



U.S. Department  
of Transportation  
**Federal Aviation  
Administration**

# Memorandum

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## Memorandum

Subject:	<u>INFORMATION</u> : Equivalent Level of Safety (ELOS) Finding for Operations at High Altitude Airfields FAA Project Number AT2587NY-T	Date:	February 23, 2007
		Reg Ref:	§ 25.841(b)(6)
From:	Ali Bahrami, Manager, Transport Directorate, ANM-100	Reply to Attn of:	Daniel F. Parrillo ANE-172
To:	Anthony Socias, Manager, New York ACO, ANE- 170	ELOS Memo #:	AT2587NY-T-S-5

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The purpose of this memorandum is to inform 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 Bombardier Aerospace (BA) models CL 600-2C10/2D15/2D24.

### Background

BA has applied for an amended type certificate to add an Equivalent Safety Finding against FAR 25.841(b)(6) for operation at high altitude airfields with airfield pressure altitudes above 8,000 feet and up to 9,600 feet for its Regional Jets – Models CL-600-2C10, - 2D15, and –2D24. Section 25.841(b)(6) requires crew warning indication when the cabin pressure altitude exceeds the safe or preset pressure differential and cabin pressure altitude limits are exceeded. This regulation states that the warning required for cabin pressure altitude limits may be met if the warning is set for 10,000 feet. Use of this accepted setting for operations into and out of certain high altitude airports would result in nuisance altitude warning during takeoffs and landings. To prevent unacceptable nuisance cabin pressure altitude cautions and warnings to the flight crew, BA proposes to modify the Regional Jet’s Cabin Pressurization Control System (CPCS) to reset the maximum thresholds for the cabin pressure altitude cautions to 10,100 feet and the warnings to 11,600 feet when operating in the high altitude airfield mode – HI Mode.

Current § 25.841 (a) regulatory language states,

(a) “Pressurized cabins and compartments to be occupied must be equipped to provide a cabin pressure altitude of not more than 8,000 feet at the maximum operating altitude of the airplane under normal operating conditions”.

Current § 25.841 (b)(6) regulatory language also states,

“Warning indication at the pilot or flight engineer station to indicate when the safe or preset pressure differential and cabin pressure altitude limits are exceeded. Appropriate warning markings on the cabin pressure differential indicator meet the warning requirement for

pressure differential limits and an aural or visual signal (in addition to cabin altitude indicating means) meets the warning requirement for cabin pressure altitude limits if it warns the flight crew when the cabin pressure altitude exceeds 10,000 feet”.

Regulation(s) requiring an ELOS

§ 25.841 (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)**

The design changes of the cabin pressure control system regarding high airfield operation include two main areas:

Pressurization system control logic change in automatic mode in order to ensure that cabin is depressurized on landing and that cabin altitude is at or below 8,000 feet when aircraft is at maximum operation altitude. This was achieved by a raise in cabin altitude rate limits and cabin altitude control logic changes.

Caution and warning thresholds change in order to preclude nuisance messages during normal system operation into and out of high airfields. Also, a new EICAS message has been introduced to advise the flight crew that the system is operating in “high airfield” mode with higher than nominal warning threshold.

The latter change raised the existing “Cabin Alt” caution and warning thresholds from their nominal values of 8,500 feet and 10,000 feet, respectively, to new variable values which are dependent on the landing elevation selection by the pilot. These new values are 500 feet above the landing elevation selection for the caution and 2,000 feet for the warning. These values can not exceed 14,500 feet for the caution and warning regardless of the landing elevation selection.

The new pressurization system control and indication logic described above will be activated only when the aircraft is operating into and out of high altitude airfields and thus for a limited period of the time. During other operations the system will operate per nominal control and caution and warning indication logic..

Selection of a landing elevation higher than 8,000 feet during descent or departure airport elevation higher than 8,000 feet activates the “high airfield” mode and the changes described above.

The system will revert to “nominal” mode when the aircraft altitude has reached 6,000 feet above departure airfield or 10 minutes have elapsed from Weight-Off-Wheels, whichever comes first, following take-off from a high airfield.

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

a. With respect to an indication system, the FAA requires that there should be some kind of visual means (light or CAS message) to inform the flight deck crewmembers when the shift to the higher altitude-warning mode occurs and the reversion back to the 10,000 feet warning mode occurs so they are aware that they may be exposed to cabin altitudes up to 14,500 feet without warning. Also, where the shift of altitude warning is automatic, there should be an aural or visual annunciation to alert crews to take action should the automatic function fail.

b. The FAA also requires that:

(1) Decompression data and/or physiological data for the proposed cabin pressure control and warning to substantiate that a cabin warning at 14,500 feet cabin altitude provides an acceptable level of safety for the flight crew in the event of a rapid decompression while operating in the high altitude mode.; or

(2) FAA- approved AFM normal operating procedure that requires at least one flight crew member wear and use an oxygen mask for the portion of the flight during which the cabin altitude warning limit has shifted above 10,000 feet

Bombardier's position is that the requirements of a. and b.(2) are satisfied with the system design submitted under Modsum 670T-82357 and the revised AFM submissions: RS-94, RS-139, TR RJ 700/98, TR RJ 900/65 submitted January 9, 2007 under BA letter AW-CRJ/07/18.

**FAA approval and documentation of the ELOS**

The FAA has approved the aforementioned Equivalent Level of Safety Finding addressed in issue paper S5 approved by Transport Airplane Directorate on January 24, 2007. This memorandum provides standardized documentation of the ELOS that is non-proprietary and can be made available to the public. The Transport Airplane Directorate has assigned a unique ELOS Memorandum number 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.

Equivalent Safety Findings have been made for the following regulation(s): §25.841 (b)(6) Crew Warning Indications documented in TAD ELOS Memo AT2587NY-T.

Original signed by  
*Neil N. Schalekamp*

1-31-07

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Manager, Transport Standards Staff,  
Propulsion/Mechanical Systems Branch, ANM-112

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Date

ELOS Originated by NYACO:	Name Dan Parrillo	Routing Symbol ANE-172
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