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SAFO

Safety Alert for Operators

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A SAFO contains important safety information and may include recommended action. Besides the specific action recommended in a SAFO, an alternative action may be as effective in addressing the safety issue named in the SAFO. The contents of this document do not have the force and effect of law and are not meant to bind the public in any way. This document is intended only to provide clarity to the public regarding existing requirements under the law or agency policies.

Subject: Boeing 737-8 and 737-9 Airplanes: Return to Service.

Purpose: This SAFO provides information and recommendations to domestic and foreign operators regarding the return to service of Boeing 737-8 and 737-9 airplanes (referred to collectively as the 737 MAX) and the changes that have been made to the 737 MAX aircraft design, Aircraft Maintenance Manuals (AMM), Fault Isolation Manual (FIM), Component Maintenance Manual (CMM), Maintenance Review Board Report (MRBR), and the Master Minimum Equipment List (MMEL).

Background: Accidents. On October 29, 2018, a Boeing 737-8 airplane operated by Lion Air (Lion Air Flight 610) was involved in an accident after takeoff from Soekarno-Hatta International Airport in Jakarta, Indonesia, resulting in 189 fatalities. Investigation of the accident has been completed by the Indonesian Komite Nasional Keselamatan Transportasi (KNKT) with assistance from the National Transportation Safety Board (NTSB) and the Federal Aviation Administration (FAA) of the United States, the manufacturer, and the operator. Reports from the accident investigation indicate that the airplane's flight control system generated repeated airplane nose-down horizontal stabilizer trim commands, contributing to the accident.

On March 10, 2019, a Boeing 737-8 airplane operated by Ethiopian Airlines (Ethiopian Airlines Flight 302) was involved in an accident after takeoff from Addis Ababa Bole International Airport in Addis Ababa, Ethiopia, resulting in 157 fatalities. The accident is under investigation by the Ethiopian Accident Investigation Bureau (EAIB) with assistance from the NTSB and the FAA of the United States, the French Bureau of Enquiry and Analysis for Civil Aviation Safety (BEA), the European Union Aviation Safety Agency (EASA), the manufacturer, the operator, and the Ethiopian Civil Aviation Authority (ECAA).¹

¹ Refer to Ethiopian Aircraft Accident Investigation Preliminary Report AI-01/19, dated March 2019, and the Ethiopian Interim Investigation Report of accident MAX-8-ET-AVJ, ET-302, dated March 2020 available at <https://www.regulations.gov/document?D=FAA-2020-0686-0002>.

The data from the flight data recorders, as summarized in reports of the Ethiopian Airlines Flight 302 accident and the Lion Air Flight 610 accident, indicated that if a single erroneously high angle of attack (AOA) sensor input is received by the flight control system, the Maneuvering Characteristics Augmentation System (MCAS) can command repeated airplane nose-down trim of the horizontal stabilizer. This unsafe condition, if not addressed, could cause the flightcrew to have difficulty controlling the airplane, and lead to excessive airplane nose-down attitude, significant altitude loss, and impact with terrain.

Airplane Design Changes. In response to the KNKT and EAIB findings, Boeing developed a new flight control computer (FCC) software version P12.1.2 and other changes to address the unsafe condition on the 737 MAX airplanes.

Airworthiness Directive (AD). The FAA issued AD 2020-24-02 mandating the corrective action necessary to address the unsafe condition and allow for the return to service of U.S.-registered Boeing 737 MAX airplanes affected by the Emergency Order of Prohibition issued by the FAA on March 13, 2019.² The FAA further notes that, since the issuance of the emergency order, the FAA has issued a number of other ADs affecting 737 MAX airplanes. A listing of all ADs affecting 737 MAX airplanes can be found at <https://rgl.faa.gov/>.

Discussion: The discussion below summarizes the changes affecting 737 MAX maintenance documents.

AMM Changes. Boeing has revised the 737 MAX AMM and provided information to support operators' return to service preparations. The FAA recommends that all 737 MAX operators review and adhere to aircraft de-preservation tasks to ensure the safe return to service. Special emphasis should be placed on associated engines, auxiliary power units (APU), batteries, pitot static systems, and fuel systems. The revised AMM System Description section includes a description of the MCAS implemented by the new FCC software. The Practices and Procedures section includes revised procedures for maintaining the new MCAS. See section 22-11 of the AMM.

NOTE: Operators of the Boeing 737 MAX airplane should review the changes to AMM System Description Sections for the MCAS.

Fault Isolation Manual (FIM) Changes. Boeing has revised the 737 MAX FIM to support troubleshooting and maintaining the new MCAS implemented by the new FCC software. See sections 22-11 and 22-13 of the FIM.

Component Maintenance Manual (CMM) Changes. Collins Aerospace revised the AOA Sensor (0861FL) CMM. Revisions include changes to the instructions for a calibration test and test equipment setup. Repair stations and operators performing repair of Boeing 737 MAX AOA sensors should adhere to the most current CMM procedures when accomplishing maintenance, repair, and calibration of AOA sensors.

² The Emergency Order prohibited the operation of Boeing Company Model 737-8 and Boeing Company Model 737-9 airplanes by U.S.-certificated operators and the operation of Boeing Company Model 737-8 and Boeing Company Model 737-9 airplanes in the territory of the United States.

Maintenance Review Board Report (MRBR). For scheduled periodic maintenance, a new Maintenance Review Board (MRB) task is included in the FAA's approved MRBR as Item 22-011-00, Operational Check of the MCAS Discrete to Verify the Integrity of MCAS.

Minimum Equipment List (MEL) Changes. In accordance with AD 2020-24-02, the FAA is requiring changes to the MEL for operators of U.S.-registered 737 MAX airplanes. Operators of foreign-registered 737 MAX airplanes should update their MEL in coordination with the appropriate Civil Aviation Authority. All operators should refer to AD 2020-24-02 for specific details of required MEL changes. The FAA has revised the Boeing 737 MAX MMEL to reflect these changes.

Recommended Action: Domestic and foreign operators of Boeing 737 MAX airplanes should be familiar with the content of this SAFO and referenced materials. In addition to completing any actions required by AD 2020-24-02, operators of 737 MAX airplanes should incorporate all of the latest revisions of the Boeing AMM (or equivalent procedures), the latest FIM, and the latest MRBR into their maintenance and/or inspection programs, and must incorporate the latest MMEL revisions into their MEL in order to operate with the applicable items and equipment inoperative.

Contact: Direct questions or comments regarding this SAFO to the Aircraft Maintenance Division, Air Carrier Maintenance Branch, at 202-267-1675 or via email at 9-AWA-AFS-300-Maintenance@faa.gov.