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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: Pilot Training and Flight Simulation Training Devices (FSTD) Updates.

Purpose: This SAFO provides information to air carriers (domestic and foreign), operators, and training providers regarding additional pilot training needed due to The Boeing Company, Inc. implementation of design changes and Airplane Flight Manual (AFM) revisions for Boeing 737-8 and 737-9 airplanes.

Applicability: This SAFO applies to the Boeing 737-8 and 737-9 models of the Type Certificate Data Sheet (TCDS) A16WE. This SAFO will refer to these models collectively as the 737 MAX.

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.[1]

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

[1] Refer to Preliminary KNKT.18.10.35.04, Aircraft Accident Investigation Report, dated November 2018, and Final KNKT.18.10.35.04, Aircraft Accident Investigation Report, dated October 2019 which can be found at https://www.regulations.gov/document?D=FAA-2020-0686-0002.

Safety Agency (EASA), the manufacturer, the operator, and the Ethiopian Civil Aviation Authority (ECAA).[2]

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. The FAA mandated these design changes in Airworthiness Directive (AD) 2020-24-02.

AFM Changes. Boeing has developed changes to the 737 MAX AFM, including changes to the following non-normal checklists: Airspeed Unreliable, Runaway Stabilizer, Stabilizer Trim Inoperative, Speed Trim Fail, Stabilizer Out of Trim, AOA Disagree, ALT (Altitude) Disagree, and IAS (Indicated Airspeed) Disagree. The FAA mandated these AFM changes in AD 2020-24-02.

Discussion: Flight Standardization Board (FSB) and Joint Operations Evaluation Board (JOEB): The FAA Aircraft Evaluation Division convened an FSB and invited Agência Nacional de Aviação Civil (ANAC) Brazil, Transport Canada Civil Aviation (TCCA), and EASA to participate, thus forming a JOEB. The JOEB jointly evaluated the procedural changes and the pilot training proposed by Boeing for the 737 MAX airplane.

The FSB and JOEB determined that, to ensure that each pilot is adequately trained and qualified on the new procedures, special training, including ground and flight training in a full flight simulator (FFS), is necessary prior to pilots operating the 737 MAX airplane. The FSB and JOEB also identified additional special emphasis areas to be included in 737 MAX recurrent pilot training.

The FAA documented the results of the FSB evaluation in the FAA Flight Standardization Board Report The Boeing Company 737 revision 17 (737 FSB report).

737 MAX Flight Simulation Training Devices (FSTDs). Upgrades to 737 MAX FSTDs to conform to the 737 MAX changes have been developed as follows:

- Install Binary Simulation Load[3] revision 3.23.4_3, or higher.
- Ensure FCC software version P12.1.2 is active.
- Evaluate manual stabilizer trim system for proper control forces and travel as described in part 60, Appendix A, Table A1A, entry numbers 3.c. and 3.d. As described in entry number 3c., system

[2] 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.

[3] A Binary Simulation Load provides the basis for 737 MAX FFS programming and the resulting operating characteristics of the aircraft.

operation should be predicated on and traceable to the system data provided by the airplane manufacturer, original equipment manufacturer, or alternative approved data. The FAA has found Boeing Simulator Data Bulletin SDB-737-006 as an acceptable means for FSTD sponsors to validate manual stabilizer trim wheel forces. In accordance with §§ 60.11(d) and 60.25, if the forces are not adequate to meet the training objectives, the FSTD sponsor must not allow use of the FFS to conduct training on manual stabilizer trim wheel.

Recommended Action: U.S. Directors of Operations, Directors of Training, and Training Center Managers should be familiar with the content of this SAFO. They should review the FSB report and revise their 737 MAX pilot training programs in accordance with the applicable 14 CFR part. FSTD sponsors should also be familiar with the content of this SAFO to modify, test, and evaluate the 737 MAX FFSs.

Foreign civil aviation authorities, as well as foreign air carrier Directors of Operations, Directors of Training, and training providers should be familiar with the content of this SAFO. The FAA additionally recommends that these individuals review the 737 FSB report and revise their 737 MAX pilot training programs in accordance with their regulatory structure. Non-U.S. FSTD sponsors should also be familiar with the content of this SAFO so that they can modify, test, and evaluate 737 MAX FSTDs to ensure they accurately represent the redesign of the aircraft.

Contact:

- For questions on the 737 FSB report, contact the Aircraft Evaluation Division at 206-231-3950 or 9-AVS-AFS-100@faa.gov.
- For parts 91 and 125 training questions, contact the General Aviation and Commercial Division at 202-267-1100 or 9-AFS-800-Correspondence@faa.gov.
- For part 60 FFS and parts 121 and 142 training questions, contact the Air Transportation Division at 202-267-8166 or 9-AFS-200-Correspondence@faa.gov.
- For part 129 operations questions, contact the International Program Division at 202-267-0962 or 9-AWA-AVS-AFS-050@faa.gov.