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:	§ 25.1549(a)
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-15

Background

FAR § 25.1549(a) requires that each maximum safe operating limit must be marked with a red radial or a red line. Although written for conventional indicators, this has been generally applied to digital CRT indications by using a color-coding consistent with the conventional indicators. The A380 engine oil temperature is displayed on the ECAM (Electronic Centralized Aircraft Monitoring) display screen. The indication is provided in digital form:

- it is normally green
- it pulses green if the temperature exceeds a lower limit threshold,
- it turns amber if the temperature exceeds that limit threshold for more than a predetermined number of minutes or the maximum oil temperature indicated by the engine manufacturer.

The A380 oil temperature indication on ECAM therefore does not literally comply with FAR 25.1549(a), which would require the indication to turn red instead of amber when the maximum limit is exceeded.

Applicable regulation(s)

§ 25.1549(a).

Regulation(s) requiring an ELOS

§ 25. 1549(a).

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 exceedance of the maximum oil temperature limit does not require an immediate action from the crew. This had been justified by the airframe and engine manufacturers and accepted both by the airframe and engine certification specialists, and complemented, for both Rolls Royce Trent 900 and Engine Alliance GP7200, by a technical note.

The exceedance of the maximum oil temperature limit is signaled, in addition to the amber

indication on the ECAM, by an amber Master Caution located in each pilot field of view associated with a single aural chime (inhibited during critical flight phases such as take-off). This amber caution triggers an ECAM message indicating the nature of the malfunction (Oil Temperature High) and the associated procedure (reduce power and shut down the engine if it is not possible to maintain the oil temperature below the limit). FAR 25.1305, which lists the required powerplant instruments and warnings, requires an oil pressure warning and an oil temperature indicator, but does not require an oil temperature warning or caution. The current design therefore exceeds the current FAR 25 requirements by providing an unmistakable indication to the crew in case of oil temperature exceedance.

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

Exceedance of the maximum oil temperature, determined by the engine manufacturer, is shown not to require immediate pilot action because in-service experience and failure modes analyses indicate that oil temperature exceedance will not present a potential safety hazard. A red warning is required for a hazard which may require immediate corrective action by the crew. Examination of the types of the various failures indicates that most failures will not be detectable by oil temperature alone, but along with other indications such as low oil pressure, low oil quantity, filter bypass, etc. The amber oil temperature exceedance indication is satisfactory and consistent with indication color representing the degree of hazard.

When the oil temperature exceeds a lower limit threshold value for a determined period of time or exceeds the maximum limit, an amber Master Caution will be appear and an audio warning (chime) sounded, accompanied by a message (oil high temperature) and procedure. This degree of notification to the crew goes beyond the regulation's visual color change requirements for warning (red) and caution (amber) indications.

FAA approval and documentation of the ELOS

The FAA has approved the aforementioned Equivalent Level of Safety Finding in project issue paper P-15. 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):
§ 25.1549(a), Powerplant and auxiliary power unit instruments (documented in TAD ELOS Memo CP101-P-15)

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