U. S. Department of Transportation
Office of Inspector General

Memorandum

Date: November 10, 2022

Subject: INFORMATION: Audit Announcement | FAA's Oversight of the Maneuvering Characteristics Augmentation System and the Angle-of-Attack Disagree Indicator on Boeing MAX Aircraft | Project No. 19A3006A003
Federal Aviation Administration

From: Nelda Z. Smith
Assistant Inspector General for Aviation Audits

To: Director, Audit and Evaluation

The Federal Aviation Administration (FAA) is responsible for overseeing the safety and certification of all civilian aircraft manufactured and operated in the United States. FAA recertified the Boeing 737 MAX 8 aircraft in late 2020 after the aircraft was grounded for almost 20 months following the Lion Air and Ethiopian Airlines accidents in October 2018 and March 2019.[1] Numerous post-crash reports cited the Maneuvering Characteristics Augmentation System (MCAS)[2] as a contributing factor in both accidents. During the original certification process from 2012 to 2017, Boeing included limited information on MCAS in its initial briefings to FAA and presented MCAS as a modification to the existing speed trim system that would only activate under certain limited conditions.

In addition, in August 2017, Boeing engineers identified that not all 737 MAX 8 aircraft were equipped with an Angle-of-Attack (AOA) disagree alert[3] despite intending for it to be standard for the fleet. While Boeing included this issue in updated certification documents in October 2017, it did not directly notify FAA of the issue. Ultimately, in February 2019, FAA reviewed Boeing's decision and agreed that the alert was not necessary for the safe operation of the airplane.

[1] On October 29, 2018, Lion Air Flight 610 crashed into the Java Sea shortly after departing Jakarta, Indonesia, resulting in 189 fatalities. Just 5 months later, on March 10, 2019, Ethiopian Air Flight 302 crashed shortly after departing Addis Ababa, Ethiopia, resulting in 157 fatalities, including 8 Americans.
[2] MCAS modifies aircraft handling characteristics in manual flight as an additional function of the existing aircraft speed trim system to compensate for changes in aerodynamics from the previous model caused by the MAX's larger engines and the placement of those engines on the wing.
[3] The AOA disagree alert is an alert designed to notify pilots when the two AOA sensors (external sensors that measure the angle of the aircraft in the air) disagree by more than 10 degrees for at least 10 seconds.

However, FAA required a software update to enable the alert for the entire 737 MAX fleet prior to the airplane's return to service.

In light of these events, the Chairmen of the House Committee on Transportation and Infrastructure and its Subcommittee on Aviation requested that we evaluate FAA's oversight activities related to the Boeing 737 MAX AOA disagree alert and the inclusion of MCAS in the original design. This request builds on two of our previous reports[4] and one ongoing project[5] about the 737 MAX.

Accordingly, we are initiating an audit of FAA's oversight activities of two targeted elements of the Boeing 737 MAX: (1) the inoperability of the AOA disagree alert on the majority of the MAX fleet in 2019 and (2) the inclusion of MCAS as part of the speed trim in the 737 MAX design. Specifically, we will evaluate FAA's compliance with applicable statutes, regulations, and policies in overseeing Boeing actions concerning the two areas.

We plan to begin the audit later this month and will contact your audit liaison to schedule an entrance conference. We will conduct our work at FAA Headquarters and the FAA regional office in Seattle, WA. If you have any questions, please contact me or Marshall Jackson, Program Director.

cc: DOT Audit Liaison, M-1
FAA Audit Liaison, AAE-100

[4] *Timeline of Activities Leading to the Certification of the Boeing 737 MAX 8 Aircraft and Actions Taken After the October 2018 Lion Air Accident* (OIG Report No. AV2020037), June 29, 2020, and *Weaknesses in FAA's Certification and Delegation Processes Hindered Its Oversight of the 737 MAX 8* (OIG Report No. AV2021020), February 23, 2021. OIG reports are available on our website at http://www.oig.dot.gov.

[5] *Audit Initiated of FAA's Oversight of Boeing 737 MAX Return to Service*, April 20, 2021.