

“Why did Boeing make it like that? Pure negligence and greed. There is simply no other answer.”

## Aviation reporter Rytis Beresnevičius speaks to WSWs on Boeing 737 crashes

**Bryan Dyne**  
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In the aftermath of the March 10 crash of a Boeing 737 Max 8 jet operated by Ethiopian Airlines, which killed 157 people, data recovered from the aircraft indicated that the MCAS (Maneuvering Characteristics Augmentation System) software system was primarily responsible for the pilots' loss of control of the plane. This system is also implicated in the October, 2018 Lion Air disaster involving the same type of aircraft, which crashed just after takeoff from Jakarta, killing 189 men, women and children.

The circumstances of the two crashes are nearly identical: faulty readings from a malfunctioning angle-of-attack sensor on the Boeing planes fed false data to MCAS, indicating that the plane was about to stall. In turn, MCAS forced the nose of the planes down and continued to do so even after the flight crew of Ethiopian Airlines Flight 302 followed the safety procedures set forth by Boeing for just such an emergency.

These findings point in the direction of a fundamental flaw in the design of the aircraft itself, strongly suggesting that the now-grounded 737 Max fleet should have never been certified in the first place. That the plane was put into service, evidently on an expedited basis, speaks to the close relationship between Boeing and US aviation regulatory agencies. No Boeing executives or Federal Aviation Administration (FAA) officials have been criminally charged to date for actions that led to the deaths of hundreds of people.

As part of our coverage of the two crashes and the events that led up to them, the *World Socialist Web Site* recently interviewed Rytis Beresnevičius, a full-time reporter for the well known aviation site *AviationCV*. He has closely followed both Boeing 737 Max 8 crashes and the engineering, executive and regulatory decisions that led to these disasters.

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**Bryan Dyne:** Why was MCAS necessary? Why design an airplane system with only a single point of failure?

**Rytis Beresnevičius:** All of the aircraft are equipped with anti-stall features, but they inform the pilots about the danger of a stall—that's the main purpose of the stick shaker. It is still used today to vibrate the control wheel if an aircraft is about to enter a stall. There are also stick pushers, but they are mostly used on aircraft that have a T-shaped tail—for example, a Bombardier Dash-8 Q400. Most modern jet engine aircraft replaced pushers with computer-based security systems.

However, the automatic inputs from the aircraft systems are fairly new. The first automatic safety measures, called envelope protection, were installed by Airbus in the A320. But these are fairly limited measures, as their main purpose is to prevent a pilot from exceeding the capabilities of an aircraft, meaning it prevents any excessive movement of the control

wheel that would put the aircraft at risk of crashing. But an automatic safety system not working properly and even causing two accidents, as MCAS did, is very rare and unique to Boeing's system.

MCAS is a different story from the Airbus feature. Fundamentally, the design of the 737 Max aircraft forced Boeing to come up with the system. The Boeing 737 airframe is over 50 years old, and when you keep updating it with new engines or aerodynamic features (such as winglets), you have to make some design changes. Boeing has definitely put too many changes on the same 737 frame.

The new engines, which are much larger and placed much more forward on the Max variant, made the 737's nose pitch up too much. If the nose pitches up, you are in danger of stalling. So to prevent that from happening, Boeing installed MCAS.

But the problem is that MCAS made changes to the angle of attack by reading data from only one sensor, instead of comparing the data from two sensors, even though the Boeing 737 Max has two sensors, one on each side of the aircraft. So if MCAS is reading the data from a faulty AoA sensor, it will make adjustments to the aircraft's pitch even if there is no risk of stalling. Why did Boeing make it like that? Pure negligence and greed. There is simply no other answer.

Boeing will update the software so that it reads data from both sensors and compares the data before making any changes.

**BD:** My understanding is that planes have multiple safety features. Do any of those have a single point of failure (like MCAS)? How many rely on data from a single source vs. data from multiple sources?

**RB:** While planes can have single points of failure on their systems, there is always an electronic backup system to protect the aircraft from disaster. Aircraft that are equipped with fly-by-wire controls have various flight control modes. For example, on the Airbus A320 (and all Airbus models), there is normal law and then, in case of an emergency, alternate law.

Under normal law, the aircraft's computers protect the aircraft from making any abnormal movement. However, as soon as any failure happens, the systems enter alternate law and lift some of the protections so as to allow the pilots to make the required adjustments in order not to crash.

Boeing also has a normal mode and a secondary mode that works in pretty much the same manner as Airbus' controls. If everything is okay, the flight operates under normal mode. If a system failure happens, pilots are allowed to make adjustments so that the aircraft returns to normal flight conditions or can be landed safely.

However, Boeing fitted these systems only on their newest aircraft designs, namely, the 777, 787 and 747-8 variant (not the 737 Max). This

again comes back to the fact that Boeing and the airlines both wanted to save money. Boeing did not make any radical changes in the 737 Max's flight systems, only very minimal changes that wouldn't impact the way that the aircraft is controlled compared to the NG variant. So, as a result, pilots would not have to get a proper type rating, which would cost a lot of money for the airlines.

To answer your question whether they rely on single or multiple sources—usually, they do rely on multiple sensors. There are always at least two sensors that feed information into the cockpit. If one fails, pilots have the option to rely on the captain's readings, or the first officer's instrument panel. I truly do not understand what the reason was behind the decision to program MCAS so that it would rely only on a single AoA sensor.

**BD:** Why weren't pilots trained to respond to a problem with MCAS? How long do pilots typically train before they are allowed to fly a new plane?

**RB:** Interestingly enough, Boeing thought that pilots did not need to know about MCAS because the circumstances were very rare under which MCAS would activate. Boeing was thinking that nobody would ever even trigger it, let alone crash because of the system.

When pilots achieve their commercial pilot license or airline transport pilot license (ATPL is used in the US), they also have to get a type rating to be able to fly an aircraft. Getting a type rating takes anywhere from eight months to a year or a year and a half. It all depends on the program.

**BD:** Is it common for aircraft features to be absent from flight manuals? In the past, if features did not appear in manuals, what were the consequences for pilots, passengers, airlines, companies and regulatory agencies?

**RB:** No, the situation with the Boeing 737 Max is a unique one.

But it sort of reminds of the de Havilland Comet, when the first version of the aircraft was constantly updated to keep it flying, according to its pilots. Eventually, fatal crashes began to happen because of a design flaw in the fuselage. It would start to crack after a certain amount of pressurization cycles. And when it started to crack, it would explode mid-air.

Subsequently, the Comet was grounded for four years. It never recovered commercially. Of course, the difference between the two is that de Havilland's engineers did not know about the fuselage cracks at first, while Boeing knew about the pitch-up movements caused by the engine mounting. That's why they installed MCAS.

**BD:** What was their immense rush to get the planes on the market?

**RB:** Airbus forced Boeing's hand very firmly. Airbus struggled to get into the US market, as naturally the domestic aircraft manufacturer would be preferred by airlines. But American Airlines did the unthinkable and ordered Airbus aircraft, namely the A320ceo and A320neo.

At first, Boeing wanted to design a completely new jet and retire the 737 airframe. However, when the news broke that American Airlines, which operated Boeings exclusively, was now buying Airbus' aircraft, Boeing had to react more quickly. The new jet would've taken too much time. Boeing did not want to lose market share to its biggest rival, Airbus. So, it came out with the Boeing 737 Max, a re-engined version of the 737. Essentially, Boeing was scared that it would lose money.

**BD:** Were corners cut in the production, training, approval or bringing to market of this plane?

**RB:** Corners were definitely cut in the approval and training process. Boeing pressured the FAA to let it handle more of the certification process. FAA's upper management also pressured their own safety engineers to let Boeing do more and more of certification.

The training was shocking as well. It involved just an hour-long theoretical lecture about the small changes. But that was the main selling point of the 737 Max. Boeing knew that it had to undercut Airbus somehow to prevent the A320 from taking over a huge portion of the

short- and medium-haul market. And by advertising that the flight controls were virtually the same as on the NG, the previous variant of the 737, Boeing could tell the airlines that pilots would need only a theoretical lecture to fly the Max. So together with the fuel and maintenance cost reduction, training would also cost a lot less and airlines could save a lot of money when operating the Max, especially if they already were flying the Boeing 737 NG variant.

Boeing also cut a small corner with the production, especially the fact that MCAS reads data from only one AoA sensor.

**BD:** When the Lion Air crash took place, it was presented as a serious problem for Boeing. Why was nothing serious done in the aftermath?

**RB:** While it was presented as a serious problem, Boeing instantly came up with a solution—issue a bulletin to Boeing 737 Max operators on how to disable MCAS if it ever interferes with the flight. Boeing also came out and said it would be presenting a long-term solution, which would be a new software update, which is now set to come at the end of April. As far as everyone was concerned, they thought the “band aid” solution of providing a bulletin would hold until the software update came.

Also, the kicker with the Lion Air crash is that a lot of people thought that MCAS was not the main factor in the crash. Early reports indicated that Lion Air's maintenance was also part of the problem, as on a previous flight the same Boeing 737 Max 8 encountered flight control issues. Namely, the captain's instruments were unreliable: airspeed and altitude readings disagreed with the readings of the first officer's instruments.

The problems were noted in the maintenance log and engineers fixed the issue. However, as soon as the aircraft departed for the fatal flight from Jakarta, two issues arose: the angle of attack sensors showed a difference of 20 degrees and the aircraft's instruments again showed different airspeed and altitude readings.

But as Indonesian investigators later revealed in their preliminary accident report, MCAS was constantly forcing the aircraft's nose down and the flight crew was searching through the flight manual for instructions on how to disable MCAS. However, as we know, this information did not exist at the time. This report was released on March 21, 2019, 11 days after the Ethiopian Airlines crash and subsequently all Boeing 737 Max's were grounded.

So, essentially nobody realized that MCAS was such a huge issue, with Lion Air's dodgy maintenance blamed as well.

**BD:** How strong is the case for criminal negligence charges against Boeing and the regulators who allowed this plane to fly?

**RB:** The case is strong against both of them, but Boeing will definitely receive most of the charges and compensation claims.

First, Boeing will have to repay the victims' families. Insurance claims will be huge. In addition, Norwegian Air is already asking for compensation because its 737 Maxes cannot fly. I think more airlines will do the same. And a lot of airlines (including Lion Air and Ethiopian Airlines) are already discussing openly that they will cancel their 737 Max orders, which will result in reduced profits for Boeing.

As for the FAA, it does not have enough funds and human resources to do its job. At least that is what it says. But the fact that it caved to Boeing's pressure could point to the fact that corruption might be another charge as well.



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