Federal Aviation Administration

Memorandum

Date: March 18, 2008

To: Manager, Small Airplane Directorate, ACE-100

From: Manager, Wichita Aircraft Certification Office, ACE-115W

Prepared by: Anthony Flores, ASE (Mechanical Systems), ACE-116W

Subject: Equivalent Level of Safety for 14 CFR 23.841(b)(6) – Cabin Pressurization for High Altitude Takeoff and Landing Operations

Finding No. ACE-08-03

This memorandum requests your office to review and provide concurrence with the proposed equivalent level of safety for the cabin pressurization for high altitude takeoff and landing operation requirements of § 23.841(b)(6) of 14 CFR Part 23.

BACKGROUND:

Cessna Aircraft Company intends to certify the Model 525C CJ4 for takeoff and landing at airports up to 14,000 feet elevation. 14 CFR 23.841(b)(6) requires crew warning indication when cabin pressure altitude exceeds 10,000 feet. Without special design features, altitude warnings would occur which would be an unacceptable nuisance for normal operations. Cessna, therefore, has designed a cabin environmental and pressurization control system that inhibits cabin pressure altitude warnings under specific conditions for these high altitude operations. Cessna requests an equivalent level of safety finding to allow approval of this design feature.

This request was coordinated within the Federal Aviation Administration by Issue Paper SM-2.

APPLICABLE REGULATIONS:

The Cessna Model 525C will be certified in the Commuter Category to the certification basis of 14 CFR Part 23 as amended through Amendment 55.

REGULATION REQUIRING AN ELOS:

In considering the current design, the applicant has requested an ELOS for the pressurization requirements of § 23.841(b)(6) of 14 CFR, part 23 and the FAA has determined that an appropriate level of safety can be provided by the issuance of an ELOS, in accordance with the provisions of 14 CFR, part 21, § 21.21(b)(1).

14 CFR §23.841(b)(6) requires that;
(b) Pressurized cabins must have at least the following valves, controls, and indicators, for controlling cabin pressure:

> (6) Warning indication at the pilot station to indicate when the safe or preset pressure differential is exceeded and when a cabin pressure altitude of 10,000 feet is exceeded.

DESCRIPTION OF COMPENSATING FEATURES:

From Cessna letter L390-08-0270
Compensating factors, which Cessna believes would provide an equivalent level of safety to the requirements of 14 CFR 23.841(b)(6), as required by 14 CFR 21.21(b)(1), for the Model 525C are as follows:

> 1) The high cabin altitude warning is reset to occur simultaneously with the automatic passenger oxygen mask deployment. The automatic passenger oxygen masks deploy feature has been set to occur at 14,800 ± 200 feet.
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> 2) For takeoff from a field pressure altitude above 8000 feet, the high cabin altitude warning reverts to the original setting of 9800 ± 200 feet when the aircraft altitude exceeds 24,500 feet or the cabin altitude decreases below 8000 feet. For landing when the selected landing field altitude is above 8000 feet, the high cabin altitude warning will be reset from the original setting of 9800 ± 200 feet to 14,800 ± 200 feet when the aircraft descends below 24,500 feet.
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> 3) The Model 525C crew alerting system is designed to provide a cyan advisory message to the crew with the aircraft below 25,000 feet, the cabin altitude above 10,000 feet, and the aircraft takeoff field altitude or selected landing field altitude above 8,000 feet. An amber caution is provided to the crew after 30 minutes of flight operation in this condition. The airplane Flight Manual (AFM) will include instructions that when the caution is annunciated that the pilot is required to begin continuous oxygen use, which shall continue until the annunciation is extinguished.
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> 4) The maximum cabin altitude climb and dive rates are increased for high altitude airfield operation to minimize the amount of time the cabin is above 8,000 feet while the aircraft is above 24,500 feet. The cabin rates are modified as function of airfield elevation. At airfields of 9,500 feet and below, the normal maximum +600/-500 feet/minute is retained. When operating out of a 14,000 foot airfield, the maximum rates increase to +2,500/-1,500 feet/minute. Between these two altitudes, the maximum cabin rates are linearly proportional to the end points.

5) When landing at an airport between 8,000 feet and 14,000 feet, the cabin pressure altitude will not exceed 8,000 feet prior to the aircraft descending below 24,500 feet.

6) The outflow valves incorporate a pneumatic cabin pressure altitude limit feature that will override any other control limit. The altitude limiters are set to 14,300 ± 300 feet. This allows operation at airfields up to 14,000 feet with no residual cabin pressure controlled by the maximum altitude limiters.

EXPLANATION OF COMPENSATING FEATURES:

The intent of 14 CFR §23.841(b)(6) is to warn the crew when the safe or preset cabin pressure altitude limit is exceeded. The system features described previously are designed to meet this intent. Therefore, Cessna believes the features provided by the Model 525C cabin pressure control system provide an equivalent level of operational safety to meet the intent of 14 CFR §23.841(b)(6).

ACO RECOMMENDATION:

The FAA concurs with the applicant's position that the intent of 14 CFR 23.841(b)(6) is to warn the crew when the safe or preset cabin pressure altitude limit is exceeded. The system features described above are designed to meet this intent. The FAA has previously granted equivalent level of safety to other airplanes with similar operating characteristics and features.

The compensating features and procedures noted in this memo will provide an equivalent level of safety to the requirements of 14 CFR 23.841(b)(6) at Amendment 23-55, upon successful completion of required tests, and completing a compliance inspection and compliance substantiation documentation.

Concurrence:

Todd G. Dixon *3/14/08*

Acting Manager, Wichita Aircraft Certification Office, ACE-115W Date

John Colomy *3/18/08*

Manager, Standards Office, ACE-110 Date

John Colomy *3/18/08*

Acting Manager, Small Airplane Directorate, Date
Aircraft Certification Service, ACE-100