



Federal Aviation Administration

Memorandum

Date: August 8, 2014

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

From: Manager, Transport Airplane Directorate, ANM-100

Prepared by: Stephen Happenny, ANM-112

Subject: INFORMATION: Equivalent Level of Safety (ELOS) Finding for Overpressure Relief Valves and Outflow Valves on Airbus Model A350-900 airplanes (FAA Project Number TC0544IB-T)

ELOS Memo #: TC0544IB-T-ES-11

Reg. Ref.: §§ 25.841(b)(1), 25.843(b)(1) and 25.1309

This memorandum informs the certificate management aircraft certification office of an evaluation made by the Transport Airplane Directorate (TAD) on the establishment of an equivalent level of safety (ELOS) finding for the Airbus Model A350-900 airplane.

Background

Title 14, Code of Federal Regulations (14 CFR) section 25.841(b)(1) requires, in the pertinent part, *“Two pressure relief valves to automatically limit the positive pressure differential to a predetermined value.”* In addition, testing requirements for demonstrating compliance with many of the requirements of § 25.841 are addressed in § 25.843. Section 25.843(b)(1) states that *“Tests of the functioning and capacity of the positive and negative pressure differential valves, and of the emergency release valve, to simulate the effects of closed regulator valves.”* Airbus has incorporated the positive pressure differential relief functions into an integrated cabin pressure outflow system in the Airbus Model A350-900. Therefore, literal compliance to the requirements of § 25.841 may not be met. In addition, since the A350 does not incorporate regulator valves, which are distinct from the emergency release valves, it is not possible to perform the test with closed regulator valves as required in § 25.843(b)(1).

Applicable regulations

§§ 25.841, 25.843, 25.1309, 25.365(d)

Regulation requiring an ELOS finding

§§ 25.841(b)(1), 25.843(b)(1)

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

Because the A350-900 pressurization system includes regulator valves that incorporate by software, the function of emergency release valves, it is impossible to perform the test as required by § 25.843(b)(1) with closed regulator valves to demonstrate compliance. Therefore literal compliance with § 25.843(b)(1) is not possible; and, Airbus must design an appropriate test(s) to cover the intent of § 25.843(b)(1).

Also, § 25.365(d) specifies that structural pressure loads be considered in relation to the maximum pressure release valve setting. Due to the proposed design features of the A350, the phrase “*maximum pressure release valve setting*” should be understood to represent that maximum pressure allowed by the overpressure relief function imbedded in the software logic governing the regulating outflow valves.

Explanation of how design features or alternative standards provide an ELOS to that intended by the regulation

The Airbus design meets the intent of § 25.841(b)(1) by providing a means to ensure that there are two means to comply and that cabin differential pressure will not exceed set limits; albeit, not distinct or independent valves. A350 design accomplishes by incorporating the functionality of the positive pressure differential relief valve into the pressure regulator valve. The means that this is accomplished is through the software that controls the pressure regulator valve (i.e., outflow valve). Airbus will demonstrate that this dual-use system satisfies the intent of § 25.841(b)(1); it is only that the means of compliance, as demonstrated per § 25.843(b)(1), that will be new because of the unique design features of their system.

Section 25.365(d) specifies that structural pressure loads to be considered, in relation to the maximum pressure release valve setting. Airbus will demonstrate that their dual-use system satisfies the intent of § 25.365(d); it is only that the means of compliance will be new because of the unique design features of their system as described previously.

Airbus will show that the System Safety Assessment (SSA) per § 25.1309 of the cabin pressure control system will demonstrate that an uncontrollable over-pressure by the pressure relief function will be extremely improbable considering the specifics of their design. In addition, due to increased level of Cabin Pressure Control System (CPCS) integration and the associated increased complexity, per § 25.1309 there is a potential for common cause failures and for development errors. The Common Mode Analysis (CMA) must show that the risk of common cause failures and of development errors has been adequately mitigated, and that the proposed design is equivalently safe or safer, with respect of such risks, to a conventional design.

FAA approval and documentation of the ELOS finding

The FAA has approved the aforementioned ELOS finding in the Model A350-900 issue paper ES-11, titled “Overpressure Relief Valves and Outflow Valves.” In addition, because the issue paper follows the corresponding EASA certification review item (CRI) D-19, the FAA has accepted this CRI as the basis for a finding of an ELOS. All associated compliance determinations have been assigned to EASA.

This memorandum provides standardized documentation of the ELOS finding that is non-proprietary and can be made available to the public. The TAD has assigned a unique ELOS memorandum number (see front page) to facilitate archiving and retrieval of this ELOS finding. This ELOS memorandum number should be listed in the type certificate data sheet under the Certification Basis section in accordance with the statement below:

An ELOS Finding has been made for the following regulations:
 §§ 25.841(b)(1) and 25.843(b)(1), Pressurized Cabins and Tests for Pressurized Cabin, respectively (documented in ELOS Memo TC0544IB-T-ES-11).

Original signed by

Robert C. Jones

Transport Airplane Directorate
 Aircraft Certification Service

August 8, 2014

Date

ELOS Originated by: International Branch	Project Engineer: Stephen Happenny	Routing Symbol: ANM-112
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