My name is Joe Jacobsen and I'm an aerospace engineer with almost 40 years of experience. I worked for Boeing from 1984-1995 on the 767 and 777 programs. From 1995 to 2021, I worked in aircraft certification at the FAA. I retired from the FAA in 2021 and have been volunteering as an independent aviation safety advocate since, mostly in support of ET302 families.

My last 15 years at the FAA were spent as a technical specialist in performance and handling qualities for transport airplanes (14 CFR part 25, subpart B). In that role, I was the FAA sponsor of the Aviation Rulemaking Advisory Committee (ARAC) Flight Test Harmonization Working Group (FTHWG), where industry specialists came together to develop, among other things, regulatory and guidance requirements for new and novel flight control functions such as the now infamous MCAS.

On November 6, 2018, a week after the Lion Air 610 crash, I received an email from a colleague asking if we had done any issue papers on MCAS. Issue papers are the administrative process FAA uses for new and novel designs, or designs that do not have an established method of compliance with the regulations for transport airplanes like the 737 MAX. This was the first day that I heard about MCAS. We had no issue papers, and if we had, I would have been the engineer responsible for providing technical content and comment on such an issue paper.

The next day, although not assigned to this crash investigation, I received an email from a colleague at the FAA which contained flight data recorder (FDR) information from the Lion Air crash. It was immediately obvious to me that the 737 MAX had a serious design flaw. I saw that the horizontal stabilizer was repeatedly moving at a high rate because of a faulty angle of attack (AOA) input. I guessed that a software error was responsible. A few days later, I was shocked to discover that the airplane was purposely designed and certified to use just one AOA input for this flight critical function.

When the House report was released in September of 2020, I finally understood why I hadn't known about MCAS. Boeing meeting minutes from June 2013[1] recorded the reason, saying: "If we emphasize MCAS is a new function there may be a greater certification and training impact." Boeing intentionally hid the design from FAA engineers and airline pilots. Had we known, at least a half dozen experienced FAA engineers in the Seattle office would have immediately rejected the original MCAS design. Boeing's concealment led to two crashes and 346 deaths.

After working on the re-certification of the MAX after the second crash, I sent a letter[2] to the parents of Samya Stumo shortly before my retirement in March of 2021. I saw their anger and grief, and wanted them to know the true story, and not the false narrative presented by Boeing and FAA.

Over the last three years, Samya's parents have connected me with many other crash families. I frequently communicate with the devastated people who lost loved ones in the ET302 crash.

---

[1] Attachment #1 June 2013 meeting minutes (Boeing)

[2] Attachment #2 Letter to parents of Samya Stumo (Feb 8, 2021)

I've heard many inspiring stories about those who were lost: about Samya, Mick, Camille, Melvin, Bennett, Danielle, Graziella and others.

The re-certification of the MAX has been characterized as the most comprehensive in the history of aviation. This is also a false narrative. During the re-certification of the MAX, FAA leadership supported Boeing's effort to narrow the scope to primarily focus on MCAS. MCAS was a mess, for sure, but other critical items were off the re-examination table. The confusing, non-compliant crew alerting system was off the table. Also, the unreliable backup manual trim system, malfunctioning autothrottle, and manufacturing defects. All these other items contributed to the ET302 crash, but only the MCAS threat was fixed.

The MAX crew alerting system doesn't meet current design standards, and by my count the old standard has contributed to eight fatal crashes of Boeing aircraft and 885 deaths[3] since 1996. Despite this dismal safety record, in July 2022, Boeing Chief Safety Officer Mike Delaney stated "I personally have no belief that there's any value in changing the 737." CEO Dave Calhoun lobbied further and said "This is a risk I'm willing to take. If I lose the fight, I lose the fight." Boeing lobbying efforts succeeded and the ACSAA legislative deadline for producing a compliant MAX crew alerting system was removed.

Design unsafe conditions and inflight emergencies appeared almost immediately after the MAX returned to service. First, faulty electrical bonding and grounding, followed by a "bad batch" of stabilizer trim motors[4]. Since then, on the design side, we've seen FAA identify unsafe conditions for the engines, the engine anti-ice system, and the standby power control unit. On the manufacturing side, FAA has identified unsafe conditions for engine anti-ice (EAI) exhaust duct fasteners, compromised sealant adhesion within the center fuel tank, and loose bolts in the rudder assembly. Since the door plug blowout, we've seen stuck rudder pedals and FAA has revealed another unsafe condition due to chafing of mis-installed electrical wire bundles to the wing spoilers. Rather than an immediate inspection to prevent uncommanded rolls, Boeing and FAA are proposing to allow up to three years, gambling on a slow chafing rate for improperly routed wire bundles.

The "grandfathered" design of the MAX leaves many vulnerabilities. When combined with a failure to investigate the manufacturing chaos identified nearly six years ago by Ed Pierson, this led to a predictable, but still shocking, list of unsafe conditions.

In addition to the unsafe conditions, other MAX certification mistakes were identified and granted design exemptions by the FAA. The stall management yaw damper[5] and the flap-slat electronics unit[6] aren't required to be fixed until March of 2027, leaving them vulnerable to effects of lightning and high intensity radiated fields (HIRF).

Even when not identified by FAA as unsafe conditions, we've seen other serious incidents. On February 24, 2023, a brand new 737 MAX made an emergency landing after the horizontal

[3] Attachment #3 Crew alerting confusion history
[4] Attachment #4 FOIA response to bad batch of stab trim motors
[5] Attachment #5 FAA Exemption for Stall Management Yaw Damper
[6] Attachment #6 FAA Exemption for Flap-Slat Electronics Unit

stabilizer trim motor failed on its maiden revenue flight. On June 21, 2022, a 737 MAX landed on the wrong runway[7] after both flight management computers simultaneously blanked. Service difficulty reports document many similar occurrences before and since.

I've spent almost 40 years studying and trying to eliminate aviation accidents. Ignoring problems, taking short cuts, and deceiving the public leads to more crashes.

I'm testifying today out of my great love and respect for the crash family members that I know. Michael, Nadia, Naoise, Catherine, Ike, Chris, Javier, and others don't want this to happen to anyone else.

I also have children and grandchildren. Let's work together to fix this NOW. Thank you.

[7] Attachment #7 UAL wrong runway NTSB final report

My name is Joe Jacobsen and I'm an aerospace engineer with almost 40 years of experience. I worked for Boeing from 1984-1995 on the 767 and 777 programs. From 1995 to 2021, I worked in aircraft certification at the FAA. I retired from the FAA in 2021 and have been volunteering as an independent aviation safety advocate since, mostly in support of ET302 families.

On November 6, 2018, a week after the Lion Air 610 crash, I received an email from a colleague asking if we had done any issue papers on MCAS. This was the first day that I heard about MCAS.

The next day, although not assigned to this crash investigation, I received an email from a colleague at the FAA which contained flight data recorder (FDR) information from the Lion Air crash. It was immediately obvious to me that the 737 MAX had a serious design flaw. I saw that the horizontal stabilizer was repeatedly moving at a high rate because of a faulty angle of attack (AOA) input. I guessed that a software error was responsible. A few days later, I was shocked to discover that the airplane was purposely designed and certified to use just one AOA input for this flight critical function.

When the House report was released in September of 2020, I finally understood why I hadn't known about MCAS. Boeing meeting minutes from June 2013 recorded the reason, saying: "If we emphasize MCAS is a new function there may be a greater certification and training impact." Boeing intentionally hid the design from FAA engineers and airline pilots. Had we known, at least a half dozen experienced FAA engineers in the Seattle office would have immediately rejected the original MCAS design. Boeing's concealment led to two crashes and 346 deaths.

After working on the re-certification of the MAX after the second crash, I sent a letter to the parents of Samya Stumo shortly before my retirement in March of 2021. I saw their anger and grief, and wanted them to know the true story, and not the false narrative presented by Boeing and FAA.

Over the last three years, Samya's parents have connected me with many other crash families. I frequently communicate with the devastated people who lost loved ones in the ET302 crash. I've heard many inspiring stories about those who were lost: about Samya, Mick, Camille, Melvin, Bennett, Danielle, Graziella and others.

The re-certification of the MAX has been characterized as the most comprehensive in the history of aviation. This is also a false narrative. During the re-certification of the MAX, FAA

leadership supported Boeing's effort to narrow the scope to primarily focus on MCAS. MCAS was a mess, for sure, but other critical items were off the re-examination table.

The MAX crew alerting system doesn't meet current design standards, and by my count the old standard has contributed to eight fatal crashes of Boeing aircraft and 885 deaths since 1996. Despite this dismal safety record, in July 2022, Boeing Chief Safety Officer Mike Delaney stated "I personally have no belief that there's any value in changing the 737." CEO Dave Calhoun lobbied further and said "This is a risk I'm willing to take. If I lose the fight, I lose the fight." Boeing lobbying efforts succeeded.

The "grandfathered" design of the MAX leaves many vulnerabilities. When combined with a failure to investigate the manufacturing chaos identified nearly six years ago by Ed Pierson, this led to a predictable, but still shocking, list of unsafe conditions.

I've spent almost 40 years studying and trying to eliminate aviation accidents. Ignoring problems, taking short cuts, and deceiving the public leads to more crashes.

I'm testifying today out of my great love and respect for the crash family members that I know. Michael, Nadia, Naoise, Catherine, Ike, Chris, Javier, and others don't want this to happen to anyone else.

I also have children and grandchildren. Let's work together to fix this NOW. Thank you.