



Federal Aviation Administration

Memorandum

Date: June 1, 2007

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 to § 23.841(a) & § 23.1301(d); Cessna, Model 510;
ACE-07-03

This memorandum requests your office to review and provide concurrence with the proposed finding of equivalent level of safety to the pressurization requirements of § 23.841(a) and § 23.1301(d) of 14 CFR, part 23.

BACKGROUND:

Cessna letter L390-06-3575, dated November 6, 2006, requested a finding of an Equivalent Level of Safety (ELOS) for the Cessna Model 510 with regards to the cabin pressure control system as specified in 14 CFR 23.841(a) and 14 CFR 23.1301(d). The Model 510 has been approved for brief cabin transient overshoots above 15,000 ft cabin altitude following a single failure of the Cabin Pressure Control System per ELOS ACE-05-28. However, additional cabin transient overshoots after stabilization below 15,000 ft following the initial failure were not envisioned as part of that ELOS.

This request was coordinated within the Federal Aviation Administration by Issue Paper ME-7.

APPLICABLE REGULATIONS:

The Model 510 certification basis is 14 CFR part 23 as amended through Amendment 54.

REGULATIONS REQUIRING AN ELOS:

In considering the current design, the applicant has requested an ELOS for the pressurization requirements of § 23.841(a) and § 23.1301(d) 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(a) requires that; *“If certification for operation over 25,000 feet is requested, the airplane must be able to maintain a cabin pressure altitude of not more than 15,000 feet in event of any probable failure or malfunction in the pressurization system.”*

14 CFR § 23.1301(d) requires that; *“Each item of installed equipment must function properly when installed.”*

DESCRIPTION OF COMPENSATING FEATURES:

From Cessna letter L390-06-3575

Compensating factors that will provide an equivalent level of safety to the requirements of 14 CFR 23.841(a) and 14 CFR 23.1301(d), as required by 14 CFR 21.21(b)(1), for the Model 510 are outlined in the following:

1. The stabilized CPA on Model 510 is set to be at least 400 ft below the limit of 15,000 ft specified by 14 CFR 23.841(a). The altitude limiter setting for Model 510 is 14,300 ± 300 ft.
2. For all test cases, the cabin altitude was controlled within the altitude limiter setting below 15,000 ft after a brief transient overshoot above 15,000 ft. Transient overshoots above 15,000 ft were mild, reaching 15,820 ft for very rapid ascents, and lower altitudes for slower ascents.
3. The cabin altitude limiter for the Model 510 is a reliable proven design used for many years in other Cessna models.
4. The effects of the brief cabin altitude overshoot are compensated for by the comparatively low altitude limiter setting. Review of physiological data contained in FAA Advisory Circular (AC) 25-20 and AC 61-107A, and SAE AIR822 and AIR825B shows the severity of hypoxia effects increase progressively with increasing CPA and duration of exposure. The effects are cumulative. Rate of onset and severity of symptoms increase in proportion to increase in CPA. Conversely, severity of hypoxia effects decrease in proportion to decrease in CPA.
5. CPA climb to the setting of the cabin altitude limiters will be accompanied by warning annunciation of excessive cabin altitude above 10,000 ft as required by 14 CFR 23.841(b)(6) for normal operation, warning annunciation above 15,000 ft as permitted by ELOS ACE-05-11, and auto-deploy of the passenger oxygen masks before 15,000 ft. AFM procedures require the flight crew to don their oxygen masks, ensure oxygen is provided to the passengers, and initiate an emergency descent. This prevents the brief exposure of the occupants to CPA above 15,000 ft from being a hazard.
6. AFM procedures following voluntary or involuntary depressurization mandate landing as soon as possible, which would not normally involve a climb after descending below 15,000 ft.

EXPLANATION OF COMPENSATING FEATURES:

The intent of 14 CFR 23.841(a) is to prevent exposure of the occupants to a CPA that could prevent the flight crew from safely flying and landing the aircraft, or cause permanent physiological injury to the occupants. While the design and tested performance of the Model 510 CPCS failed to meet this rule in certain operations, it did so only briefly and subjected crew

and passengers to only mild transient pressure excursions before recovery to its proper limiter setting. Therefore, it is believed that the features provided by the Model 510 CPCS provide an equivalent level of safety to that specified by 14 CFR 23.841(a) and 14 CFR 23.1301(d).

ACO RECOMMENDATION:

The design features and procedures noted in the Cessna position will provide an equivalent level of safety to the requirements of 14 CFR § 23.841(a) and 14 CFR § 23.1301(d) at Amendment 23-54.

Concurrence:

<i>/s/ Margaret Kline</i>	<i>4/25/07</i>
_____ Manager, Wichita Aircraft Certification Office, ACE-115W	_____ Date

<i>/s/ John Colomy</i>	<i>5/29/07</i>
_____ Manager, Standards Office, ACE-110	_____ Date

<i>/s/ John Colomy for</i>	<i>6/1/07</i>
_____ Manager, Small Airplane Directorate, Aircraft Certification Service, ACE-100	_____ Date