



Federal Aviation Administration

Memorandum

Date: May 22, 2014

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

From: Manager, Transport Airplane Directorate, ANM-100

Prepared by: Sanjay Ralhan, ANM-116

Subject: INFORMATION: Equivalent Level of Safety (ELOS) Finding for Minimum Mass Flow of Supplemental Oxygen on Model A318, A319, A320 and A321 airplanes, FAA Project Number AT10288IB-T.

ELOS Memo #: AT10288IB-T-S-5

Reg. Ref.: § 25.1443(c)

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 A318, A319, A320 and A321 airplanes.

Background

Title 14, Code of Federal Regulations (14 CFR) section 25.1443(c) requires:

“For passengers and cabin attendants, the minimum mass flow of supplemental oxygen required for each person at various cabin pressure altitudes may not be less than the flow required to maintain, during inspiration and while using the oxygen equipment (including masks) provided, the following mean tracheal oxygen partial pressures:

(1) At cabin pressure altitudes above 10,000 feet up to and including 18,500 feet, a mean tracheal oxygen partial pressure of 100 mm. Hg. when breathing 15 liters per minute, BTPS, and with a tidal volume of 700 cc. with a constant time interval between respirations.

(2) At cabin pressure altitudes above 18,500 feet up to and including 40,000 feet, a mean tracheal oxygen partial pressure of 83.8 mm. Hg. when breathing 30 liters per mean mean tracheal oxygen partial pressure of 83.8 mm. Hg. when breathing 30 liters per minute, BTPS, and with a tidal volume of 1,100 cc. with a constant time interval between respirations.”

Airbus has proposed an ELOS finding to the requirements of § 25.1443(c).

Applicable regulations

§ 25.1443(c)

Regulation requiring an ELOS finding

§ 25.1443(c)

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)

The Airbus proposed modification replaces the Type II chemical Oxygen containers in the lavatories with a new decentralized gaseous oxygen Type II container. The oxygen source is a 3000 psig high pressure oxygen cylinder instead of a chemical oxygen generator. The oxygen supply time remain unchanged.

Airbus propose to evaluate the Airbus A318/A319/A320/A321 lavatory oxygen system performance by comparing the arterial blood oxygen saturation (SaO₂) levels established for subjects using a system with an agreed baseline SaO₂ levels to ensure that they equal or exceed the generalized baseline levels. Human subject testing in an altitude chamber are proposed to show that an equivalent level of protection from hypoxia is provided to cabin occupants while utilizing the oxygen system.

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

Airbus stated in their proposal for ELOS that the current airworthiness requirements and associated standards of Technical Standard Order (TSO) C64a/SAE AS 8025 focus on the substantiation of the mean tracheal oxygen partial pressure, which is based on the existing oxygen dispensing technology. Alternatively it is possible to verify the hypoxia protection capability of oxygen equipment by using the blood oxygenation level instead of the mean tracheal oxygen partial pressure.

For passengers and cabin crew members, Airbus will demonstrate that the passenger oxygen system provides an equivalent level of protection from hypoxia as detailed below:

- (1) Between 10,000 feet and 18,500 feet cabin pressure altitude, the supplemental oxygen system for the passenger and cabin crew shall provide a blood oxygenation level that is equivalent with the blood oxygenation level reached at

10,000 feet cabin pressure altitude when breathing standard air. Breathing standard air at 10,000 feet cabin pressure altitude provides a mean tracheal oxygen partial pressure of 100 mmHg as required by § 25.1443(c).

- (2) Between 18,500 feet and 40,000 feet cabin pressure altitude, the supplemental oxygen system for the passenger and cabin crew shall provide a blood oxygenation level that is equivalent with the blood oxygenation level reached at 14,000 feet cabin pressure altitude when breathing standard air. Breathing standard air at 14,000 feet cabin pressure altitude provides a mean tracheal oxygen partial pressure of 83.8 mmHg as required by § 25.1443(c)

FAA approval and documentation of the ELOS finding

The FAA has approved the aforementioned ELOS finding in project issue paper S-5, titled Minimum Mass Flow of Supplemental Oxygen. 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:

ELOS Findings have been made for the following regulation:
 § 25.1443(c), Minimum Mass Flow of Supplemental Oxygen; (documented in TAD ELOS Memo AT10288IB-T-S-5).

Original Signed by Victor Wicklund
 Transport Airplane Directorate
 Aircraft Certification Service

May 22, 2014
 Date

ELOS Originated by Propulsion & Mechanical Systems Branch:	Project Engineer: Robert Hettman	Routing Symbol: ANM-112
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