



Federal Aviation Administration

Memorandum

Date: December 20, 2013

To: Manager, International Branch, ANM-116

From: Manager, Transport Airplane Directorate, ANM-100

Prepared by: Mike Dostert, ANM-112

Subject: INFORMATION: Equivalent Level of Safety (ELOS) Finding for Engine Fuel Shutoff Valve Indication on a Model EMB-550 airplane, FAA Project # TC0717IB-T

ELOS Memo #: TC0717IB-T-P-26

Regulatory Ref: §§ 21.21(b)(1), 25.1141(f)(2)

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 Model EMB-550 airplane.

Background

Embraer requested an ELOS to the requirements in Title 14, Code of Federal Regulations (14 CFR) 25.1141(f)(2)(ii), which requires that powerplant valve controls located in the flight deck indicate to the flight crew when the valve has not responded as intended to the selected position or function. The Embraer Model EMB-550 airplane does not provide a direct indication when there is a failure in the engine shutoff valve.

Applicable regulation(s)

§ 21.21(b)(1), 25.1141(f)(2)

Regulation(s) requiring an ELOS finding

25.1141(f)(2)

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 intent of § 25.1141(f)(2)(ii) is to indicate to the flight crew when the engine shutoff valve has not responded as intended to the selected position or function and provide an opportunity for the flight crew to shut off fuel flow by closing the airframe valve through the fire button control when the engine mounted shutoff valve fails to respond to the commanded position or function.

The Embraer Model EMB-550 airplane has two Honeywell AS907-3-1E engines manufactured by Honeywell. There is no sensor to monitor the actual position of the engine fuel shutoff valve and therefore there is no specific indication in the cockpit for this valve position. The engine shutdown is a function of the engine full-authority digital electronic control (FADEC) and its command is provided by the start/stop switch in the cockpit. With an engine stop command, the engine electronic control unit (ECU) commands the fuel shutoff valve to close. One second after the fuel shutoff valve command, the ECU commands the fuel metering valve to close.

The accomplishment of the engine shutdown command can be verified by the engine spool down (N1, N2, and ITT decreasing). Failure of the fuel shutoff valve to shut the engine down can be detected by the FADEC and will be annunciated to the flight crew.

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

The Embraer Model EMB-550 engine control system automatically commands the fuel metering valve to close one second after the engine fuel shutoff command. Therefore in the case of an engine fuel shutoff valve failure, the engine control system acts in the place of the flight crew to prevent hazardous effects of an engine fuel shutoff valve failed open or partially open. The compensating feature to accomplish the commanded engine shutdown by the start/stop switch without flight crew action, in the case of an engine fuel shutoff valve failure, is considered acceptable to establish an ELOS to the requirements in § 25.1141(f)(2).

FAA approval and documentation of the ELOS finding

The FAA has approved the aforementioned ELOS finding in project Issue Paper P-26, titled Engine Fuel Shutoff Valve Indication. 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) 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):
§ 25.1441(f)(2) Powerplant Controls and Accessories
(documented in TAD ELOS Memo TC0717IB-T-P-26)

Original Signed By

Victor Wicklund

Transport Airplane Directorate,
Aircraft Certification Service

December 20, 2013

Date

ELOS Originated by: International Branch	Program Manager: Cindy Ashforth	Routing Symbol: ANM-116
---	---------------------------------	----------------------------