Continued Airworthiness Notification to the International Community

To: Civil Aviation Authorities **Date:** August 3, 2020

From: Federal Aviation Administration (FAA)
2200 South 216th Street
Des Moines, WA 98198

Subject: This message is to advise you of the FAA's ongoing continued operational safety activities related to returning Boeing Model 737-8 and 737-9 (737 MAX) airplanes to service.

Situation description: The FAA has worked with numerous Foreign Civil Aviation Authorities, accident investigators, the National Aeronautics and Space Administration (NASA), and the U.S. Air Force to ensure that the agency's approach, evaluations, and testing are thorough and comprehensive to ensure a safe return to service of the 737 MAX.

On October 29, 2018, a Boeing Model 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.

On November 7, 2018, the FAA issued Emergency Airworthiness Directive (AD) 2018-23-51 as interim corrective action. This AD required all operators of 737 MAX airplanes to revise certificate limitations and operating procedures of the airplane flight manual (AFM) to provide flightcrews with runaway stabilizer trim procedures to follow under certain conditions.

On March 10, 2019, a Boeing Model 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.

On March 13, 2019, the FAA issued an Emergency Order of Prohibition, which limits the operation of Boeing Company Model 737-8 and 737-9 airplanes.

Data from the flight data recorders, as summarized in reports of the Ethiopian Airlines Flight 302 accident and the Lion Air Flight 610 accident, showed that a single erroneously high angle of attack (AOA) sensor input received by the flight control system can result in repeated airplane nose-down trim of the horizontal stabilizer, which, in combination with other flightdeck effects, could affect the flightcrew's ability to accomplish continued safe flight and landing.

After thorough review of the accident investigation reports, design reviews, engineering analysis, safety assessments, simulator evaluations, and flight testing, the FAA has determined that certain design changes and actions should be mandated to address the unsafe condition identified on the 737 MAX. To address the unsafe condition, the FAA proposes to require four design changes: (1) install updated flight control computer software (with new MCAS control laws), (2) install updated MAX Display System (MDS) software, (3) revise and add certain AFM flightcrew operating procedures, and (4) revise the routing of horizontal stabilizer trim wires. The first design change revises the MCAS control laws to utilize two AOA sensor inputs and to implement layers of protection for MCAS activation. The second design change alerts the flightcrew if there is a significant difference between the airplane's two AOA sensors via an AOA DISAGREE alert. The third design change provides the flightcrew with procedures to recognize and respond to erroneous stabilizer movement and the effects of a potential AOA sensor failure. The fourth design change achieves compliance with the FAA's latest wire separation safety standards.

In addition to these four design changes, the FAA also proposes to require operators to conduct an AOA sensor system test and perform an operational readiness flight prior to returning each airplane to service. Lastly, operators with an existing FAA-approved Minimum Equipment List (MEL) would be required to incorporate more restrictive provisions in order to be able to dispatch the airplane with certain inoperative equipment.

The FAA has assembled a Technical Advisory Board (TAB) to review Boeing's final design documentation to evaluate compliance with FAA regulations. This multi-agency advisory board has also conducted a review of Boeing compliance data and provided recommendations that are being considered in the FAA's evaluation of the design changes.

In addition to the planned actions described above, the FAA will conduct an operational evaluation using U.S. and foreign industry line pilots. The FAA intends to conduct this evaluation jointly with three international civil aviation authorities: Agência Nacional de Aviação Civil (ANAC) Brazil, Transport Canada Civil Aviation (TCCA), and the European Union Aviation Safety Agency (EASA). The objective of this operational evaluation is to determine the adequacy of the proposed pilot training necessary to operate the 737 MAX, as well as determining the adequacy of the proposed 737 MAX recurrent pilot training. The proposed training for 737 MAX pilots is enhanced to improve pilot awareness and familiarity with manual trim techniques, normal and non-normal MCAS operation, AOA sensor failures, and autopilot and flight director design changes that are designed to improve the proficiency of 737 MAX pilots worldwide. Based on the results of the operational evaluation, the FAA will determine if additional pilot training subjects and tasks will be required for U.S. carriers before 737 MAX airplanes will be allowed to return to service.

Furthermore, proposed recurrent pilot training is expanded to reinforce skills and knowledge gained during the required training prior to operating the 737 MAX. These results will be published in the FAA Flight Standardization Board Report. The FAA will apply the operational evaluation results in accordance with current FAA rules and guidance.

Aircraft make, model, and series: The Boeing Company Model 737-8 and 737-9 (737 MAX) airplanes

U.S.-registered fleet: 73 airplanes; **Worldwide fleet:** 390 airplanes

Worldwide operators: 9 Air, Aerolineas Argentinas, Aeromexico, Air Canada, Air China, AIR ITALY S.P.A., American Airlines, Cayman Airways, China Eastern Airlines, China Southern Airlines, Comair Limited, COPA Airlines, Corendon Airlines, Eastar Jet, Enter Air Sp. Z O.O., Ethiopian Airlines, Fertitta Enterprises, Inc., Fiji Airways, Flydubai, Fuzhou Airlines Co., Ltd, Garuda Indonesia, GECAS, Gol Linhas Aereas, Hainan Airlines, Icelandair, Jet Aviation AG - Zurich, Kunming Airlines, Lion Air, LOT Polish Airlines, Lucky Air, Mauritania Airlines, Mongolian Airlines MIAT, Norwegian Air International, Norwegian Air Shuttle, Norwegian Air Sweden, Okay Airways Company Limited, Oman Air, Qatar Airways, Royal Air Maroc, S7 Airlines, SCAT Airlines, Shandong Airlines, Shanghai Airlines, Shenzhen Airlines, SilkAir, SMBC Aviation Capital, Smartwings, Southwest Airlines, SpiceJet, Sunwing Airlines Inc., Thai Lion, TUI Airways, TUI Fly Belgium, TUI Fly Deutschland, TUI Fly Netherlands, TUI Fly Nordic, Turkish Airlines, United Airlines, WestJet, Xiamen Airlines

Ongoing activities: The FAA plans to issue a Notice of Proposed Rulemaking (NPRM) to propose mandating the design changes and actions described above. The FAA is proposing these actions because the agency evaluated all the relevant information and determined the unsafe condition described previously exists in 737 MAX airplanes. The FAA will provide a standard comment period of 45 days after publication of the NPRM to allow public comment on the proposed rulemaking.

While the certification of the FCC software is not fully verified, the design is complete and mature, and key features of the new control laws will be included in the proposed rule to describe how they address the unsafe condition. FAA-approved Service Bulletins (SBs) are now available for implementing the other changes to the airplane design (the MDS software and the horizontal stabilizer trim wiring). After final certification of the changes to the 737 MAX type design, the FAA expects to approve an SB for installation of the FCC software and finalize rulemaking to mandate actions on already delivered 737 MAX airplanes.

In conjunction with adopting the final rule AD, the FAA intends to amend the Emergency Order of Prohibition. The amended Emergency Order of Prohibition will address the actions the FAA deems appropriate to safely return the affected airplanes to service. These actions may include actions proposed in the rulemaking described above, as well as other pertinent ADs, new flightcrew training requirements, new maintenance program documents, and appropriate maintenance actions for return to service. The FAA intends that all applicable actions be completed on each airplane before an operator returns that airplane to service.

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