BOEING IN CRISIS

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ON THE COVER: 737 MAX IN FLIGHT

PHOTO: BOEING

Military+Aerospace Electronics

FAA panel review indicates gaps in 'Boeing's safety journey'

FAA says it will continue to hold Boeing "to the highest standard of safety" and will work to ensure the company addresses 53 recommendations made by the panel, Rebecca Kanable writes for AviationPros.

By Jamie Whitney, Senior Editor, Military+Aerospace Electronics

PHOTO: NTSB

FORT ATKINSON, WIS., - PRIOR TO THE JAN. 5 mid-flight dislodging of a Boeing 737 MAX 9 door plug, the safety management processes and effectiveness of Boeing Commercial Airplanes were under review. A final report from that review is now available. In total, an expert panel selected by the FAA identified 27 findings, then made associated recommendations to improve safety processes, Rebecca Kanable writes for *AviationPros*. Continue reading original article: www.aviationpros.com/53097776.

The Military & Aerospace Electronics take:

29 February 2024 – According to a summary of the panel's work:

- The panel observed a safety culture disconnect between Boeing's senior management and other members of the organization. Interviewees, including ODA Unit members, also questioned whether Boeing's safety reporting systems would function in a way that ensures open communication and non-retaliation.
- The panel also observed inadequate and confusing implementation of the components of a positive safety culture. Boeing SMS procedures are not structured in a way that ensures all employees understand their role in the company's SMS. The procedures and training are complex and in a constant state of change, creating employee confusion.
- The panel also found a lack of awareness of safety-related metrics. ODA unit management restructuring decreased opportunities for interference and retaliation against unit members, but still allowed opportunities for retaliation to occur, particularly regarding salary and furlough ranking. This influences the ability of ODA unit members to execute their delegated functions effectively.

IndustryWeek

Boeing's Organizational Problems Date Back Two Decades

PHOTO: 116191601 | KOVA1EV | DREAMSTIME

The aerospace giant began outsourcing 70% of its design, engineering and manufacturing in the early 2000s.

By Christopher S. Tang

BOEING HAS BEEN A BEACON OF AMERICAN aviation leadership for over a century, weathering numerous storms. Following a Jan. 5 incident where a fuselage panel of its 737 Max 9 **detached** during an Alaskan Airlines flight, Boeing's stock price only dipped by 10%. But there have been more incidents since, including the discovery of **missing bolts** and **mis-drilled holes** on some fuselages of its 737 Max jets in late January.

In the commercial aircraft industry, Boeing and Airbus are the primary competitors. Unless significant sanctions are imposed due to Boeing's design and production-quality issues, it is likely that business will continue as usual. This is because the current crisis is not unprecedented.

Two decades ago, Boeing faced similar issues during the development of its 787 Dreamliner. The company's approach to managing development and production has remained unchanged since then. It is unlikely to alter unless there is substantial pressure from the government and the public.

Boeing's 787 Dreamline Development Odyssey

The development of the 787 Dreamliner was a challenging period for Boeing. The company aimed to develop the aircraft quickly and inexpensively to compete with the Airbus A380. Instead of developing the aircraft in-house and sourcing parts from suppliers, however, Boeing decided to outsource **70%** of the design, engineering and manufacturing of entire modules to over 50 strategic partners. These partners, in turn, could outsource various parts to their suppliers.

This strategy of leveraging suppliers for rapid and frugal product development can be effective if one follows the Toyota development process, which involves deep supplier relationships. In addition to close communication and coordination with suppliers, Toyota shares information with suppliers and conducts joint improvement activities, making these key suppliers an extension of Toyota.

However, Boeing **failed** to establish the close supplier relationships that took Toyota decades of effort and commitment to develop. Without close communication and coordination among the partners, Boeing was unable to manage its external development process effectively. As a result, the 787 development program, initially **budgeted** at $5.5 billion and scheduled for 5 years, ended up being three years **late** and costing over $**32 billion**.

Aside from the cost and time overruns, there are ongoing **safety concerns** with the 787 about the epoxy tape used to connect the wings and the middle-fuselage, and the inspection and maintenance of the 787's composite structure.

Boeing's 737 Max 8 Design Problems

While the development problems of the 787 may fade into the past, the two fatal crashes of the 737 Max 8 in 2018 and 2019—which claimed a total of 346 lives and led to a 20-month grounding of the aircraft—have renewed public safety concerns.

The 737 Max series, the fourth generation of the Boeing 737 family, was designed to be a fuel-efficient marvel to rival the Airbus A320neo. However, investigations following the two fatal crashes revealed a flaw in its automated anti-stall system, known as the Maneuvering Characteristics Augmentation System (MCAS). This system, which relied on a single sensor, triggered unintended nosedives due to faulty data. Despite Boeing's development of a software update, the image of the 737 Max was tarnished, leading some to suggest that the 737 Max should be scrapped.

Boeing's 737 Max 9 Production Problems

Recent investigations into a door plug that detached from a brand new 737 Max 9 mid-flight have revealed serious production control problems within Boeing's supply chain operations. On January 30, Boeing, along with other industry representatives, indicated that the bolts required to fasten the fuselage panel of an Alaskan Airlines aircraft appeared to be missing when the plane left Boeing's facility. This incident could potentially be attributed to **oversights** in documentation and procedures at Boeing's Renton factory in Washington.

While this may seem like a simple lapse in in-house production procedures that can be easily rectified, it exposes a fundamental failure in managing quality control within the Boeing facility. If Boeing struggles with managing its in-house production processes, it is likely that similar issues will arise in managing its suppliers.

This suspicion was confirmed when Boeing supplier Spirit AeroSystems, which manufactures the fuselages of the 737 Max jets, notified Boeing that two holes may not have been drilled exactly to Boeing's specifications. On February 5, Boeing announced plans to rework about 50 737 Max jets that have not yet been delivered.

Although these jets have not been delivered and therefore do not pose an immediate flight safety issue, this series of production quality issues has prompted legal actions. On February 1, passengers filed **class-action lawsuits** against Boeing, while shareholders **sued** Boeing for being misled about its potential safety lapses.

In light of Boeing's production quality problems, some airlines, such as United Airlines, might **cancel** some of their orders with Boeing. Furthermore, the Federal Aviation Administration may indefinitely halt Boeing's ambitious plans to increase production of Max planes.

Christopher Tang is a distinguished professor at the UCLA Anderson School of Management.

IndustryWeek

Boeing Replaces 737 MAX Chief After January Mid-Air Scare

The move comes after a 737 MAX operated by Alaska Airlines suffered a mid-flight blowout of an air panel on the fuselage on January 5.

By Agence France-Presse

BOEING ANNOUNCED WEDNESDAY THAT THE head of its 737 MAX program is departing the aviation giant less than two months after a major safety incident temporarily grounded 171 planes.

Ed Clark, an 18-year Boeing veteran is "leaving the program," Boeing Commercial Aviation (BCA) Chief Stan Deal said in a memo released by the company. Katie Ringgold has been named as his replacement.

The move comes after a 737 MAX operated by Alaska Airlines suffered a mid-flight blowout of an air panel on the fuselage on January 5, triggering an emergency landing with the plane left with a gaping hole in the cabin.

While there were no serious injuries, safety inspectors said the incident could have been catastrophic.

"Ed departs with my, and our, deepest gratitude for his many significant contributions over nearly 18 years of dedicated service to Boeing," the memo said.

Clark had ascended to the role in March 2021, shortly after a 20-month grounding of the MAX program following two fatal crashes in 2018 and 2019.

In her new post, Ringgold's responsibilities include management of the Renton factory where the MAX is assembled, in the western Washington state.

PHOTO: 241682028 | IANDEWARPHOTOGRAPHY | DREAMSTIME

The January 5 episode has led to enhanced scrutiny of Boeing by the Federal Aviation Administration regulatory body and lawmakers on Capitol Hill, who plan hearings on the matter.

A preliminary investigation found that four bolts which help secure the panel were missing, the National Transportation Safety Board said February 6, describing the probe as "ongoing."

The FAA has said it is midway through its own six-week safety audit into Boeing. The agency in January 2023 also appointed a panel to undertake a "safety culture" review of Boeing that is expected to be released in the coming weeks.

Boeing's response to the latest difficulty has included operational pauses at Renton and other sites to review safety and quality control procedures. It promised enhancements of efforts to bolster inspections of new planes prior to delivery.

Boeing Chief Executive Dave Calhoun has accepted responsibility for the incident and promised transparency.

Appointments

In addition to Ringgold's appointment, Boeing named Elizabeth Lund to the newly created post of senior vice president for quality in the commercial division.

The company also named Mike Flemming to succeed Lund as general manager for airplane programs and Don Ruhmann to replace Flemming as vice president of development programs.

The leadership changes were needed "as we continue driving BCA's enhanced focus on ensuring that every airplane we deliver meets or exceeds all quality and safety requirements," Deal said in the memo.

"Our customers demand, and deserve, nothing less."

Michel Merluzeau, an aeronautics specialist with consulting firm AIR, said the newly named executives were well-regarded but that the company had experienced important departures during the pandemic.

"They've lost a lot of people," Merluzeau said. "The next level of leadership needs to mature."

IndustryWeek

Boeing Says Employees Must Take 'Immediate' Action on Safety Measures

Of the 89 production process audits conducted by the FAA, Boeing failed 33 of them, the New York Times reported March 12, 2024.

By Agence France-Presse

PHOTO: 307951055 | IANDEWARPHOTOGRAPHY | DREAMSTIME

U.S. AERONAUTICS GIANT BOEING, FACING increased scrutiny after a series of safety incidents and manufacturing issues, is directing employees to take "immediate actions" to improve operations, according to a message the company sent to its workforce March 12.

The guidance, from Boeing's head of commercial aviation Stan Deal, comes after an audit by the U.S. Federal Aviation Administration (FAA)—undertaken after a close call on an Alaska Airlines flight in January—found instances of non-compliance at the manufacturer.

"We have used your feedback, and those from our regulator and customers, to take immediate actions to strengthen our safety and quality," Deal said.

"These actions are central to a comprehensive plan we will soon deliver to the FAA," he added, referring to the U.S. regulator's order earlier this month that Boeing come up with a framework to address quality control within 90 days.

According to Deal, "the vast majority of our audit non-compliances involved not following our approved processes and procedures."

To address the issues, management will set up additional training for relevant employees, establish weekly compliance checks and dedicate a portion of each shift to review procedures and check tools.

These new measures are in addition to the others put in place in recent weeks, including additional inspections.

The FAA audit came in response to a near-catastrophic incident in January, when a fuselage panel on a Boeing 737 MAX 9 Alaska Airlines jet blew off mid-flight.

No one was seriously injured, but the plane was forced to make an emergency landing with a gaping hole in the cabin.

Of the 89 production process audits conducted by the FAA, Boeing failed 33 of them, the New York Times reported March 12, with 97 instances of non-compliance identified.

The concerns included one use of a hotel key card to check a door seal and the use of liquid dish soap as a mechanical lubricant, according to the Times.

Series of incidents

Deal's letter also addressed the findings of an independent expert commission appointed by the FAA, which found shortcomings with Boeing's safety standards—notably, that they may be too complex and cause confusion among employees.

"Our teams are working to simplify and streamline our processes and address the panel's recommendations," Deal said, while meanwhile calling on employees to implement certain changes immediately.

"Precisely follow every step of our manufacturing procedures and processes," he urged.

"We can and should update procedures and processes, but until then, we must adhere to the existing ones."

Employees should also "always be on the lookout for a potential safety hazard or quality escape," Deal added, encouraging them to use the company's internal reporting system to flag concerns when necessary.

Boeing is still facing investigations from the FAA and the National Transportation Safety Board (NTSB), while the Justice Department has opened a criminal investigation.

The company has faced questions following several other potentially dangerous episodes in addition to the Alaska incident, including an engine fire on a Boeing 747 shortly after takeoff from Florida in January.

March 7, a Boeing 777 jetliner bound for Japan had to make an emergency landing shortly after takeoff from San Francisco when a wheel fell off and plunged into an airport parking lot, damaging several cars.

And New Zealand authorities on March 12 launched an investigation after a Boeing 787 Dreamliner violently lost altitude mid-flight from Sydney to Auckland, injuring a host of terrified passengers.

IndustryWeek

Boeing Ousts CEO, Chairman, Airplane Division Chief in Fallout from Safety Catastrophe

Door plugs popping off in flight, critical reports from regulators on the company's safety processes, wheels falling off of planes and other safety errors have prompted the largest U.S. plane maker to clean house.

By Robert Schoenberger

BOEING IS CLEANING HOUSE IN ITS EXECU-tive ranks following months of safety errors that put hundreds of flyers at risk, ousting its CEO, chairman and the head of its commercial airplane division, though the CEO plans to stay with the company through the end of the year.

President and CEO Dave Calhoun will leave at the end of the year, Board Chair Larry Kellner will not seek re-election and Boeing Commercial Airplanes President and CEO Stan Deal is retiring and will immediately be replaced by Boeing Chief Operating Officer Stephanie Pope.

Pope has been serving as chief operating officer of Boeing since January of this year. Previously, she was president and chief executive officer of Boeing Global Services, where she was responsible for leading the company's aerospace services for commercial, government and aviation industry customers worldwide. Prior, she was chief financial officer of Boeing Commercial Airplanes, and has held positions in every Boeing business unit.

Boeing had already replaced the head of the 737 Max program, following the January 5 disaster in which a door plug on an Alaksa Airways blew out, in flight, creating a giant opening in the fuselage that thankfully no passengers fell through. This month, a wheel fell off of a United Airlines Boeing plane, destroying a car in an airport parking lot, and a Federal Aviation Administration report thoroughly criticized the plan maker's safety and quality standards.

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CHEMICAL PROCESSING

Podcast: **Lessons Learned from Boeing's 737 MAX Crisis**

PHOTO: 2428280833 | ANDRI WAHYUDI | SHUTTERSTOCK

Boeing was known for its engineering excellence until a focus on profitability took over. Properly documenting management of change and recognizing weak signals could have prevented tragedy.

By Traci Purdum, Editor in Chief and Trish Kerin, Stay Safe columnist

IN THIS EPISODE OF PROCESS SAFETY WITH Trish & Traci, we discuss the aviation industry's Boeing 737 MAX crisis and how it revealed critical management failures, emphasizing the importance of rigorous management of change, prioritizing safety over profitability and identifying weak signals. The mishaps stemmed from design flaws and inadequate pilot training, highlighting the need for systemic improvements to prevent similar tragedies. Lessons extend to other industries, emphasizing proactive risk mitigation and a culture of safety.

Transcript:

Background On Boeing's Ethiopia Air Crash

Traci: The manufacturing world has looked to the airline industry on many occasions for best practices and lessons learned. One example is reliability-centered maintenance programs, which are centered on achieving the inherent safety and reliability capabilities of equipment at minimum cost. Author Stanley Nowlan and Howard Heap prepared a reliability-centered maintenance document for United Airlines in 1978. According to many maintenance professionals, this document is the Bible for maintenance and reliability professionals. There are other times that we look to the aviation industry with a more somber objective of learning from catastrophes. Today we will talk about the missteps that led to two plane crashes just months apart. The aircraft in question on both occasions, the Boeing 737 MAX. On March 10th, 2019. 157 people died when this plane crashed in Ethiopia. Just a few months earlier, the same model crashed, killing 189 people in Indonesia. Can you give us some background on the Ethiopia crash?

Trish: Yeah, so this was a really interesting event that took place. As you mentioned, the Lion Air crash occurred first, and so that occurred in October of 2018. And when that occurred, there was interest of how did this happen, what went wrong? And it kind of quickly died down and everyone kept flying the [737] Max 8 plane. There's no issue here; nothing to see. Boeing were very clear, there was nothing to see. It was put down at the time to pilot error, all sorts of things like that. Until then, we saw the second crash of the same sort of aircraft. And again, the Ethiopian Airlines crash, that plane was only four months old. It was a brand-new plane. Now, we don't expect brand-new planes to fail. So, when that happened, the world stood back and said, "Oh, what's going on here? And countries all over the world started saying, actually, "No, we're grounding the MAX 8. We need to figure out what caused this. There is a problem with this."

And I remember thinking at the time, there's an interesting parallel here that we've seen this sort of thing in history before. Way, way, way back mid last century, there was an aircraft called the de Havilland Comet, and in fact, the de Havilland Comet had a catastrophic mid-air failure, a passenger plane. It was sort of like, "Oh, well, we don't really know what caused it. No, it couldn't have been the plane. It's all okay, we'll keep going." And then there was another catastrophic mid-air failure of a de Havilland Comet, and it took two major crashes to get that one grounded as well. And it was then discovered there was a design fault in the de Havilland Comet, which resulted in catastrophic hull collapse of the aircraft mid-air. I reflected at the time and thought, "Hang on, we've seen this pattern before of major aircraft crash." Same model occurred again. And I thought, "Oh, there's something happening here." So, it's an interesting one.

When we talk about the actual issue of what caused it after subsequent investigation and a lot of focus by aviation authorities all over the world and Boeing as well, it came out that the cause of the crashes was related to something they called the MCAS system, which was a system that they had installed in the aircraft, electronic system or computer-based system to as Boeing described it, help with the handling characteristics. It wasn't a flight control system, it was to help with the handling of the aircraft, and it was based on when they created the MAX 8, they put these massive engines on this 737 aircraft, but they didn't really change the main body of the 737. And so, to fit the engines under the wings, they had to move them far forward of the wing and up. So the 737 engines used to be tucked in right under the wing when the 737 was first made. The engines were now right at the front and up higher so they could fit so there was ground clearance.

Now, why should that matter? Well, that changed the entire flight characteristics of the plane. And so they needed to install a software system that would avoid a potential stall because of where the engines were moving so far forward it used would cause the nose

> And in fact, the records have now shown that Lion Air had requested simulator training for the MAX 8 and Boeing said, 'No, no, no, you don't need it. We're not doing it. You're not getting it.'
>
> Trish Kerin

to pitch up and that could create an unstable stall angle for the aircraft. Aircraft have these things called angle of attack sensors, which basically tell the pilot what degrees the nose is at, whether it's pointed up, neutral or down. And so, the MCAS was based on the angle of attack sensors. If the angle of attack sensor was saying that the nose was pitched up, the MCAS would automatically take over and would drive the nose of the aircraft down by adjusting the stabilizers. They're the small wing bits that stick out on the back of the tail. So it would adjust those to pitch the nose back down to a neutral position.

Now the problem is in both the Lion Air incident and the Ethiopian Air incident, there was a failure of the angle of attack sensors and they were saying the nose was pitched up, but it wasn't. And so MCAS started pointing the nose down. The angle of attack sensors were still saying no; the nose is up. So MCAS kept pointing the nose down until it put these aircraft essentially into a nosedive. And because this happened shortly after takeoff, the greatest thing a pilot has to deal with in aviation is altitude. When they're up high, they've got space to maneuver. When you're just taking off, you're close to the ground, you don't have that vertical space to figure out what's going on and stop it before you hit the ground. And so, tragically, that's what actually happened. The angle of attack sensors were inputting false results, causing the MCAS.

Importance of Training and Management of Change

Traci: This all happened, moving the engines up and out to ensure there was clearance, putting in this software system. Was there training for pilots to understand what they were walking into? When I was reading about this, from what I understand, Boeing was in competition with Airbus and Boeing wanted to bring these new planes to market quickly and they claimed that the pilots didn't need additional training. What happened there? I mean, there's importance to training and people understanding their environment.

Trish: Yeah, absolutely. And so, there was a lack of training for this. And in fact, when they went to market with the MAX 8, one of the benefits they were marketing to the airlines of the MAX 8 was there's no simulator training required. And in fact, the records have now shown that I believe it was Lion Air had requested simulator training for the MAX 8 and Boeing said, "No, no, no, you don't need it. We're not doing it. You're not getting it." Essentially, the airlines that predominantly flew the MAX 8s, they didn't want to have the time to have do these extra training bits for the pilots. So, when Boeing said, "Yeah, look, it's just an iPad e-learning thing that'll take you about an hour to familiarize yourself," because they largely kept the cockpit identical. I mean, the cockpit of a 737 still had a lot of the original dials and gauges in it. It hadn't gone to the full electronic cockpits of all of the other aircraft.

So if you were a 737 pilot, you could pretty much get in any 737 and fly this thing because the cockpit largely didn't change at all for you over the entire history of that aircraft. So that offered a lot of advantages to airlines because if they didn't have to put their pilots through extensive simulator training, that was going to get the fleet changed over much, much faster. And so to a certain extent, Boeing was also being pressured by their customers to not have such a new aircraft that there would require training. There was a big race between Boeing and Airbus, and there still is today as to who would dominate the supply of passenger aircraft. And Boeing thought that they could be faster to market if they just kept modifying and improving the range of the 737, and more importantly, the fuel efficiency of the 737 because that's also a key factor in an aircraft for the fuel efficiency. And that's what led to the different engines.

That was their focus, to bring an aircraft to market without having to design an entire new aircraft. I mean, the 737 is really, whilst it's a smaller plane for Boeing, it's the backbone of the Boeing fleet. It is the most populous plane that they have, I believe. So, it was a significant effort to get this plane out there. And they did avoid the training. They did basically just sort of say, "No, you don't need it. We're not going to provide it to you." And even in the manual for the MAX 8, the references to the MCAS were actually inconsistent. So, the information wasn't even really in the manual. So how could a pilot actually diagnose what was going on if they didn't actually even know that the MCAS existed, let alone what it did? So, all of a sudden, you are flying, and the plane takes over, has a mind of itself and starts doing something that you can't control and don't know why. That's what happened.

Traci: That had to be terrifying. And how does that happen? How can such a momentous change happen, a design change happen without any kind of documentation or somebody raising their hands and going, "We think somebody else ... Everybody needs to know about this a little bit more than you're letting on?" How does that happen?

Trish: And it really comes down to I think a lack of the rigorous management of change that we would be used to seeing in the chemical industry, for example. They had very good designers that were designing things. They knew what they were designing. I mean, they designed great planes. These people know how to build planes, but they built or designed sort of piecemeal of you do that bit and you do that bit. And if you don't look at the overall full system, employing what we call in engineering systems thinking to look at the entire process of how one small change in one area can actually create quite a significant change in another area. The interconnectedness of what goes on needs to be understood and needs to be viewed at a high level. And so, I think there was perhaps a lack of seeing that. And again, very much this overriding pressure of getting this plane to market, ramping up production of it, they were focused on producing as many 737s as they could, ramping up production.

And you will also recall that back in January this year, there was another 737 MAX issue where an Alaska Airlines aircraft had a blowout of the plug door mid-air. That was the MAX 9. So we're still talking the same family of aircraft, and in fact, there's still some carryover issues, I think, in terms of how they were going about the manufacturing process and the design process that potentially contributed to all of this. It's interesting to note that there has been a report issued this week to Congress, which is focused on, it was an expert review panel that looked at what were the organizational causes within Boeing of the MAX 8. And so quite timely that this was commissioned to look at the MAX 8 issues historically and the FAA's involvement in that as well. But then it's come out just this week even. And in fact it found that there was a lot of focus on financial incentives for people who were essentially focused purely on profit only, with no real focus on the delivery of the aircraft.

Now we need to really think about these things. If you make a widget that can't really hurt anybody, then you can focus on the profit and getting it as lean as possible and as fast to manufacture as possible, probably without too many issues. But when your product is an aircraft that people fly in, you need to focus on the aircraft safety. It's not necessarily just about the safety of the people manufacturing the aircraft, which is still important, but you've got to focus on what keeps that aircraft in the air. What's the airworthiness of it? There were incentives in terms of the structured payment systems that really pushed for profit and somewhat above potentially that air-worthiness. We saw that the engineers weren't really empowered to be able to stand up and say that they think there was a problem with something, so they were very isolated within the organizational structure. And there was certainly a fear of speaking out, which was certainly very much found.

There was confusion about what the safety culture in the organization was. It hadn't been rolled out effectively. There was certainly an issue with effectively the self-regulation that was occurring. So the FAA designated people within Boeing to be the FAA checkers basically, but those people were actually still at the mercy of the production managers.

So, the pressure that they were under to be independent was almost impossible. We can't expect people to be able to at all times discharge their duties without fear or favor when their livelihood depends on how well it's accepted by their superiors. That's just not going to work. Sadly, I think all of those things combined is where we ended up with this idea and people saying, "We don't need to worry about the training because it's not needed. We'll scale back on that. We can save money here. We can sell an aircraft there" because the airline doesn't want to have to train their pilots any extra either. So that's going to make the aircraft more attractive. We're in this massive race with Airbus that we need to make sure we keep selling our 737s because that's one of our most profitable aircraft.

So, you can see all of these things combined within the organization to create the perfect storm for what we saw, sadly. And I think Boeing has got a way ahead of them, and to their credit, they're making changes, they're doing things to try and improve this. They've agreed that they can't just ramp up the production of the MAX aircraft now. They actually need to make sure they go back and get it right before they can continue down this path.

Process Safety Lessons Learned, Finding Weak Signals

Traci: And getting it right and convincing everybody else that you got it right is a challenge in itself. What types of lessons can we learn from this in the chemical facilities? What can we take from this and apply it to our own work and try and make things better in the future for our own facilities?

Trish: Yeah, I think there's really, for me, I think three key lessons in this. The first one is management of change. You have to get your management of change right, you have to focus on it. You have to identify what a change is and make sure you understand all the risks associated with it.

The next one is to not be lulled into that area of focusing on profitability over everything else, especially when the work you do has the potential to kill people. You need to make sure you focus on that engineering excellence part, which historically Boeing was known for its engineering excellence.

And the third part is identification of the weak signals. One of my favorite topics talking about weak signals, and the reason I talk about it here is in the flight before the Lion Air crash, that aircraft was flying and the MCAS actually initiated again, or the first time, in fact, on the flight before Lion Air crashed in that very plane. And on that particular flight, there happened to be a third pilot hitching a ride sitting in the cockpit with the other two pilots. So, while the two pilots flying the plane were trying to figure out what was going on, the third pilot looked and saw the stabilizer dial moving and went, "Oh, the stabilizer's doing something, we need to stop that." It was a weak signal. They intervened, they were able to switch off whatever was going on and fly the plane.

Now it was repaired and was reported and it was said that this issue was there and it's all been sorted. Then the aircraft went for its next flight, and sadly there were only two pilots in the cockpit that day. There wasn't that third person who shouldn't have even been there to notice that this dial was moving because no one expected it to move so they weren't looking at that. They were looking for other things at the time. Finding those weak signals, and you wonder whether there could have been a different outcome in general had that been identified clearly as a weak signal and not just a false alarm that was triggering something at the time, before the first Lion Air crash, before the Ethiopian Air crash?

Traci: I know you have a full dissertation on weak signals and how to identify them. And with this topic the first time, it's an unfortunate event. The second time, it's now suspect, and you can have that 2020 vision to say, "Okay, that was a weak signal." Are they going to change the instrumentation so that two pilots, they don't have to look down, that they can see everything they need to see without having to look down? You know what I'm saying? Having that third pilot, there was the only reason they saw that.

Trish: Correct. Yeah. So the MCAS system has changed. It has been heavily modified and rewritten. The pilots also know about the MCAS system now, which was a key thing, that if you know that there's this thing that can take over then you know can turn it off. A lot has changed in that designs. I'm confident the MCAS system has no issues with it now. It has been thoroughly investigated and thoroughly redesigned. That issue has now been engineered with an engineered fix. They had to do that obviously because they had pilots refusing to fly these aircraft, let alone passengers refusing to get on these aircraft as well. So that has been rectified, but it's about how do we make sure we get it right the first time so we are not having to go back and learn from the past and tragically see hundreds of people killed in it.

Traci: And it brings that human factors into it too. So, if you see something, say something so that those types of things can change and we can get safer environments for everybody. Trish, is there anything you'd like to add on this topic?

Trish: I think there's some really interesting reading out there and I would recommend if people are interested in understanding some of the aspects of it, to take a read of the report to Congress that came out this week. I'll give you the title of it because it's not obvious what the report's about, if you don't know what you're looking for, it is **Section 103, Organization, Designation, Authorizations for Transport Airlines Expert Panel Review Report**. That's the report you want to Google to look for.

But it's worth finding, and it's not that long. It's only about 50 pages, so it's a short report, but it's actually a report worth taking a look at. The other thing that I found quite interesting to read was a book called **Flying Blind: The 737 MAX Tragedy and The Fall of Boeing**. So it's an interesting book that goes through the history of the organization and talks about some of the changes and how it happened. I'm sure that there are things in here that are not necessarily accurate if you're inside the system and you know what's going on. But certainly for the layperson, it does paint a picture for you and have a read of it and think, could you fall into that trap in our facility or our company? Is there something that we could fall into here? And what can I do to stop that?

Traci: Thank you Trish for helping us look at the entire process and the interconnectedness to make sure that we're not missing things. Unfortunate events happen all over the world, and we will be here to discuss and learn from them. Subscribe to this free podcast so you can stay on top of best practices. You can also visit us at chemicalprocessing.com for more tools and resources aimed at helping you run efficient and safe facilities. On behalf of Trish, I'm Traci, and this is Process Safety With Trish and Traci.

Trish: Stay safe.

AVIATIONPROS

FAA Identifies Issues in Boeing's Manufacturing Process Control, Parts Handling and Product Control

An FAA audit of Boeing and Spirit AeroSystems has found multiple instances where the companies allegedly failed to comply with manufacturing quality control requirements.

By AviationPros Staff

A FEDERAL AVIATION ADMINISTRATION (FAA) audit of Boeing and Spirit AeroSystems has found multiple instances where the companies allegedly failed to comply with manufacturing quality control requirements.

The six-week audit was prompted by a Jan. 5 mid-flight dislodging of a door plug from a Boeing 737-9 MAX aircraft. The audit is separate from an expert panel review and that panel's final report, which was shared with the public on Feb. 26 and indicated gaps in "Boeing's safety journey."

During the audit, the FAA identified non-compliance issues in Boeing's manufacturing process control, parts handling and storage and product control. The FAA said it provided these details to the public on March 4 as an update to the agency's ongoing investigation.

To hold Boeing accountable for the issues, the FAA has halted production expansion of the 737 MAX, is exploring the use of a third party to conduct independent reviews of quality systems, and will continue its increased onsite presence at Boeing's facility in Renton, Washington, and Spirit AeroSystems' facility in Wichita, Kansas. The audit is one of the immediate oversight actions the FAA took after a left mid-cabin door plug blew out of Alaska Airlines Flight 1282 on Jan. 5 while in flight. At a meeting at FAA headquarters in Washington, D.C., Feb. 27, FAA Administrator Mike Whitaker informed Boeing's CEO and other senior leaders that the company must address the audit's findings as part of its comprehensive corrective action plan to fix systemic quality control issues. The plan also must address the findings from the expert review panel report that examined Boeing's safety culture. The FAA has given Boeing 90 days to outline its action plan.

The FAA said it will thoroughly review all of Boeing's corrective actions to determine if they fully address the FAA's findings.

IMAGE: FAA

AVIATIONPROS

Sen. Cantwell to Boeing: Where Are the Documents?

IMAGE: NATIONAL TRANSPORTATION SAFETY BOARD INVESTIGATIONS REPORT SCREENSHOT

U.S. Sen. Maria Cantwell, D-Washington, chair of Senate Committee on Commerce, Science and Transportation, convenes a full committee hearing titled "National Transportation Safety Board Investigations Report" with testimony from NTSB Chair Jennifer Homendy on Wednesday, March 6, 2024.

NTSB chair said Boeing has failed to provide access to key protocols, documents and personnel necessary for NTSB's investigation.

By AviationPros Staff

NATIONAL TRANSPORTATION SAFETY BOARD (NTSB) Chair Jennifer Homendy on March 6 testified that Boeing failed to provide access to key protocols, documents and personnel necessary for NTSB's investigation into the cause of the Jan. 5 Boeing 737 MAX-9 door plug incident. Homendy provided testimony during a Senate Committee on Commerce, Science and Transportation hearing on NTSB's ongoing investigations.

In response, Boeing issued this statement on March 6:

"We have deep respect for the NTSB and the critical role they play in aviation safety. Since the first moments following the Alaska Airlines Flight 1282 accident, we have worked proactively and transparently to fully support the NTSB's investigation. Our team works tirelessly with the NTSB team to respond comprehensively to all NTSB information requests and bring information to them that would be relevant to their investigation. Early in the investigation, we provided the NTSB with names of Boeing employees, including door specialists, who we believed would have relevant information. We have now provided the full list of individuals on the 737 door team, in response to a recent request. With respect to documentation, if the door plug removal was undocumented there would be no documentation to share. We will continue to cooperate fully and transparently with the NTSB's investigation."

After the hearing titled "National Transportation Safety Board Investigations Report," U.S. Sen. Maria Cantwell, D-Washington, who chairs the committee, had sent a letter to Boeing CEO Dave Calhoun, demanding that the company provide NTSB with the requested information – including documentation of the door plug removal and reinstallation, and the names of the 25 persons assigned to the door plug team – within 48 hours.

"…every shift is documented, you know the workers that were involved in this particular area, you can get their names, you can ask for interviews with those individuals. And you're saying that that hasn't happened?" Cantwell asked Homendy during the hearing.

"We have gone through emails, we've gone through texts, we've looked at pictures to begin to get a picture of the date in mid-September, the two dates in mid-September that we believe the work occurred," Homendy responded. "We haven't received that information directly from Boeing. We also believe we know what shift it occurred on. But we still—there is one team … that deals with the doors, of 25 people. Why we don't have those names today, two months later, is really disappointing."

"Well, it's beyond disappointing," Cantwell said. "We have an entire economy that depends on people getting this right. And I thought that the CEO said that they would cooperate to the fullest. So, it seems like this information is now stymieing your investigation, and it seems that it's knowable, and that you should at least be able to talk to the individuals there."

In her letter to Calhoun, Cantwell wrote if Boeing cannot provide the investigative information to the NTSB within 48 hours, Boeing should provide a thorough explanation of why not within the same time period.

"We cannot delay the important work of federal safety investigators," Cantwell wrote.

Excerpts from Opening Statement by Cantwell

"...Serious questions remain unanswered about the door plug accident on Alaska Airlines Flight 1282. We need to be satisfied that manufacturers have strong quality controls and FAA oversight is robust.

"The FAA and manufacturers, in my opinion, should listen to machinists and professional engineers who are asking for a stronger safety culture to improve certification and production quality. And we need to do everything to make sure they are not intimidated on the job to just keep the line moving.

"Members have been briefed about the accident and this committee will continue to do its oversight role.

"On February 6, 2024, the NTSB released its preliminary report regarding the Flight 1282. I appreciate its prompt investigation of the accident and its preliminary findings. The committee continues to be concerned about the deficiencies in safety culture. I think probably also, articulated or illuminated by the individual report that was required by our ACSAA [Aircraft Certification, Safety, and Accountability Act] bill and was delivered just a few weeks ago.

"The report implies that the Boeing facilities have significant, now I'm saying your report, to be clear, implies that Boeing facilities may have significant deficiencies in record-keeping and the investigation continues to determine what manufacturer documentations were used to authorize the opening and closing of the left mid-exit door plug during rework. In particular, we want to know about the disclosure of records that may show why or how it was improperly installed and what caused the accident 1282. Which raises questions that we'll ask in the Q&A period, whether the documents even exist.

"These are important issues that we need to get to the bottom of. There are lots of people in the Northwest, not just those who work at Boeing, but those who are involved in an aviation culture around our state. We want to get this right."

IMAGE: NATIONAL TRANSPORTATION SAFETY BOARD INVESTIGATIONS REPORT SCREENSHOT

U.S. Sen. Maria Cantwell, D-Washington, chair of the Senate Committee on Commerce, Science, and Transportation, March 6, Full Committee Hearing on NTSB Investigations Report

Question-and-Answer Segment

Ranking Member U.S. Sen. Ted Cruz, R-Texas, asked how cooperative the parties to the investigation have been with the NTSB.

"Have you gotten timely access to the documents, the information and the witnesses you need?" he asked.

Homendy: "There are a number of parties to the investigation and some parties have been very cooperative. For example, the Federal Aviation Administration. Boeing has not provided us with the documents and information that we have requested numerous times over the past few months, specifically with respect to opening, closing and removal of the door and the team that does that work at the Renton facility [in the state of Washington]."

Cruz: "Wow. Are you telling us that even two months later you still do not know who actually opened the door plug?"

Homendy: "That's correct, senator. We don't know. And it's not for lack of trying. It's not unusual that we don't get information immediately in an investigation. I can point to numerous investigations where this occurs and it takes months and months to get information. But for this one it's two months later.

"We know for a fact that there is a team that deals with the doors in Renton. There's an entire team of 25 people and a manager. The manager has been out on medical leave. We have not been able to interview that individual. We've asked for the names of the other 25 people, have not received the names.

"We've asked for the records with respect to what occurred. We've asked for what shift it occurred on. We think we know what days the work occurred on. But that's only because of our investigators work looking at pictures in emails to try to get to the bottom of that information.

"We don't have the records. We don't have the names of the 25 people that [are] in charge of doing that work in that facility. It is absurd that two months later we don't have that. Our investigators right now are at the Renton facility and they are conducting interviews... [from Sunday through the rest of the week].

"While we were out there, we investigated both the Spirit [AeroSystems] employees that did the work on the rivets. Well, we don't know who did the work on the door plug. For the Spirit [AeroSystems] employees, we were just informed last week, they're actually not Spirit [AeroSystems] employees, they're contractors. They work for three different contracting firms: Aerotek, Strom Aviation and Launch, all three are in the state of Washington. All three people work for three different entities for Spirit [AeroSystems]. Those were not told to us by Spirit [AeroSystems]. That information was told to us through the individuals who were being interviewed that contacted us directly. We have engaged our attorney on this matter, just so you're aware."

Cruz: "I will say that is utterly unacceptable and the parties who are being investigated by NTSB need to cooperate fully…"

Cruz asked Homendy to inform the committee in writing one week from March 6 as to whether or not Boeing has cooperated.

"I expect you to have that list of 25 names," he said.

Homendy added it's not just the 25 names. She said NTSB has repeatedly requested from Boeing the documentation that went along with the work of opening the door plug, closing the door plug or any sort of removal if that exists.

Cruz said, "Please include that as well."

Cantwell: "Following on, the expert review panel found that Boeing employees are still afraid to speak up and report safety issues. There is a way for employees to speak directly to the FAA, is there a way for people to speak directly to NTSB to aid in this investigation?"

Homendy: "Yes, in fact, I received a whistleblower report myself. Anonymously, we received some information that I made sure our team has, it also went to our team. So, we do have a couple of ways. The best way is for people to reach out to us at the website of witness@ntsb.gov. And we'll make sure to follow up on that information."

IMAGE: NATIONAL TRANSPORTATION SAFETY BOARD INVESTIGATIONS REPORT SCREENSHOT

NTSB Chair Jennifer Homendy testified on March 6 that Boeing has failed to provide access to key protocols, documents and personnel necessary for NTSB's investigation into the cause of January's 737 MAX-9 door plug accident. Homendy provided testimony during a Senate Committee on Commerce, Science and Transportation hearing on NTSB's ongoing investigations.

Cantwell: "Were you able to get from the company what specific procedures that they have for identifying, storing, protecting, retrieving and retaining quality records? Were they forthcoming on that?"

Homendy: "We have not received that information."

Cantwell: "Does the fact that Boeing has not produced these documents or that NTSB investigators have not been able to retrieve them indicate that they do not exist or ever existed?"

Homendy: "They may not. There are two options. Either they exist, and we don't have them, or they do not exist, which raises two very different questions— several different questions depending on which one is the right answer."

Cantwell: "If you don't have that documentation, what does it say about the quality assurance program?"

Homendy: "We have been told…. let me back up on that. We have been informed that they have a procedure to maintain documents on when work is performed, including when door plugs are open, closed or removed. We have not been able to verify that. And without that information, that raises concerns about quality assurance, quality management, safety management systems within Boeing."

Cantwell: "So that's why I asked that first question about procedures for identifying, storing and protecting. Everybody knows out at Boeing that the workers think that the plane will fly when the paperwork weighs more than the plane. That is their way of saying a lot of paperwork exists. People know that you don't move the line without paperwork. That's just part of the process. So, the question is, are you looking at those procedures, and you're saying they're not forthcoming, even on the procedures?"

Homendy: "That's correct. But we are looking at those procedures, we go very in-depth and very broad. We'll look at the procedures, policies, we will also look at other work that was done around the same time or within the last several years to see if there are concerns with other work or records that may be missing. So we go in depth, and we are also going in depth on safety culture, safety promotion, safety management as a whole."

Cantwell: "Okay, and so is the FAA in there? [Are] aviation safety investigators helpful in this or not helpful?"

Homendy: "FAA has been very cooperative and very helpful to us in the investigation, and we appreciate them. They've been a partner throughout this from the very beginning."

Cantwell: "I'm saying do any of their aviation inspectors on site have data or information about what processes and procedures may have existed or didn't exist?"

Homendy: "That is something that I would like to follow up with our team and get back to you on."

Cantwell: "OK. And then back to this point, every shift is documented, you know the workers that were involved in this particular area, you can get their names, you can ask for interviews with those individuals. And you're saying that that hasn't happened?"

Homendy: "Correct. We have gone through emails, we've gone through texts, we've looked at pictures to begin to get a picture of the date in mid-September, the two dates in mid-September that we believe the work occurred.

"We haven't received that information directly from Boeing. We also believe we know what shift it occurred on. But we still there is one team, one team that deals with the doors of 25 people. Why we don't have those names today, two months later, is really disappointing."

Cantwell: "Well, it's beyond disappointing. We have an entire economy that depends on people getting this right. And I thought that the CEO said that they would cooperate to the fullest. So, it seems like this information is now stymieing your investigation, and it seems that it's knowable, and that you should at least be able to talk to the individuals there.

"Do you have any concerns, there was a report about, there could be an additional, because there was a consent decree that was about to expire, that any kind of other investigation by Department of Justice would impact your investigation?"

Homendy: "I do have concerns, our attorneys also have concerns. Only from the aspect, we don't want to tell any other agency what they should or should not do. Where it becomes a concern for us—we'll get the information at some point.

"Where it becomes a concern for us is when employees and others don't feel safe to speak to us."

Cantwell: "Well, that is occurring now. And so, what do we need to do to make sure that people feel safe and secure? That's part of the expert report. It's part of why we passed ACSSA [Aircraft Certification, Safety, and Accountability Act] to make sure there was no retaliation. What else can we do?

"And we can't have a viewpoint that, 'I just had to keep the line moving.' That's not the viewpoint we want. We want employees who are saying, 'I have a concern about this,' to be listened to, and to be backed up by those FAA ASIs [aviation safety inspectors]. That's what we want. And so, in this case, we want to understand whether that kind of retaliation still exists, and what we can do to make sure that these people feel free to speak to you, and to others who are investigating."

Homendy: "I completely agree with that.

"The aviation industry is so safe because we do encourage, the industry has encouraged, anonymous reporting, and through anonymous reporting addressed risk proactively and encouraged employees to speak up. That's how we have addressed safety and gotten to our excellent gold standard safety record we are in today in the aviation industry. Without that there is a significant concern.

"I am aware of the concerns with Boeing, which is why we are delving into safety culture and safety management."

AVIATIONPROS

Who is Stephanie Pope, the New Boeing Commercial Airplanes CEO?

Stephanie Pope replaces Stan Deal.

By AviationPros Staff

STEPHANIE POPE HAS BEEN APPOINTED TO lead Boeing Commercial Airplanes, following the retirement of Stan Deal, effective today (March 25).

Pope has been serving as chief operating officer of Boeing since January of this year. When Boeing named Pope chief operating officer, the company said the position was newly created. As Boeing COO, Pope oversaw the performance of the company's three business units with responsibility for driving supply chain, quality, manufacturing and engineering excellence across the company.

IMAGE: BOEING

In December 2023, Calhoun, announcing Pope as COO, said, "Stephanie brings tremendous operational, financial and customer experience to this role, as well as a proven record of performance across our commercial, defense and services business units. Next year will be a significant transitional year in our performance as we continue to restore our operational and financial strength; and Stephanie will help drive the stability and predictability necessary to ensure we deliver on our customer, employee, regulatory, investor and other stakeholder commitments."

Prior to taking on her role as COO, Pope served as president and chief executive officer of Boeing Global Services. She started this role in April 2022. Here she was responsible for leading the company's aerospace services development and delivery model for commercial, government and aviation industry customers worldwide, focusing on global supply chain and parts distribution, aircraft modifications and maintenance, digital solutions, aftermarket engineering, analytics and training.

Previously, she was chief financial officer of Boeing Commercial Airplanes. In nearly three decades of service at Boeing, Pope has held a number of leadership positions of increasing responsibility in all three business units, within programs and at the corporate level.

Pope was an Eisenhower Fellow in Brussels and Ireland in 2008 and has a bachelor's degree in accounting from Southwest Missouri State University and a Master of Business Administration from Lindenwood University.

AMERICAN MACHINIST

Boeing Takes Slow Approach to Ensure Certainty

IMAGE: BOEING

Despite the impact on revenues, the aircraft builder has cut its 737 MAX assembly rate as it reviews its processes and performance – and works to regain the market's trust.

By Robert Brooks

BOEING'S TOP FINANCE OFFICIAL REPORTED that the ongoing review of its manufacturing processes and performance will continue for an undetermined period and financial goals will remain unmet. Speaking to an audience of investors and analysts, CFO Brian West said Boeing's targets for revenue, production and aircraft deliveries will not be met for the foreseeable future as it overhauls the 737 MAX assembly operations at the Renton, Washington plant.

The audience, and the aerospace market broadly, are hopeful that Boeing will resume higher rate of activity that will give investors, suppliers and aircraft customers more long-term confidence in the organization.

"We're deliberately going to slow to get this right," according to West, speaking to analysts and investors at a Bank of America event. "We are the ones who made the decision to constrain rates on the 737 program ... and we'll feel the impact of that over the next several months."

Boeing is operating under increased scrutiny by the Federal Aviation Administration, which has installed inspectors at the Renton location in the effort to identify the causes of the January 5 incident aboard an Alaska Airlines 737 MAX 9.

The OEM has an extensive backlog of orders for the twin-engine narrow-body 737 MAX, and has long sought to escalate its completion rate to as many as 57 jets/month. While the FAA has authorized a rate of 38 jets/month, West made it clear that the current rate of activity is less than that – by choice.

Adding to the slower progress is Boeing's determination to be more rigorous in approving deliveries of subassemblies from Spirit AeroSystems, the supplier that manufactured the fuselage section lost its side door plug in the January episode. National Transportation and Safety Board investigators determined that four bolts holding the door plug in place had failed.

The full liability for the failed section has yet to be concluded, but West pledged that Boeing would no longer take deliveries of fuselages from Spirit that are not in full compliance with safety standards..

"For years, we prioritized the movement of the airplane through the factory over getting it done right, and that's got to change," West told his listeners.

He also acknowledged the possibility of Boeing acquiring Spirit AeroSystems, telling the crowd of investors that such a deal would be executed with cash and/or debt, but not stock.