U.S. Department of Transportation

Federal Aviation Administration

Memorandum

Subject:	INFORMATION: Equivalent Level of Safety Finding for Airbus Model A380-800 FAA Project Number CP101	Date:	28 September 05
		Reg Ref:	§ 25.1203(d)
From:	Manager, Transport Standards Staff, Propulsion/Mechanical Systems Branch, ANM-112	Reply to Attn of:	Lanny Pinkstaff ANM-112
To:	Manager, Transport Standards Staff, International Branch, ANM-116	ELOS Memo #:	CP101-P-13

Background

14 CFR 25.1203(d) states that "there must be means to allow the crew to check, in flight, the functioning of each fire or overheat detector circuit". The turbine overheat detection portion of the Airbus A380 with Trent 900 design, as presently configured, 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 satisfy the testing provisions of this rule.

Applicable regulation(s)

§ 25.1203(d)

Regulation(s) requiring an ELOS

§ 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 900 engines on the A380 aircraft ensures that the turbine does not overheat in case of failure of the internal cooling air system. This system is comprised of 4 thermocouples:
2 at the rear of the HP disc to protect the HP and IP turbines from failure of the HP3 cooling air system, and
2 at the front of the LP disc to protect the LP turbine from failure of the IP8 cooling air system.

One of the forward and one of the rearward thermocouples are linked to each EEC (Engine Electronic Control) channel. The EEC is in turn linked to the Flight Warning System (FWS) to generate a warning to the cockpit (with 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.

Any system fault generates a maintenance message. Flight deck effect will depend on the detected fault and associated dispatch condition:
If faults affecting only one channel are detected, then a cockpit message associated with a limited dispatch condition will be triggered, and
If faults affecting both channels are detected, then a cockpit 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

FAR § 25.1203 requires that there be fire or overheat detectors in designated fire zones, and that each detector must be constructed and installed so that there is a means to warn the crew in the event that a sensor is severed or that there is a short circuit, unless the system continues to perform its function satisfactorily after the event. To complement and provide verification of these requirements at all times and under all conditions, the means to check, in flight, the functioning of each detector is therefore required.

The operating condition of the turbine overheat detection system is continuously monitored by the EEC from power-up. The EEC, with level A software, has two independent channels, and one each of the forward and aft thermocouples are monitored by each EEC channel. If an overheat condition is detected by the thermocouples, the EEC sends a signal to a warning system to generate a warning in the cockpit, with an associated procedure. Likewise, if any system fault occurs, and depending on the fault type and number of affected channels, a maintenance message or an appropriate cockpit message regarding dispatch will be generated.

Based on these full time detection and system fault monitoring capabilities and features, the need to provide a means to allow the flight crew to be able to directly check the turbine overheat system's functioning in flight is no longer necessary as the intent of the regulation will be met.

FAA approval and documentation of the ELOS

The FAA has approved the aforementioned Equivalent Level of Safety Finding in project issue paper P-13. This memorandum provides standardized documentation of the ELOS 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. An example of an appropriate statement is provided below.

Equivalent Safety Finding(s) have been made for the following regulation(s):
§ 25.1203(d), Fire Detector System (documented in TAD ELOS Memo CP101-P-13)

Original Signed by Neil D. Schalekamp — *September 28, 2005*

Manager, Transport Standards Staff, — Date
Propulsion/Mechanical Systems Branch, ANM-112

ELOS Originated by TSS:	Project Engineer Lanny Pinkstaff	Routing Symbol ANM-112