



Federal Aviation Administration

Memorandum

Date: May 26, 2006

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

From: Manager, Transport Airplane Directorate, ANM-100

Prepared by: Clint Jones, ANM-150S

Subject: INFORMATION: Equivalent Level of Safety Finding for High Altitude Landing Operations for Boeing 737 Model Airplane (FAA Project Number TD9770SE-T)

Memo No.: TD9770SE-T-S-1

Reg. Ref.: §§21.21(b)(1); 25.841(a),(b)(6), &(b)(8); 25.1309(c); and 25.1447(c)(1)

Background

In accordance with the provisions of § 21.21 (b)(1), Boeing submitted a request for an equivalent level of safety to the requirements of § 25.841(b)(6) when applied to the 737-600/-700/-700C/-800/-900 take-off and landing operations at airports with field elevations between 8,000 feet and 14,500 feet. Boeing wishes to obtain approval for takeoff and landing operations at airports with elevations up to 14,500 feet and to do so without activation of the 10,000 feet cabin altitude warning. Boeing has designed a dual limit cabin altitude warning system that they believe will provide an equivalent level of safety (ELOS) to the requirements of § 25.841 (b)(6). Boeing documentation calls this the High Altitude Operation system.

Applicable regulation(s)

§§ 21.21(b)(1); 25.841(a),(b)(6), and (b)(8); 25.1309(c); and 25.1447(c)(1)

Regulation(s) requiring an ELOS

§ 25.841(b)(6)

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

The cabin altitude must equal the airport elevation when departing or landing. Boeing has designed and installed a new digital cabin pressure controller, a dual limit cabin altitude warning system, and associated flight deck selector switch for high altitude airport operations, which will allow normal takeoffs and landings at those at elevations between 8,000 feet and 14,500 feet for the 737-600/-700/-700C/-800/-900. The dual limit cabin altitude warning system shifts the alarm set point from 10,000 feet to 14,000 ft or 14,650 ft, or 15,200 ft (dependent upon three airplane configurations).

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

The landing altitude of the subject airplanes, when utilizing the High Altitude Operations system, is in excess of the airplane cabin pressure altitude limit established by existing regulations (i.e., 10,000 feet pressure altitude). To compensate, Boeing has incorporated a design feature that provides cabin pressure control that shifts the warning to a higher altitude (i.e., lower) pressure. The combination of this design change and operational procedures discussed below provides a means to control the cabin pressure upon descent into a high altitude airport, such that upon landing the airplane will be unpressurized and the cabin doors may be opened, as well as the reestablishment of “normal” cabin pressure control following takeoff from a high altitude airport.

If a landing field is selected for a destination field in excess of 8,000 feet and the aircraft holds between 10,000 feet and 15,200 feet, the occupants and crew may be exposed to cabin altitudes of 10,000 feet or greater for duration in excess of that allowed by the operating rules and without cabin altitude warning in the high altitude mode. The operating rules §§ 91.211, 121.329(b), and 135.89(b)(1) address the use of oxygen to prevent hypoxia and related degraded pilot performance.

The Boeing design mitigates this exposure by limiting high altitude crew procedure to only conditions where the High Altitude Operation is required. Pilot procedures to don oxygen address crew exposure. High cabin altitude exposure to passengers (and crew) only exists when High Altitude Operation is invoked (above 10K altitude), which should only occur when crew are preparing for descent into or out of high altitude airport, and not during cruise operations. Take-off exposure is mitigated by crew procedure to select normal landing altitude mode (or select landing altitude to destination airport).

FAA approval and documentation of the ELOS finding

The FAA has approved the aforementioned Equivalent Level of Safety Finding as documented in Issue Paper S-1 (737-600/-700/-700C/-800/-900). This memorandum provides standardized documentation of the ELOS that is non-proprietary and can be made available to the public. The Transport 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 Certificate Data Sheet under the Certification Basis section. [e.g., Equivalent Safety Findings have been made for the following regulation(s):

§ 25.841(b)(6) – “High Altitude Landing Operations” (documented in Transport Airplane Directorate ELOS Memo TD9770SE-T-S-1)]

Original Signed by
Neil Schalekamp for

Manager, Transport Airplane Directorate,
Aircraft Certification Service

May 26, 2006

Date

ELOS Originated by Seattle ACO:	Clint Jones	ANM-150S
------------------------------------	-------------	----------