Federal Aviation Administration

Memorandum

Date: June 28, 2011

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

From: Manager, Transport Airplane Directorate, ANM-100

Prepared by: Steve Happenny, ANM-112

Subject: INFORMATION: Equivalent Level of Safety (ELOS) Finding for the Airbus Model A350 series Cabin Pressurization - High Altitude Airport Takeoff and Landing Operations (FAA Project Number TC0544IB-T)

ELOS Memo#: TC0544IB-T–ES-14

Reg. Ref.: § 25.841(a) and 25.841(b)(6)

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 A350-900 aircraft.

Background

In accordance with the provisions of § 21.21(b)(1), Airbus has requested by letter reference V02M10016846 v2, dated 4 June 2010, an equivalent level of safety finding (ELOS) to Title 14, Code of Federal Regulations (14 CFR) 25.841(a) and 25.841(b)(6) rather than comply with the current applicable regulation. Airbus wishes to obtain approval for takeoff and landing operations at airports with elevations up to 12,500 feet pressure altitude without activation of the 10,000 feet cabin altitude warning. Airbus designed a cabin altitude limit warning system that they believe will provide an equivalent level of safety (ELOS) to the requirements of § 25.841(a), and (b)(6).

Applicable regulation(s)
§ 25.841(a), and (b)(6)

Regulation(s) requiring an ELOS finding
§ 25.841(a), and (b)(6)

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

An Equivalent Level of Safety to § 25.841(a) and (b)(6) as proposed by Airbus included the following:

1) An automatic mode of Cabin Pressurization Control System (CPCS) has been designed by Airbus and the CPCS vendor to allow take-off and landing operations on airfield elevations above 8,000 ft and up to 12,500 ft pressure altitude without nuisance warnings for the Airbus A350-900. The system will minimize pilot workload, reduce the probability of human error, and provide automatic warning and safety backups, while a safe cabin pressurization system is maintained.

2) A350-900 CPCS controller contains sub-functions required to change the excessive cabin altitude limit warning from 10,000 ft to appropriate values for high altitude airport operation. Airbus included a description of all functions and components, together with the applicable set points and logic, and pilot actions required, if any.

3) A350-900 CPCS cabin pressure rate of change is designed to minimize the exposure to cabin altitudes in excess of 8,000 feet. The rates are such that by the time the aircraft altitude exceeds 25,000 feet the cabin altitude warning is returned to 10,000 feet cabin pressure warning level. The CPCS pressure rate during descent is adapted to the higher landing field elevation.

4) When the excessive cabin altitude warning is shifted from 10,000 ft to high elevation airfield operation, visual indication to the flight crew will be provided via a white HI ALT APRT airplane Instrument and Crew Alerting System (ICAS) message. This indication cannot be cleared manually and will only disappear automatically when the excessive cabin altitude warning setting is shifted back to 10,000 ft. When in this high elevation airfield operation, at least one pilot will be requested to don an oxygen mask.

5) Airbus has provided a draft procedure (i.e., when in HI ALT APRT operation at least one pilot has to don an oxygen mask) as described under 4) above, in the Airplane Flight Manual (AFM). The use of supplemental oxygen when the excessive cabin altitude warning is shifted is described in the AFM supplement. Supplemental oxygen is an accepted method for compensating for higher than 8,000 feet cabin altitudes.

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

1) When operating out of the maximum airport altitude of 12,500 pressure feet, the cabin altitude pressurization rates are the same as the presently certified

configuration. The CPCS will ensure that at 25,000 feet airplane flight altitude that the cabin pressure altitude will not exceed 10,000 feet. Thus even in the HI ALT APRT mode of operation the cabin pressurization warning will not exceed the required warning level at airplane flight altitudes above 25,000 feet.

2) The aircraft cabin pressure warning system never exceeds the maximum oxygen drop point (i.e. less than 15,000 feet pressure altitude) which has been used as the critical point to provide supplemental oxygen to the passengers.

3) The flight manual procedure requires crew use of supplemental oxygen if the cabin altitude warning system is set at above 10,000 feet pressure altitude after the Cabin Pressurization Control System (CPCS) is configured in the HI ALT APRT mode of operation.

4) The information provided in the AFM supplement and operation of the CPCS ensures that the flight crew is provided with the procedures and cautions when operating in the HI ALT APRT mode of operation.

FAA approval and documentation of the ELOS finding

The FAA has approved the aforementioned equivalent level of safety finding in the A350 project issue paper ES-14, titled "Cabin Pressurization - High Altitude Takeoff and Landing Operations." The issue paper contains detailed company proprietary information. 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 regulations:
§ 25.841(a) and 25.841(b)(6) Pressurization: Pressurized Cabins (documented in TAD ELOS Memo TC0544IB-T–ES-14).

Original signed by
Robert Jones 28 June 2011

Transport Airplane Directorate, Date
Aircraft Certification Service

ELOS Originated by:	Project Engineer:	Routing Symbol:
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