



# Federal Aviation Administration

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## Memorandum

Date: November 20, 2015

To: Manager, Boeing Aviation Safety Oversight Office, ANM-100B

From: Manager, Transport Airplane Directorate, ANM-100

Prepared by: Robert Kaufman, ANM-150S

Subject: INFORMATION: Equivalent Level of Safety (ELOS) Finding for Passenger and Large Cargo Door Indication on the Boeing Model 787-8, Project Nos. PS06-0413, 787-9, Project Nos. PS06-0496 and PS06-0497, and 787-10, Project Nos. PS13-0546 and PS14-1031

ELOS Memo No.: PS06-0413-CS-25

Regulatory Reference: § 25.783

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This memorandum informs the certificate management 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 Boeing Model 787 series airplane.

This memo is being revised to extend this ELOS as being applicable to the Boeing Model 787-10 airplane.

### Background

The warning, caution and advisory indications of Title 14, Code of Federal Regulation (14 CFR) 25.783(e)(2) require that:

There must be a positive means clearly visible from each operator station for any door that could be a hazard if unlatched to indicate if the door is not fully closed, latched and locked.

Advisory Circular (AC) 25.783-1A discusses a compliance approach for § 25.783(e)(2):

1. A single indication that directly monitors the door in the closed, latched and locked conditions should be provided, unless the door operator has a visual indication that the door is fully closed, latched and locked. This indication should be obvious to the door operator.

2. For example, a vent door or indication light that monitors the door locks and is located at the door operator's station may be sufficient.

The rule follows the darkened flight deck approach for indication. In other words, a safe condition is when there are no indication lights illuminated. Therefore the rule requires that the light come on and indicate when the door *is not* closed, latched and locked.

Boeing has chosen to use indicator lights at the passenger and large cargo door operator's stations. The difference in their design approach vs. what the rule requires is that a green indication light comes on when the door *is* closed, latched and locked, rather than a light when it is not.

### **Applicable regulation(s)**

§ 25.783

### **Regulation(s) requiring an ELOS finding**

§ 25.783(e)(2)

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

#### Passenger Door:

The design of the green indication light provides an ELOS with the regulatory requirements of § 25.783(e)(2) based on the following:

- Section 25.783(e)(3), which describes passenger door indication on the flight deck, is written similarly to § 25.783(e)(2) in that they both require an indication/signal if a given door *is not* fully closed, latched and locked.
  - In using a dark flight deck concept, one configuration that could be found compliant to § 25.783(e)(3) is one that has an *absence* of indication in the flight deck for a given door that *is* closed, latched and locked. Conversely, if the same door *is not* closed, latched and locked, then it is appropriate to display a *positive* indication.
  - With no such need for a “dark” door area for the 787 passenger door, illumination of the green indication light provides a *positive* means to confirm that the door *is* indeed closed, latched and locked.
- Either approach relies to some extent on operator awareness and understanding of provided indications. In the case of the proposed Boeing design, the indication light illuminates only when the door *is* closed, latched and locked; any condition where the door *is not* closed, latched and locked, will indicate the same as would a failed light.

### Large Cargo Door:

The Boeing 787 model large cargo door follows the same philosophy and provides the following means to indicate whether or not the door is fully closed, latched and locked:

1. Amber “READY TO LOCK” light illuminates when the door is closed and latched and extinguishes when the door is fully locked.  
*Illuminated = fully closed and latched but not fully locked.*  
*Extinguished after illumination during door closure = fully closed, latched and locked.*
2. Green “CLOSED AND LOCKED” light illuminates only when the door is fully closed, latched and locked.  
*Illuminated = fully closed, latched and locked*  
*Extinguished = not fully closed, latched and locked*
3. Vent door moves from open to closed, during the locking operation, after the door is locked.  
*Open = not fully locked*  
*Closed = fully locked*

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

The design approach presented by Boeing to meet the door indication requirement does not directly meet the rule, but it does accomplish the goal of notifying the door operator of the door status. The key is whether having a light illuminate when the door is closed, latched and locked is equivalent to the requirement to warn an operator that the door *is not* fully closed, latched and locked.

The regulation was written to follow the darkened flight deck approach that indicates a safe condition when there are no warning lights illuminated. Therefore, every time a door operator closes the door they can be assured that it is fully closed, latched and locked if no indication lights illuminate. This approach depends on the indication being available, considering power available in the case of a light.

With the Boeing design, the door operator must see a green light after every door closing to assure that the door is closed, latched and locked. If power is lost or the bulb fails, the operator will not get the expected indication. This compensates for not literally meeting the rule in that it will cause the operator to assume the door is not properly closed, latched and locked until the system is fixed and they see the expected indication. This design has compensating features that, while not directly meeting the rule requirements, provide an ELOS in accordance with § 21.21(b)(1).

### **FAA approval and documentation of the ELOS finding**

The FAA has approved the aforementioned ELOS finding in project Issue Paper CS-25 or Administrative Collector Issue Paper G-6. 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 this ELOS. This ELOS Memorandum number should be listed in the type certificate data sheet under the Certification Basis section. An example of an appropriate statement is provided below.

Equivalent Level of Safety Findings have been made for the following regulation(s):  
 § 25.783(e)(2) Fuselage Doors (documented in TAD ELOS Memo PS06-0413-CS-25)

Todd Malin For Suzanne Masterson      11/25/15  
 Transport Airplane Directorate,      Date  
 Aircraft Certification Service

ELOS Originated by ACO:	Project Engineer Robert Kaufman	Routing Symbol ANM-150S
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