Directorate on the establishment of an equivalent level of safety finding for the Airbus Model A350 airplane.

Background

Title 14 Code of Federal Regulations section 25.1203(d) requires that “There must be means to allow the crew to check, in flight, the functioning of each fire or overheat detector electric circuit.” The design of turbine overheat detection portion of the Airbus Model A350 airplanes equipped with Rolls-Royce Model Trent XWB engines does not allow the crew to check its functioning during flight. Although the fire zone compartment detector portion of the fire/overheat system can be fully tested in flight, and complies with § 25.1203(d), the inability to test the turbine overheat detection circuit in flight does not meet the testing provisions required by the rule.

Applicable regulation(s)

§ 25.1203(d)

Regulation(s) requiring an ELOS finding

§ 25.1203(d)

Description of compensating design features or alternative standards which allow the granting of the ELOS (including design changes, limitations or equipment need for equivalency)

The turbine overheat detection system installed on the Rolls-Royce Trent XWB engines fitted on Model A350 aircraft ensures that the turbine does not overheat in case of failure of the internal cooling air system or in case of internal oil fires. This system is comprised of four thermocouples:

- A duplex thermocouple at the Turbine Cooling Air Front location to protect the intermediate pressure (IP) and high pressure (HP) turbines from failure of the HP3 cooling air system and oil fires, and
- A duplex thermocouple at the Turbine Cooling Air Rear location to protect the low pressure (LP) turbine from failure of the IP8 cooling air system and oil fires.

Each duplex thermocouple is made of two measuring elements mounted side by side within a single common housing. Each element feeds into a separate channel (A and B respectively) of the Electronic Engine Control (EEC). The EEC is in turn linked to the Flight Warning System (FWS) to generate a warning to the cockpit (with an associated procedure), if an overheat is detected by the thermocouples. The condition of the turbine overheat detection system is continuously monitored by the EEC from power-up and any system fault is signalled to the crew in flight.

If faults affecting only one channel are detected, then a message associated with a limited dispatch condition will be triggered. If faults affecting both channels are detected, then a message associated with a DO NOT DISPATCH condition will be triggered.

Explanation of how design features or alternative standards provide an equivalent level of safety to the level of safety intended by the regulation

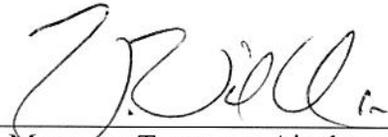
Although noncompliant with the regulation, the EEC continuous monitoring in-flight of the operating condition of the turbine overheat detection system and automatic generation of warnings, with associated crew procedures, to the cockpit are considered to provide an equivalent level of safety to that provided by the required testing provisions. Therefore, the ability to directly check the turbine overheat system's functioning in flight is no longer necessary as the intent of the regulation is met.

FAA approval and documentation of the ELOS finding

The FAA has approved the aforementioned equivalent level of safety finding in the Model A350 project issue paper P-19, titled "Rolls Royce Engine Turbine Overheat

Detection.” This memorandum provides standardized documentation of the ELOS finding that is non-proprietary and can be made available to the public. The Transport Directorate has assigned a unique ELOS Memorandum number (see front page) to facilitate archiving and retrieval of this ELOS. This ELOS Memorandum number should be listed in the Type Certificate Data Sheet under the Certification Basis section (TC’s & ATC’s) or in the Limitations and Conditions Section of the STC Certificate. An example of an appropriate statement is provided below:

Equivalent Level of Safety Findings have been made for the following regulation(s):
14 CFR 25.1203(d), Fire detector system
(documented in TAD ELOS Memo TC0544IB-T-P-19)



Manager, Transport Airplane Directorate,
Aircraft Certification Service

FEBRUARY 11, 2011

Date

ELOS Originated by Transport Standards Staff:	Project Engineer Douglas Bryant	Routing Symbol ANM-112
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