



Committee on Transportation and Infrastructure
U.S. House of Representatives
Washington, DC 20515

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May 10, 2019

SUMMARY OF SUBJECT MATTER

TO: Members, Subcommittee on Aviation
FROM: Staff, Subcommittee on Aviation
RE: Subcommittee Hearing on “Status of the Boeing 737 MAX”

PURPOSE

The Subcommittee on Aviation will meet on Wednesday, May 15, 2019, at 10:00 a.m. in 2167 Rayburn House Office Building to hold an oversight hearing titled, “Status of the Boeing 737 MAX.” The hearing will explore the Lion Air Flight 610 and Ethiopian Airlines Flight 302 accidents, the resulting international grounding of the Boeing 737 MAX aircraft, and actions needed to ensure the safety of the aircraft before returning them to revenue service. The Subcommittee will hear testimony from the National Transportation Safety Board and the Federal Aviation Administration.

BACKGROUND

The Federal Aviation Administration’s (FAA) mission is to provide the safest, most efficient aerospace system in the world. According to the FAA, the risk of a fatal commercial aviation accident in the United States has been cut by 95 percent since 1997. There has only been one commercial airline passenger fatality in the United States in more than 90 million flights in the past decade.¹ Prior to that single passenger fatality in April 2018, the last fatal domestic commercial airline accident occurred in February 2009, when Colgan Air Flight 3407 crashed near Buffalo, New York, killing all 49 onboard and one person on the ground. However, in a span of five months, there have been two fatal commercial airline accidents involving U.S.-designed and manufactured Boeing 737 MAX aircraft operated by foreign air carriers outside the United States, raising safety concerns. According to the Flight Safety Foundation, worldwide, there were more than 50 fatal airline accidents a year through the early and mid-1990s, claiming well over 1,000 lives annually.²

¹ On April 17, 2018, Southwest Airlines Flight 1380 experienced an engine failure, resulting in loss of an engine inlet and cowling. Fragments struck the airplane’s fuselage and damaged a cabin window, killing one passenger onboard.

² David Koenig and Tom Krisher, “Recent Airline Crashes Run Against Trend Toward Safer Flying”, U.S. News and World Reports and Associated Press, May 6, 2019, Available at: <https://www.usnews.com/news/business/articles/2019-05-06/recent-airline-crashes-run-against-trend-toward-safer-flying/>

Fatalities dropped from 1,844 in 1996 to just 59 in 2017, then rose to 561 last year and 209 already this year (primarily due to the two 737 MAX accidents).³

I. FOREIGN AIR CARRIER ACCIDENTS INVOLVING BOEING 737 MAX

A. Lion Air Flight 610

On October 29, 2018, Lion Air Flight 610 (JT610)—a Boeing 737 MAX—a domestic flight en route to Pangkal Pinang from Jakarta, crashed approximately 11 minutes after takeoff into the Java Sea at 450 miles per hour, killing all 189 on board (184 passengers and 5 crew).

According to the preliminary accident report by Indonesia’s Komite Nasional Keselamatan Transportasi (KNKT),⁴ after departure, the aircraft’s left and right angle of attack (AoA) sensors, which measure the angle between the airplane’s wings and the oncoming air, provided the pilots inaccurate readings (a 20-degree difference between left and right sensors). This faulty data made the accident aircraft believe it was in a stall and therefore activated a Boeing system on the 737 MAX called the “maneuvering characteristics augmentation system” (MCAS). The MCAS—designed to help pilots avoid stalls, which occur at excessively high angles of attack—pushes the nose of the aircraft down to allow the aircraft to regain airspeed. However, due to faulty AoA data, the MCAS on JT610 reactivated (i.e., pushed the nose of the aircraft down) more than two dozen times during the 11-minute flight and the pilots’ manual attempts to counter the MCAS were ultimately futile.

The preliminary report provides information on the flight crew including⁵:

- Pilot in Command: 8,122 flight hours (1,417 hours in the B737, and 103 hours in the 737 MAX)
- First Officer: 361 flight hours (207 hours in the B737, and 56 hours in the 737 MAX)

According to the preliminary accident report, there were problems reported by flight crews operating the aircraft on October 26, 27, and 28, 2018. The pilots of the flight immediately preceding the accident flight (on October 28, 2018) experienced similar problems to the accident flight. On the October 28, 2018, flight, despite experiencing problems, the pilots continued flying with manual trim and without auto-pilot until safely landing at Jakarta. They reported problems to the airline and the aircraft was serviced, tested, and determined ready for flight.

On November 7, 2019, the FAA issued an Emergency Airworthiness Directive (AD) requiring operators of the 737 MAX to “revise their flight manuals to reinforce to flight crews how to recognize and respond to uncommanded stabilizer trim movement and MCAS events.”⁶ Specifically, the AD stated that in the event of an “erroneously high [AoA] sensor input . . . there is a potential for repeated nose-down trim commands of the horizontal stabilizer. This condition, if not addressed, could cause the flight crew to have difficulty controlling the airplane, and lead to

³ *Id.*

⁴ Translated means “Transportation Safety National Committee” or “National Transportation Safety Committee”.

⁵ ET302 Preliminary Report *available at* <http://www.ecaa.gov.et/documents/20435/0/Preliminary+Report+B737-800MAX+%2C%28ET-AVJ%29.pdf/4c65422d-5e4f-4689-9c58-d7af1ee17f3e>.

⁶ Elwell, Daniel K, Federal Aviation Administration, Testimony before for the Senate Commerce Committee, Aviation and Space Subcommittee, hearing on State of Airline Safety: Federal Oversight of Commercial Aviation, p. 7 (March 27, 2019).

excessive nose-down attitude, significant altitude loss, and possible impact with terrain.”⁷ The AD identified existing flight crew procedures to be used in such circumstances.

The Indonesian government’s KNKT is leading the ongoing accident investigation. As mentioned previously, on November 27, 2018, the KNKT issued a preliminary report on the Lion Air crash. The preliminary report was compiled prior to the recovery of the cockpit voice recorder and does not contain analysis. The final report, which will include the probable cause(s) of the accident, is expected later this year. The National Transportation Safety Board (NTSB) is assisting with this investigation.

B. Ethiopian Airlines Flight 302

On March 10, 2019, Ethiopian Airlines Flight 302 (ET302)—a Boeing 737 MAX—en route from Bole International Airport in Addis Ababa, Ethiopia, to Nairobi, Kenya, crashed approximately six minutes after takeoff. The accident resulted in the death of all 157 people on board (149 passengers and 8 crew members).

According to the Ethiopian Ministry of Transport’s preliminary accident report, faulty AoA data from one sensor triggered the MCAS during flight, pulling the nose of the aircraft down, before it ultimately crashed into terrain. Unlike the Lion Air pilots, the Ethiopian Airline pilots cut off the trim (disconnecting the electric portion of the plane’s stabilizer), in accordance with Boeing’s emergency checklist described in the FAA’s Emergency AD issued months prior. The pilots did not reduce the throttles after takeoff and the aircraft accelerated between 450 and 500 knots. As depicted in the image below, manually countering MCAS activation at excessive airspeed can be difficult or nearly impossible due to the downward force on the plane’s tail. According to the report, the pilots reactivated the automated system and the plane went nose down again. The pilots were unable to recover.

The preliminary report provides information on the flight crew including⁸:

- Pilot in Command: 6,028 hours (5,176 hours in the B737; hours in MAX not provided)
- First Officer: 5,174 hours (4,286 hours in the B737; hours in MAX not provided)

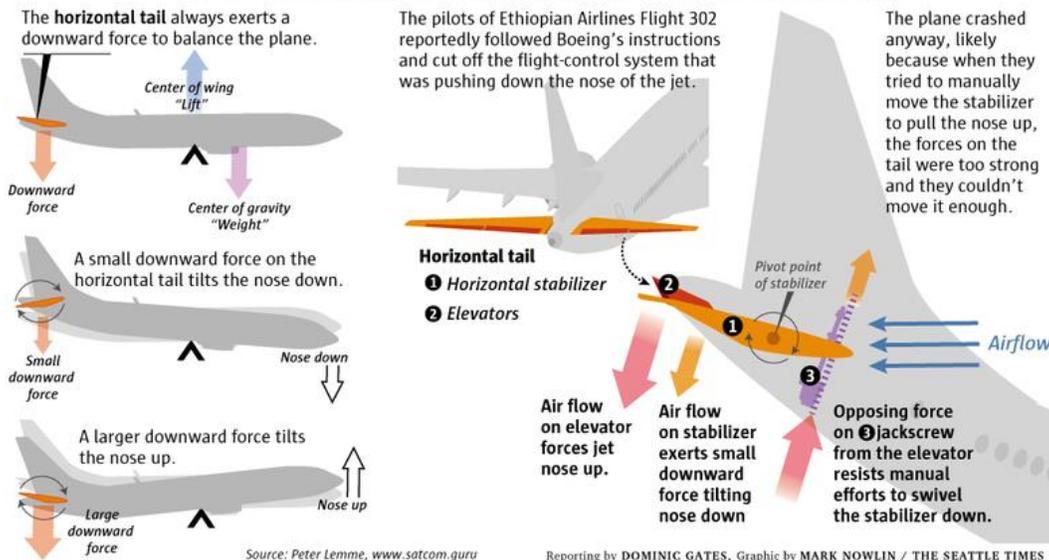
Immediately following the accident, foreign civil aviation authorities began grounding the Boeing 737 MAX planes. On March 11, 2019, the FAA issued a Continuous Airworthiness Notification to the International Community (CANIC) for 737 MAX operators, describing the FAA’s activities following the Lion Air accident in support of continued operational safety of the 737 MAX fleet. On March 13, two days later, the FAA ordered a temporary grounding of the fleet operated by U.S. airlines or in U.S. territory. The Boeing 737 MAX remains grounded today.

⁷ FAA Emergency Airworthiness Directive, AD # 2018-23-51 (Nov. 7, 2018), *available at* [http://rgl.faa.gov/Regulatory and Guidance Library/rgad.nsf/0/83ec7f95f3e5bfbd8625833e0070a070/\\$FILE/2018-23-51_Emergency.pdf](http://rgl.faa.gov/Regulatory%20and%20Guidance%20Library/rgad.nsf/0/83ec7f95f3e5bfbd8625833e0070a070/$FILE/2018-23-51_Emergency.pdf).

⁸ Lion Air 601 Preliminary Report *available at* https://reports.aviation-safety.net/2018/20181029-0_B38M_PK-LQP_PRELIMINARY.pdf

The Ethiopian government is leading the accident investigation. As mentioned above, on April 4, 2019, Ethiopia's Ministry of Transport's Aircraft Accident Investigation Bureau issued a preliminary report on the Ethiopian Airlines crash. A final report detailing probable cause(s) of the accident is expected within the year. The NTSB is assisting with this investigation as well.

With the 737 MAX's automatic system cut off, forces on the horizontal tail could make it very difficult for pilots to swivel it manually



Seattle Times article, "Why Boeing's emergency directives may have failed to save 737 MAX," by Dominic Gates on April 3, 2019.

C. Issues to be considered in 737 MAX Accident Investigations:

An aviation accident rarely has one probable cause. Rather, accident investigators consider a number of factors, including: operations, weather, human performance, survival factors, and aircraft structures, power plants, and systems, to name a few.

In terms of the two 737 MAX accidents, as the U.S. is the state of design and manufacture, the FAA and NTSB are serving as technical experts to examine aircraft design and certification. In accordance with Annex 13 to the U.N. International Civil Aviation Organization, Indonesia and Ethiopia will (respectively) be responsible for examining a number of factors, including: pilot experience, pilot training, operational factors, and aircraft maintenance.

International Pilot Training Standards: According to International Civil Aviation Organization (ICAO) Standards and Recommended Practices, the pilot-in-command requires an Airline Transport Pilot Licence (ATP). An ATP requires a pilot have "completed not less than 1500 hours of flight time. Further, "[t]he Licensing Authority shall determine whether experience as a pilot under instruction in a flight simulation training device is acceptable as part of the total flight time of 1500 hours. Credit for such experience shall be limited to a maximum of 100 hours, of which not more than 25 hours shall have been acquired in a flight procedure trainer or a basic instrument flight trainer."⁹

⁹ See ICAO Annex 1, Personnel Licensing, section 2.6 Airline transport pilot (ATP) licence

ICAO also provides standards to obtain a Multi-Crew Pilot Licence (MPL), which “allows a pilot to exercise the privileges of a co-pilot in a commercial air transportation on multi-crew aeroplanes.”¹⁰ ICAO Standards for an MPL are set at a minimum of 240 hours “as the minimum number of actual and simulated flight hours performing the functions of the pilot flying and the pilot non-flying.”¹¹ The ICAO Standard “does not specify the breakdown between actual and simulated flight hours and thus allow part of the training curriculum that was traditionally conducted on aeroplane to be done on flight simulation training devices.”¹² The applicant pilot is required to meet “all the actual flying time for a private pilot licence plus additional actual flying time in instrument, night flying and upset recovery.”

FAA Certification: Given that the FAA will need to review and approve any software fix proposed by Boeing and determine whether changes to the 737 MAX training program are needed in order to get the aircraft back in revenue service, this memorandum will focus on FAA’s certification processes.

II. OVERVIEW OF THE FAA’S CERTIFICATION PROCESSES

All aircraft and aviation products are subject to FAA certification prior to their sale and use in the United States. The FAA is responsible for regulating aviation safety, which includes approving the design and manufacture of new aircraft and aviation products before they enter the National Airspace System (NAS).¹³ The FAA’s Office of Aviation Safety encompasses two offices that handle certification processes: the Aircraft Certification Service and the Flight Standards Service. *See Appendix 1* for a depiction of these divisions’ functions. The FAA administers regulations regarding the design and production of aircraft and their constituent systems as well as continued operational safety.¹⁴

A. Boeing 737 MAX

According to the FAA, the process to issue a type-certificate for the Boeing 737 MAX, from initial application to final certification, took five years.¹⁵ The process included 297 certification flight tests, including tests of the MCAS functions. The final type certificate was issued in March 2017. The FAA reports it was “directly involved” in the System Safety Review of the MCAS.¹⁶

B. Aircraft Certification Service

The FAA’s Aircraft Certification Service is responsible for issuing “type certificates” (approvals) to manufacturers and designers for new products that are to be used in the NAS, including aircraft, engines, propellers, and aircraft parts; ensuring the continued operational safety of

¹⁰ See <https://www.icao.int/safety/airnavigation/Pages/peltrgFAQ.aspx#anchor24>

¹¹ *Id.*

¹² *Id.*

¹³ See 49 U.S.C. §§ 44702, 44704; GAO-14-829T at 1.

¹⁴ See, e.g., 14 C.F.R. part 21, *et seq.*

¹⁵ *Supra* note 2, pg. 6.

¹⁶ *Id.*

those products through their life cycles; and developing regulations and guidance in this area.¹⁷ The Aircraft Certification Service has 1,370 staff members, which includes engineers, inspectors, flight test pilots, technical advisors, and others. This staff—in local certification offices across the country—manages “certification projects” during which engineers and other specialists determine whether a new product complies with FAA regulatory standards and, if so, issues a certificate for the product. The applicant company and FAA staff work closely during each phase of the product certification process, from design conceptualization to certification, and then through the product’s remaining life cycle to ensure continued airworthiness.¹⁸

Aircraft Certification Service staff who process and approve aircraft products also oversee the continued operational safety of those products. The staff, therefore, relies on a project sequencing system to prioritize, on a nationwide basis, certification submissions based on resource availability.¹⁹ The FAA prioritizes overseeing the continued operational safety of products already in the NAS over issuing new certifications and approvals.²⁰

C. Flight Standards Service

The FAA’s Flight Standards Service is responsible for issuing certificates and approvals to pilots and operators of aircraft, ranging from large airlines to small charter outfits. Flight Standards Service grants certificates to air operators (e.g., air carriers and taxi services) and air agencies (e.g., flight schools and repair stations); ensures the continued operational safety of those persons and entities (through surveillance, inspection, investigations, and enforcement); and determines standards and regulations necessary for continued operational safety.²¹ Flight Standards Service also manages the system for registration of civil aircraft and all airmen records.²² Flight Standards Service includes 5,157 staff members, across 119 field offices. Unlike the Aircraft Certification Service’s national prioritization of certification submissions, Flight Standards reviews applications on a first-come, first-served basis. According to the Government Accountability Office (GAO), the Flight Standards Service struggles to keep up with its certification workload.²³ The U.S. Department of Transportation (DOT) Inspector General in 2014 found that Flight Standards Service had a significant backlog of applications, with over 100 applicants waitlisted for more than three years.²⁴

D. Organization Designation Authorization

Since even before the FAA was formed over 60 years ago, the federal government has delegated some safety certification responsibilities to technical experts in the industry. As airplanes, engines, and their constituent systems became increasingly complex, Congress authorized the FAA to leverage the product-specific knowledge among appropriately-qualified employees of

¹⁷ See GAO-14-829T at 7. Note that the FAA may also issue “supplemental type certificates” for modifications to an original design with a type certificate.

¹⁸ GAO-15-550T at 3–4.

¹⁹ GAO-14-829T at 5.

²⁰ GAO-14-829T at 6.

²¹ See 49 U.S.C. §§ 44703, 44705-10; GAO-14-829T at 7; FAA, *Flight Standards Service (AFS)*, https://www.faa.gov/about/office_org/headquarters_offices/avs/offices/afs/.

²² See *Flight Standards Service (AFS)*, *supra* note 12.

²³ GAO-14-829T at 6.

²⁴ U.S. Dep’t of Transp. Office of Inspector Gen., AV-2014-056, *Weak Processes Have Led to A Backlog of Flight Standards Certification Applications*, *Federal Aviation Administration* 2 (June 12, 2014).

manufacturers to determine a new product's compliance with the applicable provisions of the Federal Aviation Regulations. Through its organizational delegation authority (originally authorized by Congress in 1958), the FAA may authorize private designees (manufacturers and repair stations) to act on behalf of the agency in conducting certain safety certification actions, while the FAA retains ultimate responsibility for overseeing compliance; the FAA established the organization designation authorization (ODA) program in 2005 to consolidate all existing organizational delegation types into one program.²⁵ A designee may receive authority to examine, inspect, and test aircraft and persons for the purpose of issuing certificates.²⁶ Once a designee establishes through inspections and tests that an aviation product comports with FAA standards, the FAA will conduct a risk-based review of the designee's work, issuing a type certificate if the product meets minimum safety standards. According to the GAO, in terms of the breadth or scope of activities performed by FAA designees, designees perform more than 90 percent of FAA's certification activities.²⁷

The delegation program allows the FAA to leverage limited resources to focus on the areas of highest-risk and make timely certification decisions. Under the delegation program, there are ODA unit members and individual designees. ODA unit members are appointed under the umbrella of a specific company ODA. Individual designees are assigned specific delegated functions by the FAA and can work across multiple companies and projects. To date, FAA reports 4,646 unit members and 2,653 individual designees (covering engineering and manufacturing responsibilities) supporting certification activities nationwide. Currently, there are 79 Aircraft Certification Service ODAs.

E. Legislation

The *FAA Reauthorization Act of 2018* (P.L.115-254) includes several provisions aimed at improving and enhancing the FAA's certification process. For example, the legislation requires the FAA to implement a safety-systems approach and encourages risk-based oversight efforts. The legislation also encourages full utilization of the FAA's existing delegation authorities (i.e., ODA) so that the agency can focus on the highest-risk items and new and novel technologies during the certification process. Finally, the legislation improves workforce training for FAA aviation safety inspectors and safety engineers for certification programs including ODA oversight.

III. NATIONAL TRANSPORTATION SAFETY BOARD

The NTSB is an independent agency charged with the investigation of transportation accidents in the United States. When an aviation accident or serious incident occurs outside of the United States, the NTSB participates in the investigation in accordance with the Chicago Convention of the International Civil Aviation Organization and the Standards and Recommended Practices (SARPS) provided in Annex 13 to the Convention.²⁸

²⁵ See 49 U.S.C. § 44704(e); GAO-14-829T at 4.

²⁶ GAO-14-829T at 4.

²⁷ U.S. Gov't Accountability Office, GAO-13-442T, *Aviation Safety: FAA Efforts Have Improved Safety, but Challenges Remain in Key Areas* 3–4 (Apr. 16, 2013). In a May 7, 2019 email to Committee staff, the GAO clarified that the 90% number refers to the breadth or scope of FAA activities designees can do work on rather than the amount of certification work done by designees.

²⁸ <https://www.nts.gov/investigations/layouts/nts.gov/aviation/foreign.aspx>.

The NTSB is assisting both the Indonesian-led investigation of the Lion Air crash as well as the Ethiopian-led investigation of the Ethiopian Air crash. Boeing is serving as a technical advisor for the investigations in its role as the manufacturer of the 737 MAX. The FAA is also serving as technical advisor as the certifying authority for the 737 MAX.

IV. REVIEWS OF THE BOEING 737 MAX

Subsequent to the two fatal foreign airline Boeing 737 MAX accidents, DOT, the FAA, and Boeing have stood up various panels, including:

Safety Oversight and Certification Advisory Committee Special Committee

On March 25, DOT announced it would create the Special Committee to review the FAA's Aircraft Certification Process (Special Committee) under the new authority granted by the *FAA Reauthorization Act of 2018*.²⁹ The Special Committee is tasked with reviewing the procedures of the FAA for the certification of new aircraft, including the Boeing 737 MAX.³⁰ The Special Committee's review of the certification process includes the "FAA certification process workplan, process timeline, Organization Designation Authorization, Designated Engineering Representatives Authorization/Certification, Authorized Representation Certification and oversight thereof."³¹ The Special Committee will focus primarily on the Boeing 737 MAX 8 certification process from 2012 to 2017 and make recommendations for how the process could be improved.³² Its findings and recommendations will then be presented directly to the DOT Secretary and the FAA Administrator for their consideration.³³

Safety Oversight and Certification Advisory Committee (SOCAC)

On March 25, DOT announced it will stand up the Congressionally-mandated Safety Oversight and Certification Advisory Committee. The SOCAC is required to advise the Transportation Secretary on policy-level issues related to FAA safety certification and oversight programs, including efforts to streamline aircraft and flight standards certification processes, utilization of delegation authorities, risk-based oversight efforts, and training programs. The SOCAC will develop training and continuing education objectives for FAA engineers and safety inspectors. While not directly tasked with Boeing certification, aircraft certification is a key tasking of the committee.

Joint Authorities Technical Review

On April 2, the FAA established a Joint Authorities Technical Review (JATR)³⁴ to conduct a comprehensive review of the certification of the automated flight control system (MCAS) on the

²⁹ Federal Aviation Administration (FAA), *DOT Announces Special Committee to Review FAA's Aircraft Certification Process* (2019), available at <https://www.transportation.gov/briefing-room/dot1619>

³⁰ *Id.*

³¹ Department of Transportation (DOT), *Letter to General McDew* (2019), available at <https://www.transportation.gov/sites/dot.gov/files/docs/briefing-room/337281/gen-darren-mcdew.pdf>

³² *Id.*

³³ *Id.*

³⁴ FAA, *FAA Updates on the Boeing 737 MAX: FAA Establishes Joint Authorities Technical Review (JATR) for Boeing 737 MAX* (2019), available at <https://www.faa.gov/news/updates/?newsId=93206>

Boeing 737 Max, including evaluating aspects of its design and pilots' interaction with the system, determining its compliance with all applicable regulations and identifying future enhancements that might be needed.³⁵

The JATR is chaired by former NTSB Chairman Chris Hart and comprised of a team of experts from the FAA, National Aeronautics and Space Administration (NASA), and international aviation authorities, including China, Indonesia, Australia, Brazil, Canada, Singapore, the United Arab Emirates (UAE), and the European Union Aviation Safety Agency (EASA).³⁶ The JATR had its first meeting on April 29, 2019, and is expected to last three months from the date it was established.³⁷ The JATR is not tied to the FAA's decision for return to service of the 737 MAX. That decision will be based upon FAA's assessment of the sufficiency of the proposed software updates and pilot training to address known issues for grounding the aircraft.

Boeing Board of Directors Review Committee

On April 5, 2019, Boeing announced it was creating a panel that will examine the design and development of its aircraft.³⁸ According to Boeing's statement, the panel will examine "company-wide policies and processes for the design and development of its aircraft" and will also "confirm the effectiveness of [its] policies and processes for assuring the highest level of safety on the 737-MAX program, as well as [its] other airplane programs, and recommend improvements to [its] policies and procedures."³⁹

V. ONGOING INVESTIGATIONS

U.S. House of Representatives Committee on Transportation and Infrastructure

On March 13, 2019, Chairman Peter A. DeFazio and Subcommittee on Aviation Chairman Rick Larsen launched an investigation by the Committee on Transportation and Infrastructure into the certification of the Boeing 737 MAX.

DOT Inspector General

On March 19, 2019, Secretary Elaine Chao requested the DOT Inspector General (DOT IG) to conduct an audit, "to compile an objective and detailed factual history of the activities that resulted in the certification of the Boeing 737-MAX 8 aircraft."⁴⁰

³⁵ On March 26, 2019, Chair of the House Committee on Transportation and Infrastructure Peter DeFazio (D-OR) and Chair of the Subcommittee on Aviation Rick Larsen (D-WA) sent a letter to Acting Administrator Daniel K. Elwell of the Federal Aviation Administration (FAA), urging the FAA to engage an independent, third-party review composed of individuals with the technical skills and expertise to objectively assess the corrective measures proposed for the 737 MAX by Boeing.

³⁶ *Id.*

³⁷ *Id.*

³⁸ Boeing, *Statement from Boeing CEO Dennis Muilenburg: We Own Safety - 737 MAX Software, Production and Process Update* (2019), available at <https://boeing.mediaroom.com/2019-04-05-Statement-from-Boeing-CEO-Dennis-Muilenburg-We-Own-Safety-737-MAX-Software-Production-and-Process-Update>

³⁹ *Id.*

⁴⁰ The IG reports similar audit requests were submitted by the Chairman and Ranking Member of the Senate Committee on Appropriations, Subcommittee on Transportation, Housing and Urban Development, and Related Agencies; and Senator Richard Blumenthal (D-CT). See <https://www.oig.dot.gov/sites/default/files/Audit%20Annoucement%20-%20FAA%27s%20Oversight%20of%20the%20Boeing%20737%20MAX%20Certification.pdf>.

On March 19, 2019, Chairman DeFazio and Aviation Subcommittee Chairman Rick Larsen asked DOT IG to investigate the certification process for the Boeing 737 MAX, including how each of the new features on the plane, including the AoA sensors and the MCAS, were tested and certified. The request also seeks investigation of the FAA's decision not to revise pilot training programs and manuals to reflect flight critical automation systems; how new features of the aircraft were communicated to airline customers, pilots and foreign civil aviation authorities; whether ODA authority contributed to any of the factors FAA considered in its decision-making; and a status report on how corrective actions have been implemented since the Lion Air crash in October 2018.

On March 29, 2019, Chairman DeFazio, Ranking Member Sam Graves, Aviation Subcommittee Chair Larsen, and Aviation Subcommittee Ranking Member Garrett Graves requested that the DOT IG launch an investigation of international pilot training standards and training for commercial pilots operating outside of the United States, including training for the Boeing 737 MAX.

U.S. Department of Justice

According to multiple news sources, it was reported that the Department of Justice (DOJ) is conducting a criminal investigation into the FAA's certification of the Boeing 737 MAX.⁴¹ Reports indicate the investigation began after the October 2018 Lion Air crash and is primarily focusing on the certification process.⁴² According to news reports, the FBI Seattle Office and the Justice Department's criminal division in Washington state are leading the investigation.⁴³

VI. NEXT STEPS

After the October 2018 Lion Air crash, Boeing announced that the company is working on a design change to implement a software patch for the MCAS. Boeing continues to work on the certification documentation required to certify the MCAS software enhancement and the associated pilot training material. The FAA is responsible for reviewing and approving this and any other design changes to the 737 MAX. According to the FAA, the "737 MAX will return to service for U.S. carriers and in U.S. airspace only when the FAA's analysis of the facts and technical data indicate that it is appropriate."⁴⁴

There are more than 370 Boeing 737 MAX worldwide, with fewer than 100 operated by U.S. airlines and grounded at this time.⁴⁵ Southwest Airlines is the top 737 MAX operator in the United States.

⁴¹ See Steve Miletich, *FBI Joining Criminal Investigation into Certification of Boeing 737 MAX*, The Seattle Times, March, 20, 2019, available at <https://www.seattletimes.com/business/boeing-aerospace/fbi-joining-criminal-investigation-into-certification-of-boeing-737-max/>; Evan Perez and Shimon Prokupecz, *Justice Department Issues Subpoenas in Criminal Investigation of Boeing*, CNN, March 21, 2019, available at <https://www.cnn.com/2019/03/20/business/boeing-justice-department-subpoenas/index.html>

⁴² Id.

⁴³ Id.

⁴⁴ Elwell, supra note 5, pg. 9.

⁴⁵ <https://www.cnn.com/2019/03/13/boeing-shares-fall-after-report-says-us-expected-to-ground-737-max-fleet.html>

WITNESSES

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APPENDIX 1. Certification in the FAA's Office of Aviation Safety.



Source: GAO presentation of FAA information. | GAO-14-728T