



# Federal Aviation Administration

---

---

## Memorandum

Date: June 28, 2011

To: Manager, Atlanta Aircraft Certification Office, ACE-115A

From: Manager, Transport Airplane Directorate, ANM-100

Prepared by: Gerald Avella, ACE-119A

Subject: INFORMATION: Equivalent Level of Safety Finding on Cabin Altitude Warning System for Operations into High Altitude Airports for Gulfstream Model GVI Series Aircraft (FAA Project Number TC8700AT-T)

Memo No: TC8700AT-T-S-23

Reg. Ref: Sections 21.21(b)(1); 25.841(a)(b)(6); and 25.1447(c)(1)

---

---

The purpose of this memorandum is to inform the certificate management office and 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 Gulfstream Model GVI series aircraft.

### **Background**

Gulfstream intends to certify the Model GVI series airplane for takeoff and landing at airports with elevations up to 15,000 feet. Per Title 14, Code of Federal Regulations (CFR) 25.841(a), under normal operating conditions, the cabin pressure altitude cannot exceed 8,000 feet. 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 the warning requirement 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, airports at elevations exceeding 10,000 feet would result in nuisance altitude warnings during takeoffs and landings. Gulfstream has designed a system that changes the cabin pressure altitude warning limit under specific conditions for these high altitude airport operations and requested an equivalent level of safety to allow a cabin pressure altitude warning that annunciates at cabin pressure altitudes greater than 10,000 feet.

**Applicable regulations:**

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

**Regulations 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 needed for equivalency)**

The cabin pressure altitude must equal the airport elevation during departure or landing. Gulfstream has designed a cabin pressure control system, a cabin altitude warning system with multiple cabin altitude warning limits, and associated flight deck indications for high altitude operations, that allow takeoffs and landings at airport elevations between 9,500 feet and 15,000 feet for Model GVI series airplanes.

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

Gulfstream provides various distinct settings for the cabin altitude warning requirements based on field elevation as follows:

For high field elevation, during ground operation, takeoff and climb, the cabin pressure low warning can start as high as 16,000 ft (field elevation + 1000 ft) and is reset in increments towards 8,000 ft as the cabin altitude decreases. During descent the cabin pressure low warning is reset according to the landing field elevation (LFE) selected.

<b>Landing Field Elevation</b>	<b>Cabin Altitude for “Cabin Pressure Low” Warning CAS Message</b>
Less than or equal to 7,500 feet	≥ 8,000 feet
7,500 < LFE ≤ 9,500 feet	≥ 10,000 feet
9,500 < LFE ≤ 14,000 feet	≥ 14,500 feet
Greater than 14,000 feet	≥ 15,500 feet

The additional 15,500-ft set point provides a 500-foot margin above maximum LFE to account for the system tolerances and will prevent nuisance warnings. A blue crew alerting system message “Cabin Alt Alert Exceeds 10K” will display anytime the cabin pressure low warning is set above 10,000 ft.

The airplane flight manual will inform the pilots that the cabin pressure low warning is reset as a function of the LFE. It will also denote that one pilot must wear and use an oxygen mask during ground operation and during climb from, and descent into an airport where the field elevation is greater than 9,500 ft. If departing an airport where the cockpit crew was required to use supplemental oxygen, the crew will continue to do so until the cabin altitude rate of change is zero or the airplane altitude exceeds 34,000 feet. The cockpit flight crew shall utilize supplemental oxygen any time the cabin altitude is 10,000 feet or higher. When the landing field elevation is higher than 9,500 feet, one pilot shall use oxygen from the top of descent until landing and the shutdown checklist is completed.

## FAA approval and documentation of the ELOS

The FAA has approved the aforementioned ELOS finding in project Issue Paper S-23. This memorandum provides standardized documentation of the ELOS 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 the ELOS. This ELOS memorandum number should be listed in the Type Certificate Data Sheet under the Certification Basis section (Type Certificates & Amended Type Certificates). An example of an appropriate statement is provided below.

Equivalent Safety Findings have been made for the following regulation(s):  
§25.841(b)(6), "Pressurized Cabins" (documented in TAD ELOS Memo TC8700AT-T-S-23).

Original Signed by

*Robert Jones* for Victor Wicklund

June 30, 2011

---

Manager, Transport Airplane Directorate,  
Aircraft Certification Service

Date

ELOS Originated by ACO:	Gerald Avella	ACE-119A
-------------------------	---------------	----------