



Federal Aviation Administration

Memorandum

Date: August 2, 2011

To: Manager, Seattle Aircraft Certification Office, ANM-100S

From: Manager, Transport Airplane Directorate, ANM-100

Prepared by: John Neff, (425) 917-6521

Subject: INFORMATION: Equivalent Level of Safety (ELOS) Finding for the Standby Air Data System on Boeing Models 747-8F and 747-8, Project No. PS05-0212 and PS05-0211

ELOS Memo #: PS05-0212-F-3

Regulatory Ref.: §§ 21.21(b)(1) and 25.1325(e)

Background

Title 14, Code of Federal Regulations (14 CFR) 25.1325(e) requires that each system must be designed and installed so that the error in indicated pressure altitude, at sea-level, with a standard atmosphere, excluding instrument calibration error, does not result in an error of more than ± 30 ft per 100 knots speed for the appropriate configuration in the speed range between $1.23 V_{SR0}$ with wing-flaps extended and $1.7 V_{SR1}$ with wing-flaps retracted. However, the error need not be less than ± 30 ft.

During flight testing it was discovered that the 747-8F/-8 standby air data system does not fully comply with the requirements of § 25.1325(e). Should both of the primary air data systems fail continued flight safety depends on the standby air data system providing critical flight data such as altitude. This means that standby air data system reliability is essential to flight safety. The standby air data system, by design, is simple to ensure maximum reliability, however, this same simplicity reduces the air data system accuracy to the degree that it does not fully comply with the explicit accuracy requirements in § 25.1325(e). Boeing believes that system changes that would improve the air data system accuracy would also introduce additional points and modes of failure, thereby decreasing system reliability.

Because flight safety is the essential design goal, Boeing believes that the current 747-8F/-8 standby air data system meets the intent of § 25.1325(e) requirements for a standby air data

system. Boeing requests an equivalent level of safety finding (ELOS) for the standby air data system compliance to § 25.1325(e).

Applicable Regulation(s)

§ 25.1325(e)

Regulation requiring an ELOS

§ 25.1325(e)

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

Compensating Flight Crew Procedures

Flight crews are trained to operate aircraft at recommended operating speeds. These procedures reduce the exposure to flap configurations and airspeed combinations where altitude accuracies are outside the limits set by § 25.1325(e).

The effects of standby altitude errors are also mitigated when the flight crew applies the airplane flight manual (AFM) standby air data system corrections. These corrections provide the flight crew with the means to safely and effectively compensate for residual standby air data system errors that are outside of the accuracy requirements of § 25.1325(e).

The effects of standby altitude errors are also mitigated when the flight crew uses other sources of altitude/flight information such as the radio altimeter, electronic glide slope information (instrument landing system (ILS), global landing system (GLS), microwave landing system (MLS), etc.), and visual glide slope information (e.g. visual approach slope indicator (VASI), precision approach path indicator (PAPI), etc.).

Compensating Aircraft Design Features

Primary flight display (PFD) failure is improbable and the standby air data system is rarely required for continued safe flight and landing. When the compensating flight crew procedures noted above are followed, the effect of the standby altitude errors will be eliminated.

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

An AFM limitation will require that the standby air data system altitude corrections be provided to, and applied by, the flight crews when operating with both primary air data systems inoperative. The correction tables will be provided in the AFM, flight crew operation manual (FCOM) and quick reference handbook (QRH). When the corrections are applied, the altitude accuracy will be equivalent to that of a system that is fully compliant with § 25.1325(e).

FAA approval and documentation of the ELOS finding

The FAA has approved the aforementioned ELOS finding in Issue Paper F-3. This memorandum provides standardized documentation of the ELOS that is non-proprietary and can be made available to the public. The Transport Airplane Directorate (TAD) 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 Certification Data Sheet under the Certification Basis section. An example of an appropriate statement is provided below:

Equivalent Level of Safety finding has been made for the following regulation(s):
 § 25.1325(e) Static Pressure Systems (documented in TAD ELOS Memo PS05-0212-F-3)

Original Signed by

Stephen Boyd

 Manager, Transport Airplane Directorate
 Aircraft Certification Service

August 2, 2011

 Date

ELOS Originated by Seattle ACO	Seattle ACO Manager	Routing Symbol: ANM-100S
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