



Federal Aviation Administration

Memorandum

Date: April 7, 2016

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

From: Manager, Transport Airplane Directorate, ANM-100

Prepared by: Thomas Thorson, ANM-100B

Subject: INFORMATION: Equivalent Level of Safety (ELOS) Finding for Pressure Fueling System – Automatic Refueling Shutoff System Check Function on Boeing Model 737-600/-700/-800/-900/-900ER, FAA Project Number AT0328SE-T, and Model 737-7/-8/-9 Airplanes, FAA Project Numbers PS12-0037, PS12-0038, PS12-0039

ELOS Memo#: AT0328SE-T-P-5

Regulatory Ref: § 25.979(b)(1)

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 737-600/-700/-800/-900/-900ER (737NG) and Model 737-7/-8/-9 (737 MAX) airplanes.

Background

Title 14, Code of Federal Regulations (14 CFR) 25.979 provides specific design requirements for pressure fueling systems which are intended to ensure that the airplane has multiple layers of protection against overpressure conditions which could damage the airplane structure or the fuel system. A multiple layer fail safe philosophy is applied to pressure fueling systems because of the potential for damage due to overpressure conditions remaining undiscovered until a significant fuel leak or structural failure occurs.

The primary means of protection against overpressure is the automatic shutoff means required by § 25.979(b). The requirement in § 25.979(b)(1) for the ability to check the automatic shutoff means is intended to ensure that the automatic shutoff means will be available if it is needed. The first backup feature for the automatic shutoff means is the indication of the failure of the shutoff means which is required by § 25.979(b)(2). The indication is intended to warn the person fueling the airplane that the maximum allowable fuel quantity has been exceeded. The second

backup feature is the means to prevent damage to the fuel system in the event of a failure of the automatic shutoff means required by § 25.979(c). Section 25.979(c) is usually met by sizing the fuel tank vent system to accommodate the maximum pressure fueling flow rate while maintaining system pressures within limits, or by providing an overboard relief valve which performs the same function.

The Model 737NG and 737 MAX airplanes pressure fueling system design allows the checking of most elements of the automatic refueling shutoff system, but does not allow checking of a switch which initiates the signal to shut off the fuel when the maximum fuel quantity allowed in the tank is reached. Therefore, the proposed automatic refueling shut-off system does not directly comply with § 25.979(b)(1).

Applicable regulations

§ 25.979(b)(1)

Regulations requiring an ELOS finding

§ 25.979(b)(1)

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

The Model 737NG and 737 MAX airplanes will feature an automatic refueling system that is similar to previous Model 737 airplanes. The refueling system provides an automatic shutoff system, a check function for that system, indication when that system fails, and a fuel tank vent system that is sized to prevent structural damage in the event that the shutoff system fails and pressure fueling is continued. Boeing stated the reliability, fail-safe design of the refueling system, and proven service history on Boeing Model 737 airplane models demonstrates a level of reliability that provides an ELOS.

Explanation of how design features or alternative standards provide an ELOS to that intended by the regulations

The FAA recognizes that the automatic refueling shutoff system design for the Model 737NG and 737 MAX airplanes is similar to the system on previously approved Model 737-200/-300/-400/-500 (737CL) airplanes. In addition, the FAA agrees that the switch that signals shutoff of the fuel has been very reliable in service. A finding of equivalent safety to § 25.979(b)(1) is therefore considered to be warranted based on the following:

- a. the requirement of § 25.979(b)(1) is met for all parts of the automatic shutoff system except for the float switch,
- b. the switch has been highly reliable in service on Boeing Model 737CL and 737NG airplanes, indicating that the existing part design and maintenance procedures are mature, and

- c. the indication feature and fail safe features required by other paragraphs of § 25.979 will prevent structural damage and fuel system damage if the automatic refueling shutoff system fails to shut off refueling due to a float switch failure.

FAA approval and documentation of the ELOS finding

The FAA made the ELOS finding for the 737NG in Issue Paper P-5 and for the 737 MAX in Issue Paper G-6. This memorandum provides standardized documentation of the ELOS finding that is non-proprietary and can be made available to the public. The TAD has assigned a unique ELOS memorandum number (see front page) based on the original ELOS made for the 737NG to facilitate archiving and retrieval of this ELOS finding. This ELOS memorandum number should be listed in the type certificate data sheet under the Certification Basis section in accordance with the statement below:

Equivalent Level of Safety Findings have been made for the following regulation(s):

§ 25.979(b)(1) Pressure Fueling System

(Documented in TAD ELOS Memorandum AT0328SE-T-P-5)

Original Signed by

Jon Regimbal

Transport Airplane Directorate,
Aircraft Certification Service

May 16, 2016

Date

ELOS Originated by Boeing Aviation Safety Oversight Office	BASOO Manager: John Piccola	Routing Symbol: ANM-100B
---	--------------------------------	-----------------------------