

European regulator uncovers autopilot problem on Boeing 737 Max

By Bryan Dyne
13 July 2019

A leaked document from the European Union Aviation Safety Agency (EASA) details five major problems with Boeing's 737 Max 8 aircraft, including a previously unknown issue with the plane's autopilot. The agency says it will not authorize the jet, grounded around the world since the crash of Ethiopian Airlines Flight 302 in March, to resume flying until these problems have been resolved.

Each of the requirements, first reported by *Bloomberg*, has the potential to delay the return of the Max 8 to service by many additional months.

The 737 Max 8 has been grounded since March 13, three days after the Ethiopian Airlines jet crashed only minutes after takeoff, killing all 157 people on board. It was the second crash of the recently introduced Boeing 737 Max 8 in five months. Last October, a Lion Air flight crashed in Indonesia under similar circumstances, killing all 189 passengers and crew.

Multiple reports have focused on the previously little known piece of software known as the Maneuvering Characteristics Augmentation System (MCAS) as the cause of both crashes. MCAS, an anti-stall system, was developed by Boeing ostensibly to make the Max 8, first introduced in 2017, "one of the safest airplanes ever to fly."

EASA's checklist, however, indicates the exact opposite: that Boeing's flagship aircraft has numerous potentially catastrophic structural problems that cannot be fixed with a software patch. These include difficulty in turning the manual trim wheel, unreliable angle-of-attack sensors, poorly designed training features, lagging microprocessors and an autopilot that sometimes fails to disengage properly.

These issues, taken together, indicate that the 737 Max 8 should never have been certified to fly in the first place. They suggest that Boeing executives and US

Federal Aviation Administration (FAA) regulators participated in a profit-driven rush to produce and launch the plane while cutting corners on design safety and pilot training.

The trim wheel is used by pilots to control small surfaces on the wings so as to quickly correct for any unwanted changes in airspeed, while the angle-of-attack sensors measure the plane's airspeed and alert pilots if the plane is in danger of stalling. Faulty angle-of-attack sensors likely fed incorrect data to the MCAS, which in turn forced the two Max 8s into a dive to correct for a stall that was not happening.

Microprocessors are used on airplanes to collect data from the sensors and inform pilots about the status of the hundreds of factors required to keep the plane in flight. If they are incapable of handling the data and begin to lag, the nose of the plane can be forced down, as occurred in the two Max 8 crashes.

The faulty autopilot may be the most dangerous problem found by the European regulator. During an emergency, it is standard procedure to disengage all automated systems so that the pilots have full control of the plane, the most reliable way to recover from a dive or stall. If the autopilot doesn't disengage, pilots lose crucial seconds to correct an aircraft's flight, which can be fatal for the crew and passengers. If Boeing is forced to re-engineer the autopilot systems for the Max 8, it could delay the re-introduction of the plane by months.

The Max 8 was developed by Boeing as a direct response to the announcement by its European-based rival, Airbus, of the A320 neo, a mid-range airplane released in 2016 that has become a staple among airlines in the European and rapidly expanding Asian market, garnering 6,635 orders as of June 2019. In order to compete with the Airbus plane's improved

fuel efficiency and reduced maintenance costs, Boeing set out to update its existing 737 NG series by attaching a new, larger engine.

Almost immediately, however, Boeing engineers and pilots discovered that the new engine often made the 50-year-old airframe pitch up and stall. The solution, ordered by Boeing executives, was not to fix a fundamental flaw in the aircraft's design, costing months or potentially years of delays and hundreds of millions of dollars, but to introduce the MCAS to automatically compensate for the problems caused by the new engines.

This move was criticized by retired pilot and aviation safety expert "Sully" Sullenberger, who recently testified, "We owe it to everyone who flies, passengers and crews alike, to do much better than to design aircraft with inherent flaws that we intend pilots will have to compensate for and overcome."

Critically, Boeing did not include the software in its original manuals or training, meaning that most of the pilots flying the 737 Max 8 did not know about a system that could override pilot controls. The aerospace giant did this in order to claim that training for the new aircraft would be minimal, a mere hour on a computer, an advertised cost saving measure for airlines looking to purchase the Max 8. The manuals and training were both approved by the FAA, other aviation regulatory agencies and airline pilot unions.

Boeing is currently claiming that the Max 8 will fly again in by the end of the year, no doubt in an effort to prevent investors from jumping ship. It is unclear, however, that the company will meet this self-imposed deadline. It won't submit a software patch for the MCAS to the FAA until September, and the new problems raised by EASA will only cause more delays.

The FAA itself has fallen under scrutiny for certifying the Max 8 for flight in the first place, including outsourcing the certification of critical systems of the plane to Boeing. This has lent the EASA review weight among other international air safety regulatory agencies, which are now looking to follow Europe's lead in certifying aircraft, rather than the United States.

The new problems for the Max 8 have also caused thousands more canceled flights for airlines in the US and internationally. United Airlines, for example, will not fly the aircraft until November 3, pending

re-certification. There is a growing risk that airlines will simply start planning their 2020 routes without the Max 8, switching to Airbus to maintain their routes.

It is also unclear, even when (or if) the aircraft is authorized to resume service, that passengers will be willing to fly on it. Numerous polls have shown that a majority of people will wait up to 12 months after the reintroduction of the Max 8 before they will fly on it, further reducing the chance airlines will ever again use the planes.

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