

Written Testimony of Sam Salehpour
Senate Committee on Homeland Security and Governmental Affairs
Permanent Subcommittee on Investigations
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Chairman Blumenthal, Ranking Member Johnson, and Members of the Committee.

Thank you for inviting me to testify at today's hearing. My name is Sam Salehpour, and I am a Quality Engineer at Boeing.

I arrived in the United States in 1973 to pursue my education at the University of Missouri and to build a better life. I received a degree in mechanical engineering in 1979. I have worked in the aerospace industry for almost 40 years and have worked at Boeing for the last 17 years. While I currently work as a Quality Engineer on the 777 aircraft, I have also worked in various engineering capacities on the 747, 767, 777, and 787 programs.

I am passionate about my work and grateful for the opportunities that I have had to work on important projects in this industry, including at Boeing. However, my years of experience have also shown me the importance of speaking out when companies fail to prioritize safety, given the catastrophic events that remaining silent can lead to.

In the 1980s I worked on rockets, including for companies supporting the Challenger Space Shuttle. I commuted to work with an engineer who was wracked with concerns about the O-ring seals. During our commute he told me about all of the efforts he had made to get his employer to take his concerns about a potential failure of the O-ring seals on the shuttle seriously and how he was repeatedly dismissed or shot down. Tragically, his concerns were ignored, and the O-ring seals failed, killing all seven people on board the Challenger. Since then, I have always said that if I were in the same situation, I would do everything I could to speak up to try to avoid a tragic result. I contacted Senator Blumenthal's staff about my concerns because I genuinely believe that the safety problems I have observed at Boeing, if not addressed, could

result in a catastrophic failure of a commercial airplane that would lead to the loss of hundreds of lives. I am determined to avoid such a result, regardless of the cost to my career.

The flying public trusts companies like Boeing to build safe aircraft. In my role as a Quality Engineer, I am responsible for monitoring Boeing production activities to ensure that when Boeing's planes leave the factory, they are safe for air travel. It is my job to investigate and analyze defects identified with Boeing airplanes to determine their root causes and develop solutions to correct those defects and prevent them from occurring in the production process moving forward. I, like many conscientious Boeing engineers, take my role in ensuring the safety of passengers who travel on Boeing airplanes very seriously. While Boeing also claims to take its commitment to safety and quality seriously, I have observed a culture that prioritizes speed of production over safety and quality and incentivizes management to overlook significant defects in Boeing's airplanes. Despite what Boeing officials state publicly, there is no safety culture at Boeing and employees like me who speak up about defects with its production activities and lack of quality control are ignored, marginalized, threatened, sidelined, and worse. After years of trying unsuccessfully to raise concerns internally at Boeing, I chose to make my concerns public because I am deeply troubled, not only by the specific problems I personally observed while working on the 787 and 777 airplanes, but also by the broader pattern of Boeing ignoring and suppressing safety and quality issues. This in turn makes it less likely that engineers can prevent other dangerous defects from being detected and addressed. Despite the intimidation and retaliation I have experienced as a whistleblower at Boeing, I am testifying here today because I want Boeing to succeed. I am hopeful that my testimony will help to change the culture at Boeing and allow conscientious employees like me to speak up without fear of reprisal and termination.

While working on the 787 in late 2020, I observed that Boeing had begun taking shortcuts with respect to fit-up force (FUF) and one up assembly (OUA) to reduce bottlenecks in production and speed up production and delivery of 787s. Boeing adopted these shortcuts in its production processes based on faulty engineering and faulty evaluation of available data, which has allowed potentially defective parts and defective installations in 787 fleets. Boeing's engineering specification requires that gaps exceeding .005 inches be shimmed with 10 pounds per linear foot of FUF, the minimum force required to hold two parts together while measuring the gap opening between them for shimming purposes, per linear foot. Industry engineering standards require Boeing to shim these gaps using minimal force to avoid causing deformities, but contrary to these requirements, Boeing has increased the FUF used in the shimming process to approximately 165 times the recommended level of force.

While Boeing insists that it follows industry standards, the Company's own internal data on 28 787 airplanes, provided to me by a Boeing Applied Mathematician in February 2022, revealed that up to 98.7% of gaps over .005 inches have not been shimmed at all in sections 41/43 or 46/87 of the aircraft. This omission, which I believe has affected more than 1,000 787 airplanes in service, is likely to cause premature fatigue failure over time in two major airplane joints. Installation of fasteners with gaps exceeding .005 inches without proper shimming (or in some cases, any shimming at all) puts excessive stress on these fasteners and can cause significant fatigue in important airplane components, especially in joint areas where large fuselage barrels are connected. Because these defects weaken fatigue performance in composite material and they are generally not detectable through visual inspection, they could ultimately cause a premature fatigue failure without any warning. Boeing's internal documents also show that drilling holes when excessive gaps exist can lead to various defects, including burrs at the holes, debris from the drilling operation being left at the interface of the two parts, thick layers of sealant

getting into the gap, increased localized bending stress due to the increased fit-up forces caused by the fasteners or a loss of preload in the fasteners. Any one of these conditions can impact the joint fatigue quality and therefore can decrease the fatigue life of the airplane. This, of course, creates extremely unsafe conditions for the aircraft with potentially catastrophic accidents and passenger fatalities.

In April 2021, I prepared a detailed PowerPoint presentation explaining the impact of the increased force on the shimming process, the potential defects that could result, and the risk that this posed to the flying public. This April 2021 presentation, attached as Exhibit 1, articulated my early concerns with the 787's gap management program. As I wrote in one of my slides, Boeing airplane through hole gap inspections revealed 2,546 fasteners that had a gap exceeding Boeing's permitted standard of 0.005 of an inch. *See* Exhibit 1, at 2. In fact, these inspections also revealed a gap that was up to 0.035 of an inch— almost seven times the permitted figure. *Id.* Throughout April and May of 2021, I revised this document and presented it to Boeing managers. This initial group included an Associate Technical Fellow, a Quality Engineering Manager, and a Senior Quality Specialist. Some employees validated the concerns I identified and suggested that they should be elevated, yet no one was willing or able to do so fearing retaliation if they did. Additionally, although senior managers initially were open to my objections, they quickly began to dismiss my concerns and pressured me to stop raising these issues.

In mid-June of 2021, I invited approximately 30 Boeing employees to a meeting where I planned to give an updated version of my presentation. I explicitly told them that this meeting was to discuss barrel deformation and my concern about what this meant for passengers. I wrote, "I believe we are comprising safety by utilizing excessive fit ups forces that are deforming the Barrel ISS/IML above and beyond its allowable engineering requirements of .005/5 at the detail

level.” My selected attendees included senior Boeing managers, such as a Senior Quality Director, Subject Matter Experts in Stress Engineering, a Senior Technical Fellow, and more. Unfortunately, my direct manager was not supportive of this meeting. Eventually, he forced me to have a much shorter meeting than I had initially requested and with only a few of my requested attendees. I found his indifference to the serious quality problems with the 787 deeply concerning. This led me to believe that I needed to escalate my concerns further within the Company. However, as I continued to press Boeing officials to hear and respond to the safety issues I had observed, the response from my supervisor and other managers became increasingly hostile.

Despite the lack of support from my managers, I continued to share my presentation with my fellow engineers at Boeing. Many of them shared my concerns but were unable to address the problem with the increased FUF. Some were too scared to join my efforts internally, and some felt stymied because Boeing insisted that it had performed testing validating this change but refused to provide any of us with the data. We were told repeatedly to trust that Boeing had addressed the issues, but we feared that this was not the case. Indeed, despite my repeated requests, no one I spoke with at Boeing was able to cite any testing which tested the use of 100 pounds of FUF – the force that Boeing was actually using – and to date I have not seen any data validating the safety of such a drastic increase. To the contrary, the internal Boeing documents that I reviewed indicated that the shortcuts being applied to the 787 shimming process posed serious risks.

One such report was a white paper prepared by two Boeing Quality Engineers who also worked on the 787. They distributed the paper internally on August 18, 2021 – at the same time that I was continuously appealing to Boeing management to change their manufacturing

processes. I was astounded to review their conclusion that Boeing's inspection protocol failed to properly estimate gaps between airplanes' barrels and straps (the pieces of metal connecting the two barrels together). *See Exhibit 2*. Although the research topic did not address FUF per se, this paper confirmed that there were serious quality issues with Boeing's 787 gap management standards. After reviewing this report, I redoubled my efforts to have Boeing management address my concerns, as the Company's problems with the 787 were clearly systemic.

In September 2021, I again tried to set up a meeting with my supervisor and Boeing subject matter experts to discuss the problems with the 787, but I received no response. My updated presentation included additional Boeing data that I had gathered over the intervening months. *See Exhibit 3*. I showed how the increased FUF was already creating problems. I discussed recent inspection data which reviewed gaps within sections of 28 787 planes. This inspection found that 98.7% of gaps over 0.005 were not shimmed. *See Exhibit 3 at 16*. Meanwhile, I continued to attempt to set up meetings to discuss my concerns. In late August 2021, I sought to set up a meeting with various stress engineers to discuss my concerns. Predictably, my manager once again canceled the meeting. As you can imagine, Boeing management's failure to address my concerns was deeply troubling to me. I worried constantly about planes being pushed off the production line and delivered to customers with engineering defects and about the catastrophic results that could occur as result. The more I pushed for answers, the greater the retaliation became. Around this same time, I learned that my managers were attempting to transfer me out of the 787 program to the 777 program. Days after the meeting that I had scheduled to address my updated shimming presentation was canceled, I told my manager and other Boeing managers, "Kicking me out of the program because I am raising safety concerns over the unintended consequences of the increased fit up forces and potential

escapements as a result does not help anybody.” *See* Exhibit 4. Unfortunately, I was never able to meet with these senior leaders.

A few weeks later, a Boeing researcher released a presentation that directly addressed my gap management concerns. *See* Exhibit 5. This presentation discussed how an airplane subjected to the type of excessive force and improper shimming could have its approximate life cycle, meaning the time it could be safely operated, reduced from 53,400 to 11,800 flights. Meanwhile, Boeing’s representations to its clients about the 787 airplanes being produced failed to take such a reduction into account. While this presentation was greatly affirming, I knew that my time on the 787 was limited. In 2022, I was involuntarily transferred to the 777 in retaliation for my whistleblower activity.

Following my transfer, I almost immediately learned of alarming safety concerns in the 777 program as well. It became abundantly clear that the problems with Boeing’s approach to safety were not limited to any one airplane. Several years before I joined the 777 team, Boeing had adopted a Fuselage Automated Upright Build (FAUB) process in an effort to speed up production by expediting the assembly of the 777’s fuselage, replacing Floor-mounted Assembly Jigs (FAJ). Implementing a process like the FAUB, which initially relied on guided vehicles to assemble the 777’s fuselage panels, would ordinarily require parts and sub-assemblies to be redesigned to be compatible with determinative assembly process and provide correct alignment of parts in the initial assembly process. The automated drilling component of the FAUB was ultimately unsuccessful and was abandoned by Boeing. Boeing decided to maintain some elements of the FAUB system, in part because, in another example of Boeing prioritization of speed over quality, the previous system had been prematurely disassembled before the new one was proven to be effective. However, Boeing failed to make necessary changes to the design of

relevant parts and subassemblies to accommodate the new processes resulting in significant misalignments between parts in the assembly of hundreds of 777 airplanes built for commercial airlines.

Rather than taking steps to properly remedy these misalignments and address the problems with the underlying assembly process, Boeing responded to these defects by using unlimited and unmeasured force to “force align” parts and assemblies that do not align. I observed Boeing workers using improper and untested methods to align parts in the 777, such as using cranes and inappropriate heavy equipment, and in one instance even jumping on pieces of the airplane to get them to align. This can cause damage to the parts and reduce the lifespan of the airplane, limiting the ability of airlines to predict when airplanes need to be taken out of service to avoid a failure during flight. Boeing has failed to make any meaningful changes to the underlying production processes to avoid defects which could pose serious safety risks, and Boeing management involved in the 777 production has also pressured engineers responsible for addressing defects to work faster, increasing the likelihood that defects will not be identified and addressed. These engineers are also pressured to allow production of 777s to move forward despite the presence of defects without the opportunity to actually see and evaluate those defects.

I repeatedly brought my concerns about the chronic defects with the 777 caused by the FAUB process and the grave risks that they pose to my supervisor and Boeing management, just as I had when I observed problems with the 787, but Boeing once again ignored my concerns and failed to take any steps to address the serious safety problems I reported. Instead, Boeing officials attempted to intimidate and retaliate against me by sidelining me from my job duties and excluding me from key meetings. I have even been subjected to threats of violence from my supervisor after I attempted to discuss the problems with the FAUB process in a meeting in April

2023. After the meeting, my supervisor said to me, “I would have killed anyone who said what you said if it was from some other group, I would tear them apart.” I provided evidence of this threat as part of an ethics complaint, but no action has been taken and I continue to report to a supervisor who has threatened me with bodily injury for speaking out.

This retaliation has continued even within the last month. On March 19, 2024, during a Boeing Preliminary Design Review (PDR) meeting to discuss the 777, I asked Boeing senior management how the company was going to improve its build process and discussed how the initial 777 design differed from the company’s practices, which require unmitigated and unmeasured force. Another Quality Engineer from my group then told me that my direct supervisor had asked me to leave the meeting. When I spoke to my supervisor he told me that I should not have attended the meeting, that a manager had written to him to complain about my question, and that he was upset that I had voiced my concerns in front of potential Boeing customers. Boeing has also prevented me from consulting with subject matter experts within the company who would be able to properly evaluate these defects and come up with solutions to address them.

I have also recently learned that Boeing is planning to increase the FUF used in the production of the 777-9 in order to increase production speed. I am concerned that the testing that Boeing is running to justify this increase is inaccurate, and that the 777 program will face the same dangers currently troubling the 787 program. I have also learned that Boeing is providing the FAA with data designed to lessen requirements that relate to the drilling debris within the stack-up interfaces, which currently require Boeing separate, deburr, clean, and reassemble the 777’s stackup interfaces to ensure that there is no drilling debris present. The relaxed requirements would likely introduce defective assemblies and planes into the fleet without

mitigating any of these defects, and the resulting debris could create a crack in the fuselage which could lead to premature fatigue failure of the plane.

Even though I am afraid that I may face further retaliation and even physical violence if I continue to try to get Boeing to address the safety problems I have observed, speaking out is necessary to avoid the potentially catastrophic consequences of continuing to overlook serious defects which reduce the lifespan of Boeing's airplanes. That is why, in addition to my continued efforts to make my concerns heard within Boeing, I have reached out to the FAA and have decided to speak to you today. I hope that my testimony will help to motivate Boeing to make meaningful changes to the way it approaches safety and quality in the production of its airplanes and to end its pattern of silencing people like me who voice their concerns about problems which put the flying public at risk and try to hold Boeing to a higher standard. Since my whistleblower complaint has become public, I have spoken to several Boeing engineers who told me that they share my concerns, but no one is willing to voice them because they fear reprisals from Boeing. Boeing claims to encourage its employees to "Speak Up" about quality concerns, but it has become obvious that speaking up at Boeing comes at a cost.

I believe that Boeing can do better and that the public's trust in Boeing can be restored. I hope that this Committee will hold Boeing accountable and demand an end to a business culture that prioritizes profit and speed over safety.