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FAA ORGANIZATION DESIGNATION AUTHORIZATION (ODA) EXPERT PANEL REPORT

HEARING

BEFORE THE

COMMITTEE ON COMMERCE, SCIENCE, AND TRANSPORTATION UNITED STATES SENATE

ONE HUNDRED EIGHTEENTH CONGRESS

SECOND SESSION

APRIL 17, 2024

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SENATE COMMITTEE ON COMMERCE, SCIENCE, AND TRANSPORTATION

ONE HUNDRED EIGHTEENTH CONGRESS

SECOND SESSION

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FAA ORGANIZATION DESIGNATION AUTHORIZATION (ODA) EXPERT PANEL REPORT

WEDNESDAY, APRIL 17, 2024

U.S. SENATE,
COMMITTEE ON COMMERCE, SCIENCE, AND TRANSPORTATION,
Washington, DC.

The Committee met, pursuant to notice, at 10 a.m., in room SR–253, Russell Senate Office Building. Hon. Maria Cantwell, Chair of the Committee, presiding.

Present: Senators Cantwell [presiding], Klobuchar, Markey, Baldwin, Duckworth, Tester, Rosen, Hickenlooper, Warnock, Welch, Cruz, Thune, Fischer, Blackburn, Young, Budd, Schmitt, and Vance.

OPENING STATEMENT OF HON. MARIA CANTWELL, U.S. SENATOR FROM WASHINGTON

Chair CANTWELL. Good morning. The Committee on Commerce, Science, and Transportation will come to order.

I want to thank our witnesses who are here today on the FAA ODA Organization Expert Panel Report.

I also want to recognize our former colleague; Peter DeFazio is in the audience and thank him for his work on the ACSAA legislation with this committee.

Today, we will hear from three experts on the Organization Design Authorization, the expert panel's final report.

I want to mention, I appreciate the witnesses being here today, but I want to acknowledge, this is directly from the report that, quote, "The successful completion of this report was made possible with the cooperation and assistance of the following organizations: the Federal Aviation Administration; the Boeing Company; American Airlines; Bell Textron, Inc.; University of Southern California, Viterbi School of Engineering; and special thanks to Brittney Goodwin, Mina Mitchell and Heather Thorson, and analysis supported by Data and Assessment Teams, within the Office of FAA's ODA."

I want to mention that because you're the representatives of all of those people today, and we could have had many people here, but wanted to appreciate the work of the two Chairs of the Committee, and for you being here as representatives of these individuals today.

We are joined by Dr. Javier de Luis, Lecturer of MIT's School of Technology, Department of Aeronautics and Astronautics, thank you so much for being here; Dr. Tracy Dillinger, Manager for Safe-

ty Culture of Human Factors at NASA; and Dr. Najmedin Meshkati, Professor of University of Southern California School of Engineering and Aviation Safety Programs.

The expert panel's 53 recommendations regarding Boeing's ODA safety management system safety culture serves as an important catalyst for us in future aviation legislation. While we've made some safety improvements through the Air Certification Reform law, and some of that is still playing out with a new Administrator who I think is more aggressively taking the responsibilities of the Act seriously, we look to build on those advancements with a 5-year authorization bill and some enhanced safety features.

But we're not going to stop there. There is more to be done to implement the recommendations from your report. We owe a debt of gratitude to those who are here today.

I want to especially thank you, Dr. de Luis. Thank you so much for being here. I can't imagine the tragedy of losing your sister in one of the MAX crashes and then continuing to be involved in trying to correct and improve our safety culture. But I can just say I so appreciate you being here and the active role that you have played in all of these discussions.

The expert panel's final report focused on the importance of safety management systems. And while Boeing was required to adopt an SMS in 2015 as part of an FAA settlement agreement, and while the FAA later adopted voluntary SMS programs, the experts panel's report make it clear now that we need a real SMS with teeth. Both Boeing and the FAA need strong and effective safety management systems. Not in name, but in reality.

Safety management system might, for the public, sound like management strategies that maybe they shouldn't pay attention to. But when it comes to this management strategy, and it revolves around aviation, it is about saving lives. That is why section 102 of ACSAA required that the FAA develop a real SMS standard for aviation manufacturers. And the agency expects, the FAA expects, to finalize that SMS rule this June.

This expert panel made several recommendations, findings about the safety culture and about ODA. And I want to highlight some that Boeing safety management procedures are not thoroughly understood throughout the company. I'm sure you'll expand on this, that it is focused on only one of the four pillars of what ICAO, the international standard, has said that you have to meet if you're going to have an SMS program understood by the workforce writ large. I'm sure you'll expound on this.

The expert panel raised concerns about the FAA's ability to effectively oversee Boeing's SMS, and I believe the FAA needs not only a strong workforce strategy to exercise the oversight of the manufacturers to ensure proper implementation of SMS, I'd like to query the panel today on exactly what SMS the FAA should implement in their own house to make sure that they are improving the safety culture and standing up on these important safety measures.

Right now, we are relying on employee safety reporting system, Speak Up, which you talked about. And I think a comprehensive system that the employees know and understand has to be a key component of SMS. And documentation provided by the interviews of Boeing employees showed that they may not have understood

how safety fit into the culture of the overall obligations of the company.

Human factors have not been prioritized as a technical discipline, and human factors are at the core of focus of what we need to do, both at the FAA and at Boeing. While I think you did talk about the loss of experience and capability of a workforce, we definitely want to build that expertise throughout government, clearly at the FAA, so that they can keep pace with technological change. And while the restructuring of Boeing's ODA unit did decrease the opportunity, as your report is saying, for retaliation, we still are seeing that interference is occurring. This is unacceptable.

ACSAA strengthened the FAA's oversight and put them in charge of these employees. And we certainly expect the FAA to back up those individual engineers and machinists who are calling out safety and making sure that they address those.

Although the final report gave Boeing six months to make this action plan a reality, the expert panel's recommendations, the FAA Administrator, has cut this time to 90 days, and I expect the company to comply with this deadline and submit a serious plan that demonstrates this commitment to these kind of safety measures.

The FAA must also demonstrate that it is going to be a strong regulator on these issues. I hope to query the panel about how to ensure that, how we, as the oversight committee of the FAA, in strength—basically strengthen this oversight by the FAA.

So, I look forward to hearing from our witnesses today. Again, thank you so much for being here.

And now I turn to Senator Cruz for his opening remark, and then we'll hear from our two subcommittee colleagues on their statement as well.

Senator Cruz.

STATEMENT OF HON. TED CRUZ,
U.S. SENATOR FROM TEXAS

Senator CRUZ. Thank you, Madam Chair.

The United States sets the benchmark for flight safety. And, by arguably the most important measure, 2023 was a remarkably safe year for aviation, with no fatal accidents or hull losses for commercial jet aircraft.

Flying commercial remains the safest way to travel. But understandably, recent incidents have left the flying public worried. The perception is things are getting worse. The public wants the Federal Aviation Administration and Congress to confront perceived risks in order to restore confidence for fliers.

That brings me to the topic of today's hearings: the FAA's Organization Designation Authorization program. ODA is important to the future of aviation safety, as well as to American competitiveness. I appreciate the work of our congressionally-appointed expert panel, which reviewed Boeing's ODA for transport airplanes.

Congress established this panel in the aftermath of the tragic crashes of Lion Air Flight 610 in 2018 and Ethiopian Airlines Flight 302 in 2019, in which 346 people tragically lost their lives.

The panel's final report was released in February. And three of its members are here with us today. Welcome.

As a brief aside, I want to in particular acknowledge that one of our witnesses, Dr. Javier de Luis, lost his sister on Flight 302. Dr. de Luis, please accept my sincere condolences, and thank you for continuing to speak out on an issue that I know has grieved you and your family personally.

I also want to recognize the other families that are here today remembering their loved ones whose lives were lost on those two tragic accidents.

Discussing ODA and what changes may be needed is critical, and I welcome this conversation.

It is worth noting, however, that the FAA is still implementing the Aircraft Certification, Safety, and Accountability Act, this committee's response to the MAX 8 crashes. It has not been fully—it has not even fully implemented the 2018 FAA Authorization Act, even as we are currently negotiating the current reauthorization.

While it is clear that Boeing's culture and safety management needs drastic improvement, we should not rush to legislate just for the sake of legislating.

To that point, I look forward to engaging with today's witnesses, all of whom deserve our appreciation and thanks for their hard work on this effort. Their report was a consensus product issued without any dissenting views, which all of us in Congress can appreciate is no small accomplishment. And I hope to better understand their recommendations and how Congress can work to improve aviation safety in a targeted and effective manner.

While discussing ODA and Boeing's safety culture is important, the flying public is also acutely worried about why pieces of Boeing airplanes are falling from the sky. The experts' panel report specifically noted that the panel was not directed to investigate or provide recommendations toward specific airplane incidents or accidents which occurred prior to or during the expert panel's work.

In addition to today's hearing, I believe we also need to hear from the FAA and from Boeing itself about episodes like Alaska Airlines Flight 1282. Our committee needs to understand not only Boeing's ODAs, but the specific production missteps that caused the January incident.

And we need to hear from Boeing directly about the company's safety culture and safety management writ large. The public will want to know what changes Boeing is making to restore confidence in its brand. Boeing is a great American company with a great history and great legacy, and we all want Boeing to be successful.

But when accountability is needed, and it clearly is here, we should not hesitate to demand answers. And for Boeing to succeed going forward, those answers need to be given and changes need to be made to ensure that safety is central.

When each of us, when our families, when our children get on an airplane, we want to trust that we're going to land safely. That's the topic of this hearing, and I hope subsequent hearings as well. Thank you.

Chair CANTWELL. Thank you, Senator Cruz.

Senator Duckworth.

STATEMENT OF HON. TAMMY DUCKWORTH,
U.S. SENATOR FROM ILLINOIS

Senator DUCKWORTH. Thank you, Chairwoman Cantwell, for holding this hearing and for your commitment to continued oversight.

I also want to thank our witnesses and all those who worked on the expert panel review. This review confirms my view that we need to judge Boeing not by what it—that we need to judge Boeing by what it does, not by what it says it's doing.

Boeing says it prioritizes safety above all else. But when the expert panel asked Boeing to produce evidence of this commitment, the evidence that Boeing provided, and I quote, "did not provide objective evidence of a foundational commitment to safety that matched Boeing's descriptions of that objective," end quote.

That should be shocking. But based on some of Boeing's recent actions, frankly, it's not. Weeks after a door plug blew out of a 737 MAX 9, Boeing was still petitioning the FAA for a safety exemption to rush its next 737 MAX variant into service, despite the fact that it had known—a known, potentially catastrophic safety defect. To its credit, under pressure, Boeing eventually withdrew that petition.

But the fact that Boeing filed it in the first place speaks volumes about the lack of a proper safety culture at Boeing and, until recently, the lack of a proper regulatory culture at the FAA.

Boeing filed this petition because they thought FAA would grant it. Boeing thought they could minimize the significance of this safety defect and that the FAA would just let it slide.

Boeing had a good reason to think this. FAA let Boeing's bad actions on the 737 MAX slide for years; and, go figure, we're seeing more bad results.

I'll give two examples which I think are particularly relevant to our discussion today about Boeing's Organization Designation Authorization, or the ODA.

The first example involves MCAS. Boeing downplayed MCAS so successfully, it actually persuaded the FAA to let Boeing remove it from the flight manual. And after MCAS crashed two 737 MAX planes, killing 346 people, investigators uncovered an internal Boeing memo, showing that Boeing had been explicitly planning to downplay MCAS in order to avoid regulatory scrutiny. The plan called for Boeing to not even use the term "MCAS" when describing the plane to a regulator.

Even worse, the memo showed an ODA unit member approved this plan to deceive a regulator. And yet, when this memo surfaced, the FAA did nothing. It did not even investigate. By sitting on its hands, FAA effectively told Boeing that this type of conduct was perfectly fine.

The second example concerns the angle-of-attack disagree alert, the AOA disagree alert. Shortly after the 737 MAX 8 went into service, Boeing discovered that the AOA disagree alert was not functioning on most of the 737 MAX jets, which was a violation of the plane's approved type design.

Instead of reporting this to the FAA and to 737 MAX pilots, Boeing intentionally concealed this and continued to manufacture more than—more 737 MAX jets with the same defects.

In other words, Boeing made a decision to knowingly and repeatedly violate its approved type design for years. Boeing's ODA knew about this, but did not alert the FAA.

And when FAA finally found out that Boeing had been knowingly and repeatedly violating its approved type design, the FAA did nothing. This effectively told Boeing that type design doesn't matter, because the FAA isn't going to always enforce it.

When the FAA fails to take action in response to bad behavior, it sends an unmistakable message to both Boeing and its employees that bad behavior is acceptable. No wonder the expert panel found that Boeing employees are so confused.

FAA needs to more closely scrutinize Boeing's behavior and make use of its civil enforcement authority when appropriate. And I am pleased by the more aggressive regulatory tone Administrator Whitaker has brought to the agency. But as this expert panel review makes clear, there is still a long way to go to bring an effective safety culture back to Boeing.

We have our work cut out for us on this committee, as we continue our oversight and consider whether additional legislation may be needed. And I thank the panelists for being here. I really appreciate your hard work on this to make flying safer for the American people.

Thank you, and I yield back, Madam Chair.

Chair CANTWELL. Thank you so much, Senator Duckworth, and for your leadership and your help on the FAA reauthorization, and safety improvements in that bill.

I guess Senator Moran will not be here for an opening statement. I'm sure he will be attending, but we'll now just go to the witnesses.

So Dr. de Luis, again, thank you so much for being here. You're free to make an opening statement.

STATEMENT OF DR. JAVIER DE LUIS, LECTURER, DEPARTMENT OF AERONAUTICS AND ASTRONAUTICS, MASSACHUSETTS INSTITUTE OF TECHNOLOGY (MIT)

Dr. DE LUIS. Thank you very much, Senator. Chair Cantwell, Ranking Member Cruz, and members of the Committee, on behalf of myself and my fellow panelists, I want to thank you for the opportunity to come here and talk about our findings and recommendations from the final report.

My name, as you know, is Javier de Luis. I'm an aerospace engineer, as I would describe myself. I earned a doctorate from—in aeronautics and astronautics from MIT. I spent my 40-year career in private industry, mostly running small businesses that I helped start. Then we built hardware for NASA, DOD, and other agencies. I'm currently a lecturer at MIT.

But I'm also the brother of Graziella de Luis, as you have noted. And my sister was killed when the airplane she was on, the 737 MAX, crashed a few minutes after takeoff, killing all 157 people on board. So for me, serving on this panel has been an opportunity to help prevent anyone else from going through what I and my family have sadly experienced these past 5 years.

Our panel met for almost a year; reviewed over 4,000 pages of documents provided to us by Boeing; interviewed 250 Boeing em-

ployees at all levels of the organization, from the executive suite down to the people that tightened the bolts, across six different geographic plants across the country; and we reviewed thousands of survey responses that came to us through several surveys that were conducted.

As has been noticed, this is a consensus report, and I'd be remiss if I did not give full credit to this, to our co-chair—co-chairs Michael Bartron and Keith Morgan, for herding what was at time this diverse and rather unruly group to hopefully a productive end.

Our channel—our panel was charged by ACSAA to focus its review on three specific topics: the safety culture, the safety management systems, and the ODA program at Boeing. We were, however, also allowed to evaluate other topics of concern that we might identify that would impact the safety of the flying public.

As Senator Cruz noted, we were not charged—or I'm sorry, as one of—as was noticed previously, we were not charged with investigating specific airplane incidents that occurred prior to our panels. But it was—as understandable, on several occasions during our activities when safety issues arose with Boeing products, we, of course, considered them.

My fellow witnesses and I felt that it would be useful to expand on several of the key recommendations in our report, as this may help the stage for today's—set the stage for today's hearing.

First and foremost is one that has been talked about since the report came out, is our finding that there exists a disconnect, for lack of a better word, between the words that are being said by Boeing management, and what is being seen and experienced by employees across the company.

They hear, "Safety is our number one priority." But what they see is that that's only true as long as your production milestones are met. And at that point, it's push it out the door as fast as you can.

They hear, "Speak up if you see anything that's unsafe." But what they see is that if they do speak up, they get very little feedback. And if they insist, they may find themselves on the short end of the stick next time raises or bonuses or job transfers come up, or even worse.

We found this disconnect to be present at almost all levels and at all worksites that we visited. We heard it from technicians, we heard it from engineers, and we heard it, more concerning, from members of the ODA that are delegated by the FAA to conduct inspections and tests on behalf of the government.

To me, it is clear that the commitment to change, the level of change, and the pace of change at Boeing is not commensurate with the events that created the need for all this change in the first place: namely, the two fatal crashes of two brand new airplanes 5 years ago. It was distressing to read a recent statement by Brian West, the CFO of Boeing, speaking about the Alaska Air incidents from this past January, where he said, "For years," and this is a quote, "For years, we prioritized the movement of the airplane through the factory over getting it done right. That's got to change."

The leadership team got it in the immediate aftermath of January 5. Now I would have thought that they would have gotten it 5 years ago.

In closing, I'll note that for the last 20 years, every FAA Reauthorization Act pushed more and more responsibility over the fence to the manufacturer's side. At the time, this was done with the understandable objective of increasing efficiency and productivity.

The two MAX crashes showed that the pendulum had swung too far, and ACSAA was the response to try to correct this.

But ACSAA cannot be the high-water mark in your efforts. I urge you, as you debate additional steps that can be taken, to ensure that you increase the FAA oversight of Boeing, and that you keep pushing for structural change at the company, and as well as ensuring that all of our panel's 53 recommendations are fully implemented.

I believe that this is the only way that we can return this company to what we all remember it once being: a company known for engineering excellence, and a company where the headlines were written about it because of its accomplishments and not because of its failures. I believe the flying public deserves no less.

I will now turn it over to my colleague, Dr. Dillinger.

[The prepared statement of Dr. de Luis follows:]

PREPARED STATEMENT OF DR. JAVIER DE LUIS, LECTURER,
DEPARTMENT OF AERONAUTICS AND ASTRONAUTICS,
MASSACHUSETTS INSTITUTE OF TECHNOLOGY (MIT)

Chair Cantwell, Ranking Member Cruz, members of the Committee. On behalf of myself and my fellow FAA Expert Review Panel members, I want to thank you for the opportunity to come here today and discuss the findings and recommendations from our final report.

My name is Javier de Luis. I am an aerospace engineer. I earned a doctorate in aeronautics and astronautics from MIT. I spent my entire career in private industry, mostly in small businesses that I helped start, where we built hardware for NASA, DoD, and other organizations. Though I'm trying to retire, I currently hold a lecturer appointment at MIT, where I help teach system engineering to seniors and graduate students and have lectured at several universities across the US.

That is, however, not why I am here. I am here because I am also the brother of Graziella de Luis, who was killed when the airplane she was on, a 737Max flown by Ethiopian Airlines, crashed a few minutes after takeoff killing all 157 people on board. For me, serving on this panel is an opportunity to do something that might keep anyone else from going through what I and my family have experienced these past five years.

Our panel met for almost a year, reviewed 4000 pages of documents provided to us by Boeing, interviewed 250 Boeing employees at all levels of the organization, across six Boeing's locations, and reviewed thousands of survey responses. It should be noted that we were required to sign Non-Disclosure Agreements (NDA), however no NDA-protected data is in our report, which contains 27 findings and 53 recommendations.

It is a *consensus* report, with no dissenting opinions. I would be remiss if I did not give full credit for this to our co-chairs, Mr. Michael Bartron from the FAA and Mr. Keith Morgan from Pratt & Whitney, for herding this diverse and at-times unruly group to a productive end.

Our panel was charged by the Aircraft Certification, Safety, and Accountability Act (ACSAA) to focus its review on the three topics: safety culture, safety management systems (SMS), and the Organization Designation Authorization (ODA) program, while also evaluating other topics of concern for the safety of the flying public. The Act also defined the required composition of the Panel.

However, we were *not* charged with investigating specific airplane incidents which occurred prior to or during the Expert Panel's work. Nevertheless, on several occasions during the Panel's activities, serious safety issues with Boeing products which became public were considered.

My fellow witnesses and I felt that it would be useful to expand on a few of the recommendations in our report, as they may serve to set the stage for today's hearing. First among these is our finding that there exists a "disconnect" between the words that are being said by Boeing management, and what is being seen and experienced by the technicians and engineers. They hear "safety is our number one priority", but they see that that is only true as long as you meet your production milestones. They hear "speak up if you see anything unsafe", but they see that when they do, there's little feedback, and if they insist, they may find themselves on the short end of the stick next time raises are distributed, or worse.

We identified this *disconnect* based on our interviews and survey responses. It was present at almost all levels and almost all worksites that we visited. We heard it from technicians and engineers, as well as from members of the ODA that are delegated by the FAA to conduct mandated inspection and tests on behalf of the government.

To me and I think to our Panel, it is clear that the *commitment* to change, the *level* of change, and the *pace* of change at Boeing is not commensurate with the events that created the need for all this in the first place: the two fatal crashes brand new airplanes, killing all aboard. I believe it is safe to say, given our findings, that the events of Jan 5 and the subsequent NTSB investigation identifying the missing bolts in the Alaska Air door did not really come as a surprise. What was distressing, though, was the recent statement by Mr. Brian West, Boeing's finance chief at a investor conference where he said:

> "For years, we prioritized the movement of the airplane through the factory over getting it done right. That's got to change. The leadership team got it in the immediate aftermath of January 5."

I would have thought that they would have "gotten it" five years ago.

In closing, I would like to say that for the last 20 years, every FAA authorization act has pushed more and more responsibility over the fence to the manufacturer side, usually with the understandable objective of increasing efficiency and productivity. The two 737 Max crashes showed that the pendulum had swung too far. ACSAA was your response to trying to correct this imbalance. But recent events show us that we're not there yet, and ACSAA cannot be seen as a high-water mark in this effort. It is just a first step, and I urge you as you debate additional steps that can be taken either as separate legislation or though the reauthorization, to increase FAA oversight at all levels and keep pushing for structural change at Boeing, as well and to ensure that **all** of our Panel's 53 recommendations are fully implemented. This is the only way that we can return this company to what we all remember it being: a company known for engineering excellence, where headlines were written about it because of their accomplishments, not because of their failures. The flying public expects and deserves no less.

Chair CANTWELL. Dr. Dillinger, welcome. Whatever opening statement you can make, that would be great.

STATEMENT OF DR. TRACY DILLINGER, MANAGER OF SAFETY CULTURE, HUMAN FACTORS IN MISHAP INVESTIGATIONS, AND HUMAN RELIABILITY ASSESSMENT, NATIONAL AERONAUTICS AND SPACE ADMINISTRATION

Dr. DILLINGER. Thank you.

Chair Cantwell and distinguished members of the Committee, thank you for the opportunity to appear today to discuss the report of the ODA for transport airplanes from the expert panel review. I'm Dr. Tracy Dillinger, and I'm currently the Senior Executive Psychologist for Safety, Culture, and Human Factors programs within the NASA Office of Safety and Mission Assurance.

In this position, I have created and chaired the agency's Safety Culture Working Group and the Human Factors Task Force. And I am responsible for NASA's safety culture survey, safety culture courses, safety culture audits and assessments, human factors mishap investigation support, human factors training, and our annual human factors report.

I am also a proud veteran of the United States Air Force, where for over 20 years, I served as a human factors investigator; human factors instructor; 10 years as the chief aviation psychologist; and in numerous roles, including the chief of safety assessments for the Air Force Safety Center; and served on the Columbia Accident Investigation Board.

I've spent the majority of my career working in the field of aerospace and aviation safety. I'm truly passionate about safety culture, human factors, and their combined effect on organizational performance.

Clearly, a robust safety culture is essential to preventing mishaps. Safety is a NASA core value, along with excellence, teamwork, integrity, and diversity, and it's integral to everything we do. We strive to create an environment where everyone works safely, feels comfortable communicating safety issues, learns from both mistakes and successes, and feels confident balancing challenges and risks.

The International Civil Aviation Organization describes safety culture as arguably the single most important influence on the management of safety and recognizes the interdependence of safety culture and safety management, noting that effective safety management empowers a positive safety culture; and a positive safety culture empowers effective safety management.

I was privileged to participate in the ODA panel, where I was able to lend my knowledge and passion for safety culture to the work of my fellow panelists with whom I had the privilege to serve. Boeing, like NASA, uses Jim Reason's five-factor model of safety culture, comprised of reporting, just, flexible, learning, and informed elements.

While the company has begun addressing reporting and just culture training, it needs to enlarge its safety culture program to include all areas, all five factors, using multiple means; and the program should be endorsed, promoted, and modeled by its leaders.

Employees, including team leads, managers, and senior leaders need to know what to do when a deficit has been reported.

That includes ensuring that tools and processes are available so employees can report without fear of reprisal. Managers can listen, reported issues are fixed, and then communicated with recognition given to those who come forward with concerns.

It's equally important that senior leaders continually message and demonstrate to their workforce that safety is a critical, fundamental aspect of doing business, even over profit. Aviation safety isn't just good for the flying public. Ultimately, it's good for successful operations and mission accomplishment, and that's good for business.

I believe that successful adoption of the report's recommendations will improve the level of safety provided by Boeing to its workforce, operators, and the public.

I would note that while the panel focused on Boeing as an ODA holder, the panel's findings and recommendations contain numerous best practices that could assist other companies with similar authorizations to implement successful safety culture, safety management systems, or ODA programs.

Thank you once again for inviting me to appear before you today, and I look forward to discussing these important issues with members of the Committee.

I yield to Dr. Meshkati.

Chair CANTWELL. Thank you again so much for being here, and thank you for your management strategy books, "Managing the Risks of Organizational Accidents" from James Reason. Thank you so much for the leadership at the University on these issues.

STATEMENT OF DR. NAJMEDIN (NAJM) MESHKATI, PROFESSOR, SONNY ASTANI DEPARTMENT OF CIVIL/ ENVIRONMENTAL ENGINEERING, DANIEL J. EPSTEIN DEPARTMENT OF INDUSTRIAL AND SYSTEMS ENGINEERING, USC AVIATION SAFETY AND SECURITY PROGRAM, VITERBI SCHOOL OF ENGINEERING; PROFESSOR, INTERNATIONAL RELATIONS, DORNSIFE COLLEGE OF LETTERS, ARTS AND SCIENCES, UNIVERSITY OF SOUTHERN CALIFORNIA

Dr. MESHKATI. Good morning, Chairman Cantwell and distinguished senators and distinguished members of the Committee. Thank you for inviting us, the FAA expert panel members, to testify before you today.

I am Najm Meshkati. I am a professor of engineering at the University of Southern California. I'm also a senior faculty member with the 72-years-old USC Aviation Safety and Security Program. And I have an affiliation with Harvard Kennedy School Project on Managing the Atom.

For the past four decades, I have been conducting interdisciplinary research on system safety, human factors, safety culture, and risk reduction of complex technological systems. These systems include aviation, oil and gas drilling, pipeline and refining, nuclear power, and healthcare. System failures in these industries, these safety-critical systems, have a deadly impact on humans and the environment.

I have developed many courses at USC around this area. I've been involved in several accident investigations like BP Deepwater Horizon. I have visited several nuclear plants like Chernobyl, Fukushima, and Three Mile Island. But my participation in this distinguished expert panel, and working with my great colleagues on this panel, further corroborated what my research experience has taught me in the last 40 years.

And this is it. The safety culture is the foundation, as Dr. Dillinger mentioned. Safety culture is the foundation of any processes and operation in organization. It could make or break the system. As my mentor, Professor James Reason said, "Safety culture can affect all elements in the system, for good or ill."

I believe safety culture is analogous to human body's immune system, which protects it against pathogens and fend off diseases. And it is incumbent upon the leadership of any organization to strive for immunizing and constantly boosting the healthy safety culture of the company. A healthy safety culture is based on competence, trust, transparency, and accountability.

Another equally important lesson that I've learned by my participation in this panel, which also corroborated what I have learned in my career, is that human operators in the safety-critical system,

such as pilots in the airplanes or human operators in a control room of a nuclear plant, always constitutes the system's both first and last layer of defense.

First and last layer of defense. Human operators. As we saw it in the case of The Miracle on the Hudson, and also at Fukushima Daini nuclear plant.

As such, our panel found and recommended human factors and human systems integration consideration should receive attention commensurate to their importance in aviation safety and aircraft design and operation.

Human factors as a cross-cutting science should become a formal, stand-alone, and highly prioritized discipline, and a design practice at Boeing and within any company that they deal with safety-critical system.

And finally, my research experience has taught me that a world class engineering company that makes or operates a safety-critical system such as an aircraft, must be run by world class engineers who are thoroughly trained to understand, respect, and impact human factors and safety culture.

Thank you once again for your attention to our panel's report and appearing before you. Thank you.

[The prepared statement of Dr. Meshkati follows:]

PREPARED STATEMENT OF DR. NAJMEDIN (NAJM) MESHKATI, PROFESSOR, SONNY ASTANI DEPARTMENT OF CIVIL/ENVIRONMENTAL ENGINEERING, DANIEL J. EPSTEIN DEPARTMENT OF INDUSTRIAL AND SYSTEMS ENGINEERING, USC AVIATION SAFETY AND SECURITY PROGRAM, VITERBI SCHOOL OF ENGINEERING; PROFESSOR, INTERNATIONAL RELATIONS, DORNSIFE COLLEGE OF LETTERS, ARTS AND SCIENCES, UNIVERSITY OF SOUTHERN CALIFORNIA

Good morning, Chairman Cantwell, Ranking Member Cruz, and distinguished Members of the Committee. Thank you for inviting us—the FAA Expert Panel members-to testify before you today.

I am Najm Meshkati, a professor of engineering and international relations at the University of Southern California (USC). I am also a senior faculty member of the 72-year-old USC Aviation Safety and Security Program, and an Associate (ex-Research Fellow) with the Project on Managing the Atom at the Belfer Center for Science and International Affairs at the Harvard Kennedy School.

For the past four decades, I have been conducting interdisciplinary research on system safety, human factors, safety culture, and risk reduction of complex, safety-critical technological systems. These systems include aviation, oil and gas drilling, pipeline and refining, nuclear power, and healthcare. System failures in these industries can have a deadly impact on humans and the environment.

At USC, I have had the privilege of developing and teaching several undergraduate, doctoral, and executive training courses on human factors in aviation and process safety management, mental workload measurement, root-cause analysis, High Reliability Organization (HRO), nuclear safety culture, and engineering diplomacy.

I have been an eyewitness to the unfolding of several disasters' consequences. I worked with the U.S. Chemical Safety and Hazard Investigation Board as an expert on human factors and safety culture in the investigation of the BP Refinery explosion in Texas City in 2005, which killed 15 and injured 180 people. I was a member of two committees, which were convened by the National Academies (NASEM) and the National Research Council, and investigated two major accidents, the BP Deepwater Horizon, and the Fukushima nuclear plant disasters. I have visited and studied many complex systems, including more than a dozen nuclear plants around the world, including Three Mile Island, Chernobyl, Fukushima Daiichi and Daini.

My participation in the FAA Expert Panel and working with my great colleagues on this Panel have further corroborated what my research experience has taught me: That safety culture is the foundation of any process and operation in an organization; it could make or break the system. And as my mentor, Prof James Reason,

succinctly put it, "safety culture. . .can affect all elements in a system for good or ill."

I believe safety culture is analogous to the human body's immune system, which protects it against pathogens and fends off diseases. And it is incumbent upon the leadership to strive for immunizing, and constantly boosting! the healthy safety culture of the company. A healthy safety culture is based on competence, trust, transparency, and accountability. A primary evidence of a healthy safety culture is that equal or at least proportional attention paid to safety versus production/profitability goals.

Another equally important lesson that I have learned and participation in the Panel reinforced that is human operators of safety-critical systems, such as pilots in an airplane, always constitute the system's both first and last layer of defense against a catastrophic failure. As such, as our Panel found and recommended, human factors and human-systems integration considerations should receive attention commensurate to their importance in aviation safety in aircraft design and operation. Human factors, as a cross-cutting science, should become a formal, standalone, and highly prioritized technical discipline and "design practice" at Boeing and within companies such as Boeing.

Our 24-member strong panel and support staff, under the exemplary leadership of Mr. Michael Bartron and Keith Morgan, worked diligently for almost a year on this unprecedented report, which includes 27 findings and 53 associated recommendations to Boeing and the FAA. These recommendations are vital, and we hope that all of them are implemented in their entirety.

And finally, my research experience has taught me that a world-class engineering company that makes or operates a safety-critical system such as an aircraft must be run by world-class engineers who are also thoroughly trained to understand, respect and implement human factors and a healthy safety culture.

Our written testimony further elaborates on our points, which we have submitted for the record, and I'll be delighted to answer questions about those issues, as well as the issue at hand.

Thank you once again for your attention to our Panel's report and inviting us to appear before you today.

Chair CANTWELL. Well, thank you to all the witnesses. Appreciate you being here.

I think I have a question just generally. I want to draw this out a little bit from your report, because you've again emphasized it.

But some of these terms may just be lost on people and their significance. And so I'm just trying to—you're saying there isn't a singular culture program on safety that is understood by the employees, or that is implemented or responded to by the employees. And again, I want to make sure, because I'm going to get to a question about SPEEA and Machinists, because the frontline people are saying these are the safety problems. They're just not being backed up.

And so, but I want to understand why the phenomenon exists. And I think your report says because there are three different programs, and people don't know which one to pay attention to at any given time. Is that—is that a correct understanding?

Dr. DE LUIS. Well, if I may, I think there are a couple of things there, and I'll just try to tease them out.

It is true that there is an overwhelming amount of documentation on SMS and safety culture at Boeing. But as has been described to me by someone recently, it's sort of like if you're trying to teach your kid to drive, and you give them the statute book on all the road rules, you know? But what they really want is the driver's manual.

And what you're referring to is, one observation that we made is that while all the documentation that exists right now on SMS and safety culture checks all the boxes that ICAO says you're supposed to, for the person on the ground turning the bolts and hammering the nails, they don't know.

We asked at all of our interviews. We said, "What's the safety metric are you working toward? How do you know that you're doing a safe thing?"

And we got like the deer in the headlights. "What are you talking about?" "Oh, safety. We have production metrics, we got this metric," but there wasn't anything about that. So that was one thing.

I think the thing that you're referring to about it being multiple ways, there are multiple reporting ways right now at Boeing, and that's not necessarily a bad thing. Having multiple ways of reporting is good and is encouraged.

The problem we found was that they just didn't seem to—there was lack of confidence in, say, for example, if you tried to report it anonymously.

There was a lack of confidence that there would be an anonymous that would be maintained.

There was lack of confidence that things would actually get done about what you were doing.

And there was a very real fear of retribution and payback if you held your ground.

And obviously those are things that are just not compatible with any sort of safety culture or SMS system.

Chair CANTWELL. Any of the other witnesses want to add to that?

Dr. DILLINGER. Boeing has been working to develop and field a safety culture model throughout the organization. They've been successful in providing training on some of the elements of it; they have not yet put it all together so that it works together as a system.

At NASA, we use the DNA logo for it. You know, all of those parts work together. When someone reports something, somebody has to listen to it. The way they treat them has to be fair. There needs to be an environment of psychological safety. They need to learn from that, and communicate it, and pass it on.

And to create that, everybody in the system needs to know what they're supposed to do, and how to do it, and what's expected of them.

And if that doesn't work, they need to know the next option. And if that doesn't work, they need to know the next option.

That's why having multiple reporting systems can be a good thing, because if one doesn't work, the employee needs to know what else they can go to.

One of the things, for example, would be to know who is the chief of safety. That would be where the buck stops. And in one of the surveys that we saw, 95 percent of the people who responded to the survey did not know who the chief of safety was. That's a deficit that could be corrected. But people need to learn who the key people are in that system, so they know who they can go to when the processes don't work.

Chair CANTWELL. Well, I wondered to what degree this committee, or I did as Ranking Member of the Committee. Then a whistleblower report that detailed in 2021, an FAA engineer, Michael Collins, describes an instance where the FAA management overruled an engineer regarding a lithium ion battery in the 787.

And notably later, the FAA had to ground the 787 in response to fires caused by the very lithium ion batteries.

So there was an instance where people were not listening to what people were saying on the line, what needed to be done.

There's another incidence where Dr. Martin Bickeboeller stated that a more secure safety reporting system may have prevented him from facing retaliation for filing complaints about different components not meeting FAA standards.

So how do we ensure that those who are speaking up about safety measures get listened to? I'm sure in this case, these two knew who to go to, but just because they've been very experienced people; but this—they weren't listened to. So what do we need—what do we do with this part of the problem? What do we need to do with the FAA?

Dr. DE LUIS. Well, you know, in a properly functioning SMS and a properly functioning safety culture, those questions wouldn't be asked. Right? Because they—people would be empowered. People would have confidence that they wouldn't be, that they wouldn't be smacked down if they spoke up.

I don't think that's what we're dealing with here. And which is one of the reasons that, by the way, that we, in one of our recommendations, we encouraged, we recommended that Boeing establish what are called ASAP programs, aviation safety action programs. They're very common in airlines.

And an ASAP program has—is a tripartite program. It has the FAA, the labor, and management. And if you initiate an ASAP event, you're protected. But more importantly than being protected, the event gets visibility at the FAA level and at, as well as the management level.

And for me, I've been in—and when I started on this committee, I quickly became a big convert to visibility, because I am convinced that if enough eyes had seen the MCAS design 10 years ago, somebody would have raised their hand and said, "Hey, wait a second, maybe having a system that if one sensor failed, it crashes the airplane to the ground is not the best idea."

But they didn't, because as was noted, it was purposely hidden. Right? So I'm honor-bound——

Chair CANTWELL. Well, just to be clear, there were whistleblowers who did bring this up and said that it was unsafe, but they weren't listened to.

Dr. DE LUIS. They weren't listened to.

Chair CANTWELL. So it's hard; they weren't listened to. And so we're—this is why we're saying good engineering, as I think you agree, wins the day. But people have to listen to the engineers——

Dr. DE LUIS. You're about to lose——

Chair CANTWELL.—and so we're trying to discover here, what kind of—look, our committee can only do the oversight of the FAA that enforces the FAA to do its oversight job correctly. And we want to know what we need to do to strengthen this.

But my time has expired. I have a suspicion I'll be able to come back to this and we'll, yes, go back to, but I'll turn to Senator Duckworth.

Senator DUCKWORTH. Thank you, Chairwoman.

Again, you know, I want to dig deeper into this conversation. I mean, since the door plug fell out of the 737 MAX 9 for Alaska Airlines, there has been a lot of attention on Boeing's stunning lack of quality control throughout its supply chain. And this is understandable.

And yet, as we've already heard, the expert panel appears to have identified a much broader problem at Boeing, the utter absence of an effective safety culture. And I fear that merely increasing scrutiny on how a door plug is removed and replaced will fail to solve the more fundamental cultural failures that are at the root of the Boeing's flawed development and production of the 737 MAX.

And Dr. de Luis, I would love for you just to go deeper in the conversation we're already having, because I think you would agree with me, would you not, that fixing a specific assembly line problem would not be sufficient to get Boeing back on track.

And frankly, I personally think that Boeing's recent manufacturing problems are merely a symptom of a much deeper problem, the destruction of a proper safety culture by share-price executives who time after time prioritize Wall Street profits over long-term production excellence. It's sort of the replacement, the driving out of the engineers that were at the heart of what Boeing was.

So can you talk a little bit about manufacturing problems——

Dr. DE LUIS. Sure.

Senator DUCKWORTH. —Are more of a symptom. Would you agree they're more of a symptom of the bigger problem than—you can't just fix a quality control issue and think that that's going to solve it.

Dr. DE LUIS. Right. I completely agree.

And let's talk about the door plug and just use that as an example. Everyone's seen the picture, right? Of the door plug sitting there without three of the bolts; you can't see the fourth one, right? But everyone's seen that picture, and you go, "Oh, my goodness, their bolts are missing. Where was the inspector?"

Oh, OK. Should have been inspected.

But more importantly, I think, why did a mechanic install the door and walk away, leaving it in that condition? Why wasn't he or she trained to know that you just can't do that, right? And that's where you go to, you know, yes, more inspection is good.

I firmly believe you can't inspect your way to quality, and you can't inspect your way to safety, because all it's going to take is one slip, and we're back here again.

It's got to be in the DNA of the people that understand that you don't walk away from a door, leaving it in an unsafe condition. Now you can even take that a little further and say you shouldn't design a door which allows the bolts to be separated from the door so that, you know, so, I mean, it should be captured or something. I mean, you can take it all the way back up to the design level.

But I completely agree that just putting out Whack-a-Mole, trying to—playing Whack-a-Mole with Q.A. problems is not the way that you're going to get there, because that's impossible.

The car industry learned this a long time ago, right? You don't let cars move forward when they have defects. You fix the defect, and you figure out why the defect's there, and then it doesn't show up again.

That's not happening here. When problems arise on the line, the line keeps moving forward. And I think that until they take a page from what the U.S. auto industry learned 30 or 40 years ago, we're not going to be able to get to where we need to be for Boeing.

Senator DUCKWORTH. I would agree with you. And by the way, that picture was from a cell phone text message, because when the NTSB went and asked Boeing to provide all the logs—and, you know, back in my—in the, you know, when I flew for the Army, it was all paper logs, and we switched to computerized. They couldn't find any logs for anybody who inspected it, who took it off, or put it back on. They still haven't been able to identify who did the work.

But that picture wasn't even official. That was just a text message between workers.

I want to get into the ODA reforms. After all the ODA reforms, I am frustrated that Boeing's ODA still allows opportunities for retaliation against those who raise safety concerns. And the expert panel found continuing problems tracking safety concerns once they're made.

This sounds eerily like how ODA operated before Congress passed the ACSAA Act. And in 2016, an internal Boeing survey found that 39 percent of Boeing authorized representatives had experienced undue pressure from Boeing. We've already talked about this a little bit.

A 2020 FAA survey found that 56 percent of respondents from its aircraft certification service believe external pressure from industry is perceived to get in the way of safety decisions. And 49 percent of respondents from FAA's aviation safety office believe that safety concerns will not be addressed, so they don't bother to report them.

I would love for both Dr. de Luis and Dr. Meshkati to address this issue. Congress tried to fix this in the Aircraft Certification and Reform Accountability Act, but clearly a problem remains. Does Congress have more legislative work to do? And what do you—would you recommend we do? I know that the panel found, made 54 suggestions, but I would love to hear.

Dr. Meshkati, would you like to kick us off?

Dr. MESHKATI. Thank you, Senator. That has been a major issue about the fearful retaliation and the independence of ODA. And we talk about that, and we heard about that during our interviews and surveys and the documents that we reviewed.

One important conclusion that we came up with, this reorganization of ODA within Boeing, that the old—because Boeing, as you know better than I do, is a matrix organization. You have the functional group, and you have the program group. ODA in the past was in the basically program group. Now they are reporting to the functional group.

And there have been some—something which was a little bit of a surprise to me, that there were some non-Boeing ODA members also, which were contractors, which their security could be subject to job stability and security could be subject to the review that they get.

But with this reorganization that they have done, that the ODA unit members, they report to the functional group, they—it could

fix that. And I want to open a prontices (phonetic 0:57:30) here, Senator, that in our panel, we have had manufacturer's representative that they have ODA. We had person from Gulfstream, we have person from Bell Textron, and GE, and Pratt & Whitney. They do ODA correctly. It's not that there is something fundamentally wrong or inherently wrong with ODA. ODA can be managed correctly, and these issues would not appear as much as we saw here.

Dr. DE LUIS. The—if I may, the—you asked what could the FAA do whatever. I think that the FAA needs to take a very close look.

The FAA right now approves ODA members. Right? I think it needs to take a very close look as to what the organizational structure of the ODA within the company is, and require it to be, you know, to be independent when it comes to decisions that affect the person's livelihood.

It's a very hard ask for someone, you know? I mean, do—you're putting your livelihood at stake in order to stand your ground. Most engineers are ethical and are going to do it. But we shouldn't have to ask them, you know, to risk their family livelihood.

And Najm, Professor Meshkati, brought up the issue of the contractors as ODA members. That's—to me, I'm—I was very troubled by that, because, you know, a contractor's relationship with a company is very tenuous financially. Right? I mean, you're basically there at will, completely at whim. It's a big ask to have a contractor, and that's going to stand their ground, knowing that they could be shown the door the next day.

There are times where they're needed, you know, recently retired people that you want to bring back because of their expertise. I completely get that. But that should be the exception, I believe, and not the rule. I mean, I think you really want these to be full-time employees that have a little bit more security, whether they're SPEEA members or not or whatever.

Senator DUCKWORTH. You've been very indulgent, Madam Chair. Thank you.

Chair CANTWELL. Senator Vance. And then Senator Rosen.

STATEMENT OF HON. J. D. VANCE,
U.S. SENATOR FROM OHIO

Senator VANCE. Great. Thank you, Madam Chair. And thanks to you and the ranking member for hosting. And thanks to all of you for being here.

So first, I want to thank each of the witnesses for the important work you put into this report. And I'd like to focus my questions on the ODA, the Organization Designation Authority culture at Boeing, and more broadly, some of the concerns that have been raised about retaliation against employees for identifying defects and other problems in the course of Boeing's operations.

So in the report's executive summary, the expert panel found that even though "Boeing's restructuring the management of the ODA unit decreased opportunities for interference and retaliation against" ODA unit managers and provided better organizational messaging regarding the independence of unit managers, something was missing.

Now Dr. de Luis—I hope I'm getting that pronunciation right. In your executive summary, you say, and this is quoting from the re-

port, The ODA "restructuring, while better, still allows opportunities for retaliation to occur, particularly with regards to salary and furlough ranking. This influences the ability of unit managers to execute their delegated functions effectively," end quote.

So Dr. de Luis, I want to understand how this fear of retaliation manifests itself on the assembly line. So in your investigation, did you find Boeing employees on the factory floor were empowered and encouraged by management to stop the processes if an employee detected a nonconformity or a possible defect?

Dr. DE LUIS. No, Senator, as I understand it, the only thing that stops the line on the factory floor is an OSHA violation. If an employee thinks that his or her life or health can be threatened, they can stop the line.

Everything else basically gets written up and gets put into one of various processes. Depending on how—where it sits, it gets written up, and then supposedly gets addressed down the line. And this leads to the traveled-work problem that we've heard about before, where you have a problem, you'll fix it later; but in order to fix it later, you have to take apart something that, you know, wasn't there before.

And that's in part what caused the door problem, by the way. Right? They had to replace some rivets. They had to remove the door. They put the door back, they forgot the bolts, et cetera.

But no. To answer your question directly, we did not find any encouragement or any empowering to stop the line. They're focused on reporting it. And supposedly that loop should be closed and those problems fixed. But it's very difficult to say that that's actually happening.

I can give you an example in one of our interviews that I believe you and I did, Tracy. We were at the receiving area, the receiving room—receiving section, where they check out the airplanes before the FAA inspects them. And I asked them, "What is the major thing that you find?"

They say, "Oh, it's FOD." Foreign object debris.

And I'm like, "So what happens?"

"Well, you know, we report it, we clean it up, and we move on."

I say, "Well, don't you track back where the FOD came from, so you can be sure it doesn't happen again?"

And they're like, "Well, we put the report in, and somebody's supposed to do it, but it keeps on showing up."

Senator VANCE. Yup.

Dr. DE LUIS. And that's not how you're supposed to do things if you want to fix the problem once and for all.

Senator VANCE. Got it. So it sounds—it sounds like there was not exactly a promotion of people sort of stopping the line or raising these issues. I mean, is there any evidence that there was actually the opposite, there was retribution or that people were actually penalized for raising some safety concerns?

Dr. DE LUIS. Yes, that's correct. We heard reports—we heard several reports of people that felt that they were transferred or didn't get the raise that they were expecting.

Now please understand, we were not empowered to conduct a statistically significant, all-encompassing review. And I am very

well aware that data is not the plural of anecdote. Right? I mean, we——

Senator VANCE. Sure.

Dr. DE LUIS.—we were—I'm recounting anecdotes. But, that's what we heard. And that's—I think that's our impression from——

Senator VANCE. OK.

Dr. DE LUIS.—from a year of studying this.

Senator VANCE. So being mindful of time—I appreciate your testimony. One quick question, I guess, just to follow up, and maybe we can sort of further follow up with my staff in a detailed way. I mean, is there anything that you think Congress could do to sort of solve or at least improve this sort of basic incentive problem? Right?

If you're going to be penalized for raising safety concerns, then you're not going to raise safety concerns. So we want to actually promote people for raising valid safety concerns. What do you think Congress could do to meaningfully change this?

Dr. DE LUIS. As I mentioned in response to an earlier question, one thing you could do is you could—I'm not in your shoes, so I don't know if it's legislation or encourage or direct, but the setting up additional channels for where people can come and report without fear of retaliation, such as the ASAP program, I think would be a very good step.

Senator VANCE. OK. Well, thank you, Dr. de Luis, and I appreciate it. And I know you personally have suffered some tragedy because of some of these problems. And so I'm grateful for your work on this, but also my condolences.

Thank you, Madam Chair.

Chair CANTWELL. And just on that point about the ASAP, because I don't want it to get too confusing about existing systems.

Dr. Luis, you're saying that if somebody knew about either the batteries or the MCAS or whatever, that what you want is a larger universe of people, not just one engineer talking to one line manager. You want a broader awareness. And you want a broader awareness even at the FAA, so that it isn't just the FAA, one person overriding the line manager.

Dr. DE LUIS. Right, Senator. I mean, you know, I'm a belt-and-suspenders kind of guy. I think that you need to have—you need to have more visibility in order to prevent the things that we saw on MCAS in Congressman DeFazio's report, you know, that where one person could basically hide the existence, or suppress the existence of certain systems, or make sure that they don't go very far.

It's not—when we were discussing this in our panel, several people brought up, "You know, in a properly functioning SMS, you don't need ASAP programs." That is absolutely true.

But that's not the world that we're in right now. So, and there may be other things besides ASAP. ASAP was just the one that when we were at American Airlines, they talked to us about it, and they were very, very positive about the impact that that's had on their SMS at American.

And so it really resonated with many of us on the panel, and that's why it's in the report.

Chair CANTWELL. As a broadening of the communication.

Dr. DE LUIS. Right.

Chair CANTWELL. The key thing——

Dr. DE LUIS. Yes, right. Exactly.

Chair CANTWELL. The key thing is to broaden—again, I would just want to, I know you keep referring to this one instance, but I'm assuming you're referring to some of the actions by people who may have tried to hide that information from the FAA. But this committee also received whistleblower reports from people who made it very clear they had concerns.

Dr. DE LUIS. Right.

Chair CANTWELL. It's just that you—we have to figure out this larger communication.

Dr. DE LUIS. And it shouldn't take a whistleblower report. Right? I mean, a whistleblower report is a big deal for somebody to do, right? I mean——

Chair CANTWELL. Yes.

Dr. DE LUIS.—it's often a career-ending move. Whereas as the ASAP has been described to us, you know, a mechanic can say—this was actually a case that was brought up. "You know, I'm not sure if I put in the locking pins on that panel." And he goes and reports it. And that immediately—he's not going to be fired for making that mistake.

The focus is going to be, "Well, why didn't you? Is there a problem in the process?" The focus is first—it's let's get the airplane down if it's in the air and make sure it's safe, and then it's why didn't it happen? Is there a problem with the process? Is there a problem with the training? And then make sure that that never happens again.

I think that's the attitude that we need to encourage across the airplane—the aviation world, but in particular at Boeing.

Chair CANTWELL. Thank you.

Senator Rosen.

STATEMENT OF HON. JACKY ROSEN,
U.S. SENATOR FROM NEVADA

Senator ROSEN. [Technical issue] it's really important, and this hearing is so important. And I really want to thank the panel for your hard work on this and your care. Well, it matters, and we're grateful.

Because as Americans look to Congress to address recent Boeing incidents that have placed passenger safety at risk, we're reminded that American air travel can only remain safe and reliable as a form of transportation through vigilant oversight and accountability, just like the hearing we're having right now.

I want to thank you again for taking the time to be here answering questions about the findings, and the recommendations that were provided in the expert review panel's final report.

And so the report found that for aviation safety matters, input from Boeing's pilots—pilots were neither consistently nor directly, directly delivered to the highest level of decisionmakers in the organization.

It also noted that the chief pilot position did not have the same authority as other executive positions. This is concerning, given that Boeing's pilots are uniquely qualified to identify those safety issues and hazards inherent to a company's aircraft. It's clear that

the expertise pilots provide need to be elevated within Boeing's ODA process, and your recommendations are consistent with that.

So Dr. Meshkati, and then Dr. Dillinger, can you both elaborate on why the expertise that pilots provide is essential to evaluating Boeing's aircraft? And what can Congress do to ensure that pilots have a greater seat, not just in the cockpit, but at the table moving forward, so that their expertise can enhance aviation safety. We'll go to Dr. Meshkati first, please.

Dr. MESHKATI. Thank you very much, Senator Rosen. That's a very, very important and profound question that, in fact, relates to our findings of number 24, 25 and toward several recommendations about that.

It is my position, and I think our expert panel has very specifically said that the chief pilot, and the pilot, and basically the way that the pilots, they could bring up their voice to be heard and be paid attention to, is through a very robust human factors group.

If we can have that robust human factors group and make it a line function with the authority that commensurates (sic) with its role, I think that issue that you said, can be resolved.

I heard that in Boeing, they say, "Structures is the king," because of the impact and importance that they have. And I've said that to my student. If structures is the king, human factors and voice of pilot has to be at least a queen in Boeing. Because this is equally important, as equally important as the structures.

I think this issue that you raised is very close to my heart and very close to the heart of my colleagues and the panel, and that's what we made with this recommendation. We used the term, Senator "design practice" in our recommendation—recommendation for these findings associated with the findings about that.

Design practice has a very special and important meaning in Boeing. And if this issue that you said be raised at that level and it gets to the design practice, I think some of these issues can be resolved.

Senator ROSEN. Thank you.

Dr. Dillinger, would you like to add something?

Dr. DILLINGER. Thank you. Thank you, Senator.

The pilots are the customers in a great sense. And so the reason why it's important to hear from the pilots is they are critical in the design from a human factors perspective of the flight deck.

The human factors inputs and the pilot's inputs go together. The pilots need to have a strong voice, and their opinion needs to have a strong weight. They should be the ones who are providing feedback to those designs, and making adjustments in those designs.

Equally so, we learned as the panel that when you say "Boeing pilots," that has changed a little bit. And the pilots are no longer Boeing employees, they're contractor employees. And so again, the ability for them to have a voice at the proper level with the design modifications that take their opinions into account, the panel felt that that was important.

Senator ROSEN. Well, thank you very much. I see my time has expired. But I do want to say, the human factor matters. There are humans on that plane. It matters to all of us. It's not just the structure. And so thank you for your hard work.

Madam Chair, I yield back.

Chair CANTWELL. Thank you so much, Senator Rosen. Senator Budd.

STATEMENT OF HON. TED BUDD,
U.S. SENATOR FROM NORTH CAROLINA

Senator BUDD. Thank you, Chair. And again, thank you all for being here.

You know, the expert panel report notes that Boeing human factors specialists have played a diminished role in the design and functionality of recent aircraft. But it was once considered the gold standard in this area.

Dr. Dillinger, can you share any of the specific steps Boeing staff shared with the expert panel to rebuild its human factors capability, or any additional recommendations you have to Boeing to restore Boeing as the gold standard in human factors engineering? And Dr. Dillinger, please.

Dr. DILLINGER. Thank you, Senator. The human factors cadre has diminished recently, and the company has made a great effort to bring in more human factors expertise. They know that that is critical.

It needs to also be in a stand-alone organization, where they can have a voice formally. And we were introduced to the new senior tech discipline lead for human factors, who is developing a new cadre. But that is a critical element to the design, and it's essential for future designs.

Senator BUDD. Thank you.

Dr. de Luis, again, thank you for being here.

In 2019, Boeing launched the Speak Up portal, an internal online platform meant to provide a place where employees could confidentially report concerns on a number of factors, including production quality. Speak Up is one of the many channels employees have used to report concerns to the company.

Yet in several places, the report finds that employees, and I quote, "did not understand how to utilize the different reporting systems, which reporting system to use and when," end quote. And that many of the employees preferred to report issues directly to their manager.

So is there any record of how many production quality concerns were reported through the Speak Up program or other reporting system, as opposed to reporting directly to the managers?

Dr. DE LUIS. I know they keep track of how many Speak Up reports they have. I don't have those numbers in front of me.

I did, however, recently read that since the door incident, they've had a 500 percent increase.

And I remember that one of the last briefings we got from Boeing, I asked, was that good or is that bad? Right? Because there are two ways to look at this. What's—how many Speak Ups would you expect normally? Right? Never really got clear.

But to go to your point, to your question, excuse me, there's nothing wrong with having multiple reporting systems. What our concern was, what our concerns were, there were multiple.

One is that people are—have trouble believing that anything they put in Speak Up is going to actually result in any action. That was one.

The other concern was that most people prefer to deal with their problems by talking to their manager. That's not necessarily a bad thing. However, we were not convinced that there was actually a path from when that report goes up to the manager for it to be captured into the safety system.

So what I mean is, if you have a problem in your particular station on the line, for example, and you report it to your manager, you may fix it right then and there, and then that's the end of it. And maybe that's appropriate for minor things.

But for all you know, somebody at another production, in another line, is having exactly that same problem. And there wasn't—we did not see any sort of mandatory reporting sort of requirements in order to make sure that that gets captured, and subsequently learn from them. I mean, that's one of the key tenets of SMS, right? You're supposed to be—you're supposed to learn from your—from what happens. And so that was problematic.

In addition, of course, that sometimes you want—that if you're just doing it that way, there is no assurance that it was done in the best and most proper way, as opposed to the way to just get it done and keep the line moving.

So you want to have those—you want to make sure that you have those checks and balances as well.

So those were sort of our broad concerns about Speak Up. It's a good program, I think. I mean, it's not a bad—the intentions are very good. It can be a good program. People need to be trained.

And people—well, more importantly, people need to begin to see results when they report stuff into it, that things actually change, that nobody gets fired for reporting, that nobody gets—you know, anything bad happens, and that—and that their reporting is making a difference. I think that there was a lot of skepticism about that, which is why people keep going to their managers or their union rep or whatever. The most local.

Senator BUDD. Do you think the 500 percent increase in reporting in the system was due to more training, or clarifying, or just a new safety emphasis? Do you think it's a—what's your notion? Is that a good thing or a bad thing?

Dr. DE LUIS. Well, there was clearly at the—you know, they've been told yet again that to, that if they see something, they need to speak up. So I think that there's some of that. I think that the real question is, is it going to be a lasting, lasting blip?

You know, there's probably a right number of Speak Up reports to have per month. I don't know what that number is. If you have zero, well, maybe you're doing a perfect job, but most likely nobody is really using the system.

And if you have thousands, well, you got deeper problems, right? I'm not sure where the balance is, unfortunately. We need to look at what the longer-term data is going to show us.

Senator BUDD. Thank you all for being here.

Chair CANTWELL. Thank you so much. I just wanted to note, too, in this large discussion about human factors in ACSAA, we required that the human factors assessment has to be done before the certification, and that no longer can the FAA delegate the human factors assessment. They have to do it themselves. So.

Senator Klobuchar, and then Senator Schmitt and, I think, Senator Welch. So, Senator Klobuchar.

STATEMENT OF HON. AMY KLOBUCHAR,
U.S. SENATOR FROM MINNESOTA

Senator KLOBUCHAR. Yes. Thank you, Chair, for this important hearing.

And thank you—and I'm so sorry, Dr. de Luis, about your sister. We also lost a Minnesotan on that plane, and thank you for your advocacy.

I'm going to start with you, Professor Meshkati, and can you talk about why it's critical we invest in a strong pipeline to the aviation field? And I'm obsessed with this just because, you know, whether it's air traffic controllers or mechanics or the like, what's going to happen if we don't invest?

Dr. MESHKATI. Sorry, your question, Senator Klobuchar, was investing on the pipeline for training in——

Senator KLOBUCHAR. Yes.

Dr. MESHKATI.—aviation safety?

Senator KLOBUCHAR. Yes.

Dr. MESHKATI. That's extremely important, particularly—and thanks for that question. Right now, one of the issues that we are facing is the workforce attrition. There have been a lot of retirement and exodus from Boeing and other places.

And the issue of training is becoming very important in workforce development. In fact, this thing for the safety-critical system; in the case of aviation, being air traffic controller and pilots and engineers and machinists, and also in other industries.

I've been just two weeks ago at the board of Gulf Offshore Energy Safety of National Academy. The workforce development for the energy system in the Gulf of Mexico is also another issue, particularly with coming with the new technologies like wind turbine.

In this particular case, one solution is basically joining forces with technical colleges and universities, and develop internship program. And for the students that they get the training and they go work, and then they come back and continue their education.

This is something that I know that for this new technology of the offshore wind, some organizations in the Gulf of Mexico, and some companies, and maybe BSA is getting involved in that.

Senator KLOBUCHAR. OK, thank you.

Dr. Dillinger, you mentioned how pilots and crew need to play an important role in the design and evaluation of aircrafts. Can you also speak to the importance of training new pilots?

Dr. DILLINGER. It's essential that we grow new pilots, and that novice pilots have experienced pilots to help them learn and become superior experienced pilots.

And the pipeline of pilots is a constant effort. I think from a human factors perspective, again, the more experience we get from the pilot cadre and the more they learn how to speak up and make their needs known, especially from a design perspective. The panel was very concerned about the human factors element coming into design from the very beginning, and that requires experienced pilots having input into that process.

Senator KLOBUCHAR. OK, very good. Thank you.

Dr. de Luis, what additional FAA oversight do you believe is necessary to ensure a stronger safety culture?

Dr. DE LUIS. I think that we covered it a little bit before with regards to making sure that the FAA is able to vet and approve not just the people, but also the organizations, as well as higher scrutiny for non-employee ODA members.

I think that one of the things that has been touched on here is the need for the FAA to also establish its own SMS. Right? I mean, the FAA has an SMS on the ATC side, but not on the other side.

I—as I understand it, and I'm by no means, even though I'm on an expert panel, I'm an expert in SMS. But as I understand it, SMS's work best when they sort of intermesh with each other. Boeing, with its suppliers and the regulators.

I—you know, it's a little difficult to see how the FAA is going to be able to do sort of the bidding of the Boeing SMS system—sorry. Without having its own SMS. Sorry.

Senator KLOBUCHAR. Exactly. OK. Just one last question.

Professor Meshkati, on the—I passed a bill with Senators Moran and Capito, Senator Stauber in the House—Representative Stauber in the house, which alerts personnel to potential safety hazards, the NOTAM system, and how we need to upgrade it. As we do the long overdue work of upgrading that technology, how can updated technology strengthen safety culture?

Dr. MESHKATI. The technology needs to be updated with equal and adequate attention to organizational factors. One thing that we have said over here, just by bringing the new technology, or even if you have a updated technology, but if you don't do workforce training and also change the organizational mechanism that could adopt that technology, it wouldn't work.

The issue of the adoption of the technology in the organization is very important. We have seen that Senator Klobuchar, in the case of positive train control, for example, for railroad system, this is very important issue that you raise and needs to be addressed in a very systematic manner.

Senator KLOBUCHAR. OK. Thank you.

Chair CANTWELL. Thank you.

Senator Schmitt.

STATEMENT OF HON. ERIC SCHMITT,
U.S. SENATOR FROM MISSOURI

Senator SCHMITT. Thank you, Madam Chair. When I first learned about this hearing, I was under the impression that we would be speaking to people on the ground, whether current or previous, with current or previous experience within Boeing, to examine the current safety issues the company is facing.

However, I'm surprised to see that not a single Boeing employee or executive present today to discuss their safety and cultural practices and ongoing efforts to right the wrongs that have unfortunately occurred.

So let me reiterate. We have a hearing about Boeing safety practices without Boeing present. This is frustrating.

It's even more frustrating that another committee, just sat down the hallway here, is instead having a Boeing representative appear before their members to answer their questions and concerns.

Member of the Senate—as members of the Senate Commerce Committee, we possess the authority to hear from representatives from Boeing on—or any other company that falls within our jurisdiction on short notice. Today's hearing is about examining the findings of a report about Boeing's procedures. They should, at the very least, be here today to respond to any recommendations or findings from the report.

On a similar note, I've been on this committee now for almost a year and a half, and during that time, our transportation sector has experienced a number of challenges under this administration, including a concerning train derailment in East Palestine, a nationwide shutdown of our national air system, near misses along runways at our Nation's airports, and most recently, a devastating collapse of the Francis Scott Key Bridge. Yet, I along with my colleagues, have yet to have the opportunity to question Secretary Buttigieg, the one person charged with leading our transportation system.

Joining this committee, I expected us, in a bipartisan way, to rigorously examine and resolve critical issues facing our Nation that fall within the jurisdiction of this committee. Yet today, it appears we are again missing the mark.

Therefore, today's hearing is yet another chapter in an unfortunate series of events where we as a committee could be making a larger impact, finding answers to questions, and fully executing the duties as members of this great committee.

To be clear, this is not an indictment of our witnesses, whose knowledge and insight are invaluable. The report to which they contributed provides many recommendations, to which I hope Boeing not only reads, but strongly considers in its efforts to get its house in order.

However, for a comprehensive oversight, I think we should be hearing directly from Boeing and its representatives today on how they're addressing the findings and executing changes within the company. Rumored hearings in months down the line don't do anything to help Missourians flying today.

As I want to transition the questions for our panel today, I do want to focus on how as a committee, with the Chair, who I do enjoy working with, how we can actually deliver the world's leading transportation system and keep Americans safe.

So with that, I don't have a lot of time. But Dr. Dillinger, based on the report and based on the findings—again, this would be something I would be asking somebody from Boeing, but to your knowledge, what changes are being implemented? Clearly, there's a sort of a cultural challenge with feedback, and being collaborative based on the report. So are you aware of any changes that are taking place? And this would be for any of you.

Dr. DILLINGER. Thank you, Senator. When the panel completed the report, our mission was done. And so the panel has, in effect, disbanded since the report was submitted. However, the follow-up responsibilities to the findings and recommendations have been provided to the FAA, and the Administrator has made appropriate replies to that, from what we could tell.

Dr. DE LUIS. We believe that all of our recommendations should be implemented. I don't believe that any have been yet. I mean, it's

only been a few weeks. But our feeling is that while not a comprehensive set of remedies for all that ails Boeing, it's at least a really good set of first steps if they were to implement what we have recommended.

Dr. MESHKATI. And if I may add, in our last findings and as recommendation 51, 52, 53 to both Boeing and FAA to work together and meet periodically to make sure that recommendations are being implemented. And as far as I remember, FAA Administrator, Mr. Whitaker, has given Boeing three months since February or early March to come up with a plan as how they are going to implement that.

And our panel, and I think it's in our report, we volunteered to help Boeing during our interviews, to resolve some of these issues.

There is a statement somewhere in our report that they didn't really take this opportunity to our kind offer to help. At least in my case, they didn't ask.

Senator SCHMITT. OK, thank you.

I yield back. Thank you, Madam Chair.

Chair CANTWELL. Thank you, Senator Schmitt. I will note that we are going to hear from the company, and we've long said we were going to go to the FAA and then the company, because our oversight job is with the FAA and making sure they're implementing.

But I did mention at the beginning of this that they did cooperate with the interviews that you did conduct. And so we will hear from them. And my sense is, they've digested your report, and by the time they get here, they'll have a lot of commentary about this. And so we'll look forward to hearing it.

Senator Welch.

STATEMENT OF HON. PETER WELCH,
U.S. SENATOR FROM VERMONT

Senator WELCH. Thank you very much.

Thank the witnesses.

You know, people are pretty terrified. I mean, it's unreal when you think about it. In October 2018, the Indonesian flight, 189 people, Dr. de Luis, died. March 2019, Ethiopia Airlines. And then of course on January 5, the door blows off.

I mean, bottom line, people are wondering all the time whether they should fly on a Boeing plane. Is the public safe right now?

I'll start with you, Dr. Dillinger, and we'll go down the line. That's the bottom line question a lot of folks have. Are we safe on a Boeing plane?

Dr. DILLINGER. As best I understand it at this point, I—I have continued to fly on Boeing aircraft, and I hope that they have taken our findings and recommendations to heart and implement them.

Senator WELCH. The hesitation makes me feel like you're taking your chances.

Dr. DE LU——

Dr. DE LUIS. Yes——

Senator WELCH. De Luis. I'm sorry.

Dr. DE LUIS. Sir, that's fine.

I get asked this question all the time. I get asked this question, is it safe——

Senator WELCH. And I do too.

Dr. DE LUIS. Is it safe? And so here—here's what I answer. And I don't know if it's a—I say, "You know, the safest place for a rocket is sitting on the pad. The safest place for an airplane is sitting in a hangar. The safest place for you and me is on our couch, doomscrolling through Instagram."

And yet every day, rockets launch, airplanes fly. And we get up and we go and do something productive.

Safety is always a trade.

Having said that, the—within the airplane world, you have to look at what's happening and go, "How comfortable am I flying in this airplane versus that airplane?" For me personally, I keep track of what's happening on the MAX for obvious reasons——

Senator WELCH. Right.

Dr. DE LUIS.—and I'm worried about what's happening on the MAX.

Senator WELCH. Thank you.

Dr. DE LUIS. Now if I had to fly somewhere because there were—and there was no other option, I would absolutely fly it versus driving, for example, because I can make that trade.

Senator WELCH. But, you know, I think the public's entitled to more confidence in the security and safety of flying.

Dr. Meshkati, there's—you know, there seems to be like two issues about safety. One are the practices and the culture of the manufacturer. And the other is how much they put profit ahead of safety. Because it is a trade-off. The more they're going to focus on safety, that's going to come at some expense.

And I understand there are problems in both of those elements for Boeing. Would you say that's true?

Dr. MESHKATI. It was very much discussed, Senator, I think, in this seminal book by Peter Robison, "Flying Blind," and the issue of the putting—and basically, this is a delicate balance, Senator, between safety and profitability. And we know that these companies are not in philanthropic business. They need to make money.

But it's really the job. This is one of the tenets of safety culture, to give proportional attention to safety goals versus production goals.

And in the case of Boeing, unfortunately, based on the way that is chronicled very nicely in this book, that has happened after the merger with McDonnell Douglas.

Senator WELCH. So can you attribute—you attribute some of that change to after the merger?

Dr. MESHKATI. Yes——

Senator WELCH. And tell me what the dynamic was.

Dr. MESHKATI. The dynamic was because if you look at the history of McDonnell Douglas, in fact, I was reading another book by John Nance about—it's called "Blind Trust," about the series of problems that McDonnell Douglas had, crashes and that.

And the mentality over there was just to push, push, and make more aircraft. Not really pay attention to detail, and then somehow resolve that later. And that, unfortunately, according to my reading of the book by Peter Robison and some of the series of great articles by Mr. Dominic Gates in *Seattle Times.* It also chronicles this issue. And we have seen that, unfortunately.

Senator WELCH. Let me ask you one last question. What would you have to see from Boeing for you to have confidence that they had successfully developed human factors as a technical discipline in design practice?

Dr. MESHKATI. I personally, and I may distance myself from my distinguished colleague a little bit, I use my USC professorial academic freedom. I like to see the human factors person, the top person, have equal power and authority as the chief engineer. This is what I would like to see.

Senator WELCH. OK, thank you.

I yield back. Thank you all.

Dr. MESHKATI. Thank you.

Chair CANTWELL. Thank you. Following up on that, we may have a couple more members coming, but if not, we'll conclude the hearing soon.

But Dr. Meshkati, the report states that during the development of the 757 and 767, human factors and flight deck operations "were the gold standard" in part because human factor specialists worked "closely and collectively" in Seattle. Then the report goes on to say, quote, "the role of human factors and its influence eroded due to a series of" administration issues, including "reorganization, decentralization, downsizing, and relocation of the company's headquarters."

What does that have to do with human factors?

Dr. MESHKATI. Human factors works very good when they are very close to engineers and system designers. They exchange information, they work together, they work on the design of the system. And then they work on the training and that, and they solve that problem together.

Again, I'm—I'm not in the business of promoting book, but chapter nine of this book, which is about human factors, which I strongly recommend that that shows the way that the demise of the human factors or erosion of the human factors.

One of them, for example, is chronicled in the book, is when and—when the simulator trainings, and that was totally moved away from the design and that from Seattle to Florida or somewhere else. That—that is when you see a problem, you're in——

Chair CANTWELL. I think that was just the training, though, right, that——

Dr. MESHKATI. The training, but before that, also, that they during the design, because you get some of that input from the training coming back——

Chair CANTWELL. Oh, I see.

Dr. MESHKATI.—to the design.

Chair CANTWELL. You—you think that doesn't exist in a holistic way, you're saying?

Dr. MESHKATI. Absolutely.

Chair CANTWELL. OK. And then—and that's all feedback——

Dr. MESHKATI. Holistic and centralized way. Holistic and centralized way.

Chair CANTWELL. Holistic and central. OK.

Dr. MESHKATI. Thank you, Senator.

Chair CANTWELL. I wanted to ask about this in regards to the FAA. So most of the report is focused on what you can do to make

sure that you have a strong safety culture within the organization, and how much that has to be backed up by the FAA. What does the FAA need to do to have its own safety system improvements to make sure that it is thinking about human factors—or across the board, a variety of issues that can enhance security, particularly at a time of changing technology?

How do we get an FAA who is up to speed? ACSAA said, let's have this group that is at the beginning of the certification process kind of detail out more of the risk factors, so that that discussion could happen.

Dr. DE LUIS. So that's actually very—you know, we focused a lot about, especially since January 5, on the need to put more FAA boots on the grounds in the factory. And I am by no means saying that's a bad idea. That's an excellent idea.

But what you point out about the technology is why I think that ODA or DER or delegation of some sort is here with us forever. Because the FAA does not have the resources to be able to be the world's experts on these technologies. That's not what they're there for. The world's experts reside at Boeing or whatever.

The key thing, I think, is that the FAA has to have the ability to interface with the world's experts. And that's a different set of skills that's needed. You're not going to be conducting the cutting-edge research, but you should be able to talk to the people that are developing that technology and be able to understand it, and in particular understand how it impacts the safety and the operation of the aircraft.

I keep going back to a—something that was said earlier about the need for the FAA to really step up its own SMS. I think that that's critical. If you have that, then you have a chance of being able to appropriately interface with the people you're supposed to regulate.

If you don't have that, you're sort of, you know, spectators at the party here. And I think that that—they should be encouraged or directed or whatever it is, however it is that you do it, to move in that direction.

Chair CANTWELL. Thank you.

Senator Blackburn, are you ready?

STATEMENT OF HON. MARSHA BLACKBURN,
U.S. SENATOR FROM TENNESSEE

Senator BLACKBURN. Thank you, Madam Chair, and I want to thank all of you for being with us today. I think this aviation safety issue is something that we are all concerned about and are—we are going to stay in behind this. I appreciate the Chairman's attention to this issue.

Dr. Meshkati, I want to come to you, and I think I'm saying your name right. Correct me if I'm not. I was reading a report about the aerospace maintenance competition where the 450 airplane mechanics met to show off their skills. And they were working in 15-minute time slots, troubleshooting issues.

And I think in 15 minutes, it's pretty remarkable what people are able to do. And it's important to know that there are skilled people. You look at what has happened with these different re-

ports, Alaska Airlines, United Airlines, the Boeing planes, that have come up.

So when you look at this, and you see the skills training that some of them have, where is the disconnect in this? Where is—is it a lack of skill? Is it a lack of training or preparation? Or, you know, is it inattention? Why are we beginning to have such a negative impact, see such a negative impact on safety?

Dr. MESHKATI. Thank you, Senator. This issue, we didn't study that here, but your question reminds me of Aloha Airline and the accident that it had around—I think it was 1988 or so. And it was—started with the aviation maintenance-related problem.

And at that time, FAA really looked a very hard look at aviation maintenance. And I think they created a program called National Plan for Aviation Maintenance. And then at that time, one board member of NTSB who was later elected to NTSB, the Hon. John Goglia, pushed on this a lot. The issue of aviation maintenance, ma'am, is extremely sensitive to the human factors and safety culture issues that my colleague, Dr. Dillinger, is talking about here.

Senator BLACKBURN. OK. Let me do this. Dr. Dillinger, let me come to you, because I know you conducted hours of interviews for the safety report that you produced. Did you speak with any of the whistleblowers when you conducted those interviews?

Dr. DILLINGER. As far as I recollect, we did not speak to a——

Senator BLACKBURN. Did not.

Dr. DILLINGER.—whistleblower.

Senator BLACKBURN. Why did you not talk to any of the whistleblowers?

Dr. DILLINGER. That—that was not the purview of the—of the panel. And at the time, I don't think—we weren't aware of the whistleblowers or——

Senator BLACKBURN. OK. Well, let me——

Dr. DILLINGER.—or that——

Senator BLACKBURN.—ask you this, then. Does Boeing do enough to ensure that their employees know that there will be no retaliation if they come forward and report safety issues?

Dr. DILLINGER. The panel believes they need to do a lot more than what they are currently doing.

Senator BLACKBURN. And, you know, one of the things that we have heard from—from NTSB is that there is a problem getting information from Boeing. Do you think that Boeing executives do not understand, when there is an investigation, they need to come forward with complete information?

Dr. DE LUIS. I mean, I can't speak for the executives. I—I will say that Boeing is a very large and very bureaucratic company that produces a lot of paper. And I'm not surprised that there are lags in their responses, because that's—they're just—that's just the way it is. But I can't speak for them.

Senator BLACKBURN. I—I will tell you, reading the report and Boeing's safety culture being described as "inadequate and confusing," this is something that harms the flying public. And I appreciate the attention to the issue.

Thank you, Madam Chairman.

Chair CANTWELL. Thank you, Senator Blackburn.

Senator Warnock.

STATEMENT OF HON. RAPHAEL WARNOCK,
U.S. SENATOR FROM GEORGIA

Senator WARNOCK. Thank you, Madam Chair. Listen, the stakes are simply too high for a commercial aircraft to have the kinds of systemic problems that we're seeing with Boeing. So I'd like to examine how we got here with this panel.

Dr. de Luis, yes or no, through organization designation authorizations or ODAs, can the FAA—can the FAA delegate certain safety certification and other responsibilities to an aircraft manufacturer like Boeing? Yes or no?

Yes or no?

Dr. DE LUIS. Yes——

Senator WARNOCK. Yes.

Dr. DE LUIS.—but, currently, yes, because it's done with other manufacturers. But there are issues, as described in our report, that makes us be leery of saying, yes, go ahead and just do it. I think Boeing needs to prove that it is capable of doing it.

Senator WARNOCK. But the question is, are they able to delegate certain safety and certification responsibilities to an aircraft, like, so—so they are—the answer is yes, correct?

Dr. DE LUIS. Yes.

Senator WARNOCK. OK. So, Dr. Dillinger, yes or no, can an aircraft manufacturer like Boeing subcontract manufacturing responsibilities for, say, the fuselage of its signature MAX aircraft line to another company?

Dr. DILLINGER. The work of the panel, I think, would say yes, like with ODAs, that we heard successful examples of ODA delegation. However, the concerns remain about the risk that Boeing's safety culture presents to that process.

Senator WARNOCK. Yes, I share that concern, which is why I'm asking the question.

Dr. Meshkati, yes or no, can a manufacturer subcontracted by Boeing, such as Spirit Aerosystems, assign manufacturing responsibilities to an international affiliate, in Malaysia, for example?

Dr. MESHKATI. 787 is now made all over the world. Wings in one country, the other wing in another country, fuselage in another country. They are doing that.

Senator WARNOCK. So the authorization can then be passed from FAA to a manufacturer.

The manufacturer can subcontract that manufacturing responsibility to another entity.

And then the manufacturer subcontracted by Boeing can assign manufacturing responsibilities to an international affiliate.

Which I'm sure you've realized that what we walked through step-by-step is a supply chain of the Boeing MAX 9 aircraft at the heart of the near-catastrophic door plug blowout that happened on January—in January 2024 to an Alaska Airlines flight.

You know, there are many words for this. You can call it "delegating," "subcontracting," "reassigning"; at the end of the day, it's "outsourcing." Outsourcing key responsibilities, none more important than safety oversight to someone else. To someone else. To someone else.

I submit that while we're focused on Boeing, this is obviously not just a Boeing problem. This is far too common across aviation systems and its suppliers.

Whether the result of poor leadership, a focus on production targets, profit margins at all costs, even the cost of safety, or some combination of both, Congress must take a serious look at this culture of outsourcing and its safety implications. This is an instance in which we can't afford a mistake. It costs too much.

Dr. Dillinger, what more can Boeing do to improve its safety culture and our own—and our own responsibility for the safety of its products?

Dr. DILLINGER. Thank you, Senator. The panel focused a great deal on safety culture, and there is so much that they could be doing.

Part of it has to do with the timing. And if they were to accelerate the efforts, I think, and the panel thinks, that that would be beneficial. There has been a very soft start to that, to implementing the training, to getting feedback back from employees via their own surveys, to providing workshops, to focusing specifically on training at different levels.

So, for example, executive training, yes. But down through the other layers of the organization, to managers and supervisors, targeted training, those are—there are multiple ways that they could be going after that, and as they look at a more comprehensive way where they really dive in, and in a more timely way, address that, the panel felt that that would be important and that it was in our recommendations.

Senator WARNOCK. Great. Thank you so very much for that.

Dr. de Luis and Dr. Meshkati, last question. What more can Congress do to encourage both the FAA and manufacturers like Boeing to take direct responsibility for the safety of aircraft and our aviation system?

Dr. DE LUIS. I believe that the Congress and this committee needs to keep the—essentially the pressure on, to make sure that the waivers are not granted on safety-related issues, for example. That would be a—a good thing, because they—right now there are a handful of waivers on the MAX that directly affect safety.

But you need to keep the spotlight on this, because it—in doing our interviews, we heard often the sentiment expressed, "Yes, this is happening now, but as soon as everybody moves on to something else, we're going to go back to the way things were."

And that can't happen. It's too—as you say, it's too expensive and the cost in human lives is just way too high.

Dr. MESHKATI. Thank you, Senator. That is also related to an earlier question by Senator Cantwell. I think what Congress can do vis-ă-vis FAA—and that's also related to the SMS.

There is a document which is signed by FAA Administrator and then Chair of NTSB, the Hon. Robert Sumwalt. It's called "State Safety Program." This is something that United States files with the International Civil Aviation Organization. In this one, this is very interesting, Senator. It talks about the safety management responsibility for the state, for the application of SMS at FAA.

What I would suggest, and what can Congress do, is to create another panel like the one that we are in, Section 103, to look at the

implementation of this report. And how does United States stand vis-à-vis this report?

If this state safety program being fully implemented, what needs to be done, because that has a kind of a impact, or—or it can tremendously impact FAA's power on using, basically—in the case of SMS, for example, in United States, it's only FAA—correct me, my colleagues here—has the SMS on for air traffic controller.

Senator WARNOCK. Right.

Dr. MESHKATI. And SMS needs—there is a Notice of Rulemaking for SMS, but SMS needs to be fully incorporated. And if this document be fully implemented at FAA and other places, I think that would be a good solution.

Senator WARNOCK. Thank you so much.

I know I'm way out of time. I appreciate your indulgence, Madam Chair, and I look forward to working with my colleagues on this committee to improve aviation safety.

Chair CANTWELL. Thank you so much.

And just to clarify again one more time on this issue, because it's related to what he said and Senator Schmitt, and I want to emphasize, you know, people, we all represent big aviation states. We want this to be right. And we definitely believe in the workforce that we have in our states. We want them to continue to grow in expertise and excellence.

So recommendation 30 and 31 of your report says, "Foster an effective safety culture and publish a roadmap for workforce development" with "engineers and inspectors" and "oversee SMS for design and manufacturing organizations." And "Partner with industry to" measure the "success of SMS" and design, and organization "jointly review these measures of success on a regular basis."

OK, those are your two key recommendations about SMS.

So the FAA is now in this rulemaking that is going to come out in the next 90 days. And so what specifically do you want to see in that rulemaking that will help guarantee this success?

And then second, what do we do about this problem that Dr. de Luis suggests? Which, listen, it's a whole of government issue, if you ask me, because we could ask Dr. Dillinger about space in general, but it's—we're trying to keep the government at pace with technological change.

So you're saying the FAA may not have some of these people, and so how do we, what do we need to do? Because obviously we do want to listen to what these sectors say and they have input. They really have some of the smartest people about this technology, but we also have to get our oversight correctly.

So how do we make sure the FAA rulemaking has what we want to see in it? And how do we deal with this lack of engineering, if you will, skillset at the FAA, not at the company? At the company, I think it exists; I think we're just not listening closely enough.

Dr. DE LUIS. I think, if I may, I think with regards to your first question, fortunately, SMS isn't new. Right? It has been around in the aviation world now for 30 years——

Chair CANTWELL. But it was voluntarily implemented——

Dr. DE LUIS. Right.

Chair CANTWELL.—as part of a 2015 Consent Decree instead of being a real mandatory SMS. So I'm hoping the FAA gets this right this time, but——

Dr. DE LUIS. Yes. No, what I meant is that it's been in the aviation industry for 30 years, not at Boeing. You're absolutely correct.

So fortunately, I mean, in a sense, all the FAA has to do is look at what it's done successfully with organizations like the airlines and others and apply those same standards and the same rules to Boeing. So they're—they don't—it's not a blank sheet of paper, is what I'm saying. They got something to draw on.

With regards to your other question, I've always been a strong advocate of government agencies like the FAA drawing on the resources of the national academies. I mean, I see when new technology enters a field, such, let's say for example, AI, for example. Because that's the one, that's the new technology du jour right now.

You know, I've always been an advocate that you have these national academies right down the street here with members that you can draw upon to basically go in, and advise, and give stuff—people that know a lot more about these subjects than any of us. And I don't—some organizations do it more than others. But I think that the—that that's a resource that FAA and NASA and other agencies don't use enough, in my opinion.

Dr. MESHKATI. The National Academy, I have just one good news, Dr. de Luis. FAA has gone to National Academy, and National Academy has created a panel of, they call it community of experts for risk analysis of transport aircraft. And that one I have the privilege of being a member. We meet over Zoom weekly, and I think it has been great, because FAA has reached out to nuclear power industry for that community of experts, how do they do PRA, probabilistic risk assessment? They do that here.

Back to you, Senator Cantwell, I think that two recommendations that you brought up, 31 and 30, is fantastic. That's exactly that I think in light of this state safety program, if these two be combined together, I think that's going to be a paradigm shift for SMS.

Chair CANTWELL. Well, I think it's pretty simple to get a real SMS. And I think it's a great idea, as we envisioned in ACSAA, to get a panel of experts. I'm glad to see that that is actually happening with the national academies as it relates to this input. I—I don't—we'll have to query the FAA more on exactly how broad that can go.

Dr. Dillinger, I'm going to leave the last question to you, because you know, as—as painful as all this is to me, we can get through it.

And—and I think you were referencing your work on the Columbia. That was also a very painful moment for NASA, very painful moment for this committee. I sat on the oversight investigation of that, that the Committee did in joint session with other Senate committees. So but we did get through that.

What do you think are the lessons learned here? How can you—how can we successfully move past this and onto the success that we want to see in aviation? Because I think the foundation is very strong. We have a great hundred years of aviation success. We

want to build on it. As Dr. de Luis said, we want to be known for the successes that the United States has had in aviation, and I—I think the elements are there. But what—what is it that we need to do to learn from what Columbia learned on how to move forward?

Dr. DILLINGER. Thank you, Senator. That has been my life for decades. I think what we learned from Columbia that's applicable here and was applicable to the report, is how important people are and the relationships between people. That's what the safety culture issues all address.

It's about trust. It's about communication. It's about being there. And having a workforce that comes in that is prepared, that's trained, that's energetic, that's curious, that's dedicated, that will work their heart out, an organization can recover from a catastrophic loss when that's happened, by pulling all of those resources together, and focusing on, then, the mission and how everybody works toward the mission to make that happen.

But to do that, all of those parts, including the processes, have to come together with safety as a priority, where people understand that it's just part of doing business. It's—Bryan O'Connor, the former chief of safety for NASA, used to talk about, "Safety isn't the mission, it's how we do the mission." And that's a critical lesson learned for us.

Chair CANTWELL. Thank you.

Well, I want to thank the witnesses again today. You'll—the record will remain open until May 15. Any Senators wishing to submit questions for the record should do so by May 1. And we ask responses be returned by May 15.

That concludes our hearing today.

And again, thank you for your report and your willingness to be here today.

We're adjourned.

[Whereupon, at 11:55 a.m., the hearing was adjourned.]

A P P E N D I X

RESPONSE TO WRITTEN QUESTIONS SUBMITTED BY HON. RAPHAEL WARNOCK TO DR. JAVIER DE LUIS

Aviation Workforce Needs

In its report, the Expert Panel noted that many Boeing employees did not demonstrate knowledge of the company-wide safety culture efforts.[1] The report also raises concerns that experienced ODA Unit Members are leaving Boeing and the Federal Aviation Administration (FAA) and not being replaced in a timely fashion.[2] In a March 2024 report on commercial aviation manufacturing, the Government Accountability Office found that many aviation manufacturers are facing difficulty maintaining enough sufficiently skilled workers to meet current production demands.[3] Many manufacturers have lost employees due to layoffs, retirements, and decisions to leave the industry and are facing difficulties in hiring skilled labor to competition for workers, a lack of skilled and experienced labor supply, and labor cost increases.[4]

Question 1. Would a more robust aviation workforce pipeline, including expanded partnerships with academic institutions, improve Boeing's safety culture?

Answer. As noted in the question above, the overall reduction in the experience level of the average worker at Boeing is a factor in establishing and maintaining a safety culture. Partnering with outside organizations, including academic institutions (both traditional and community college-level) in the areas where Boeing has facilities could help increase the number of people applying for jobs, but as we noted in the report, Boeing needs to increase its efforts to retain this workforce once they are in-house and trained. We noted, for example, a recent large exodus of experienced engineers last year due to issues related to pension and retirement funds, which made it economically unfeasible for many to stay without losing a significant portion of their retirement savings. As a result, a large amount of corporate knowledge walked out the door. This could have been avoided with better planning and compensation on the part of Boeing.

Question 2. How would the aviation system benefit from a diverse and representative pipeline of aviation technical experts?

Answer. As noted above, a pipeline is just one of the necessary components. Retention is the other one. Boeing needs to engage with its workers at all levels, both those represented by unions and those that are not, and implement policies that will encourage them to stay at the company for the long term.

Safety Reporting

During its investigation, the ODA Expert Panel observed a disconnect between Boeing's senior management and employees on safety culture, with some employees questioning the effectiveness of the company's safety reporting systems.[5] The report found that managers who oversee employee performance, salaries, and disciplinary actions might also be tasked with investigating safety reports, which may cause some employees to hesitate reporting safety concerns in fear of retaliation.[6] The

[1] *Section 103 Organization Designation Authorizations (ODA) for Transport Airplanes Expert Panel Review Report,* Federal Aviation Administration (Feb. 26, 2024), *https://www.faa.gov/newsroom/review-panels-final-report-organization-designation-authorizations-oda-design-and.*

[2] *Id* at p. 37.

[3] Heather Krause, *Commercial Aviation Manufacturing: Supply Chain Challenges and Actions to Address Them,* Government Accountability Office (Mar. 6, 2024), *https://www.gao.gov/products/gao-24-106493.*

[4] *Id* at p. 19, 21–23.

[5] *Section 103 Organization Designation Authorizations (ODA) for Transport Airplanes Expert Panel Review Report,* Federal Aviation Administration (Feb. 26, 2024), *https://www.faa.gov/newsroom/review-panels-final-report-organization-designation-authorizations-oda-design-and.*

[6] *Id* at p. 32.

Panel also found that Boeing does not have a clear and consistent safety reporting process and employees may lack understanding of which process to use and when.[7] Boeing promotes the Speak Up reporting system as a preferred method of safety reporting for employees, but many employees distrust the anonymity of the system and prefer to report safety issues to their managers.[8] The Expert Panel could not verify, however, whether safety concerns reported to managers are captured and resolved in a systematic way.[9] In addition, the Panel found that safety of flight concerns raised by test pilots during the certification process are not adequately addressed when evaluating aircraft design.[10]

Question 1. Has Boeing failed to establish an effective safety culture?

Answer. The panel found that there are significant shortfalls in Boeing's efforts to establish a safety culture throughout the company. We observed inadequate and confusing implementation of the safety culture principals (Reporting Culture, Just Culture, Flexible Culture, Learning Culture, and Informed Culture). We also found confusing documentation that made it difficult for the typical employee to understand how their job impacts product safety, and how that impact can be measured.

Question 2. What has been the result of Boeing's systemic safety culture failures?

Answer. The result has been two fatal accidents, one near-fatal one (Alaska Air), and multiple safety-related violations with a new one coming to light every few weeks. I think our report showed that it would be a mistake to treat all of these separately, and simply limit our response to fixing whatever the particular issue is for that one particular case (*e.g.,* MCAS, missing bolts, etc). The common cause for all these problems is the lack of focus on product safety over and above the focus on meeting production targets.

Question 3. Would Boeing, and the national airspace system, benefit from more robust oversight from the FAA or independent watchdogs?

Answer. Until Boeing demonstrates that it has fundamentally changed, additional oversight in the form of more inspectors on the factory floor, and more review of submitted designs, is inevitable. The ODA system is one that is built on trust. It will take many years before that trust is restored.

RESPONSE TO WRITTEN QUESTIONS SUBMITTED BY HON. RAPHAEL WARNOCK TO DR. TRACY DILLINGER

Aviation Workforce Needs

In its report, the Expert Panel noted that many Boeing employees did not demonstrate knowledge of the company-wide safety culture efforts.[1] The report also raises concerns that experienced ODA Unit Members are leaving Boeing and the Federal Aviation Administration (FAA) and not being replaced in a timely fashion.[2] In a March 2024 report on commercial aviation manufacturing, the Government Accountability Office found that many aviation manufacturers are facing difficulty maintaining enough sufficiently skilled workers to meet current production demands.[3] Many manufacturers have lost employees due to layoffs, retirements, and decisions to leave the industry and are facing difficulties in hiring skilled labor to competition for workers, a lack of skilled and experienced labor supply, and labor cost increases.[4]

Question 1. Would a more robust aviation workforce pipeline, including expanded partnerships with academic institutions, improve Boeing's safety culture?

Answer. There are people eager to help with strong knowledge and experience in the area of safety culture, and various academic institutions have programs in place devoted to educating people about multiple aspects of aviation industry, including management, leadership, operations, flying, and maintenance. Engagement with these entities could be beneficial to any organization's safety culture.

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[7] *Id* at p. 32.
[8] *Id* at p. 32.
[9] *Id* at p. 33.
[10] *Id* at p. 39.
[1] *Section 103 Organization Designation Authorizations (ODA) for Transport Airplanes Expert Panel Review Report,* Federal Aviation Administration (Feb. 26, 2024), *https://www.faa.gov/newsroom/review-panels-final-report-organization-designation-authorizations-oda-design-and.*
[2] *Id* at p. 37.
[3] Heather Krause, *Commercial Aviation Manufacturing: Supply Chain Challenges and Actions to Address Them,* Government Accountability Office (Mar. 6, 2024), *https://www.gao.gov/products/gao-24-106493.*
[4] *Id* at p. 19, 21–23.

Question 2. How would the aviation system benefit from a diverse and representative pipeline of aviation technical experts?

Answer. The aviation workforce has aged and experienced the attrition predicted years ago, as well as the impacts of the COVID–19 pandemic, leading to people leaving the workforce and creating challenges across the industry. Thus, it is all the more important that the aviation industry have a robust pipeline dedicated to developing technical experts across all of its constituent areas (*e.g.,* air traffic control, human factors, and others).

Safety Reporting

During its investigation, the ODA Expert Panel observed a disconnect between Boeing's senior management and employees on safety culture, with some employees questioning the effectiveness of the company's safety reporting systems.[5] The report found that managers who oversee employee performance, salaries, and disciplinary actions might also be tasked with investigating safety reports, which may cause some employees to hesitate reporting safety concerns in fear of retaliation.[6] The Panel also found that Boeing does not have a clear and consistent safety reporting process and employees may lack understanding of which process to use and when.[7] Boeing promotes the Speak Up reporting system as a preferred method of safety reporting for employees, but many employees distrust the anonymity of the system and prefer to report safety issues to their managers.[8] The Expert Panel could not verify, however, whether safety concerns reported to managers are captured and resolved in a systematic way.[9] In addition, the Panel found that safety of flight concerns raised by test pilots during the certification process are not adequately addressed when evaluating aircraft design.[10]

Question 1. Has Boeing failed to establish an effective safety culture?

Answer. The ODA Expert Panel, of which I was a part, found that in some places, Boeing's safety culture is strong and effective, and in others, it is growing and improving. Other areas require a great deal more attention, education, encouragement, and management engagement.

Question 2. What has been the result of Boeing's systemic safety culture failures?

Answer. The ODA Expert Panel, of which I was a part, discussed potential outcomes of any aviation mishaps attributable to organizational safety culture. The most obvious potential outcome of any safety culture failures, of course, is the loss of life or serious injury, coupled with the resulting impacts to family and friends. Beyond this, such failures could damage the reputation of—and public confidence in—any company involved in aviation mishaps and possibly American aviation generally. This may lead to decreased competitiveness globally, and losses in revenue and stock value from reduced orders of aircraft.

Question 3. Would Boeing, and the national airspace system, benefit from more robust oversight from the FAA or independent watchdogs?

Answer. I would defer to the Federal Aviation Administration (FAA) regarding their level of oversight on the national airspace system.

RESPONSE TO WRITTEN QUESTIONS SUBMITTED BY HON. RAPHAEL WARNOCK TO DR. NAJMEDIN (NAJM) MESHKATI

Aviation Workforce Needs

In its report, the Expert Panel noted that many Boeing employees did not demonstrate knowledge of the company-wide safety culture efforts.[1] The report also raises concerns that experienced ODA Unit Members are leaving Boeing and the Federal Aviation Administration (FAA) and not being replaced in a timely fashion.[2] In a March 2024 report on commercial aviation manufacturing, the Government Accountability Office found that many aviation manufacturers are facing difficulty maintaining enough sufficiently skilled workers to meet current production de-

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[5] *Section 103 Organization Designation Authorizations (ODA) for Transport Airplanes Expert Panel Review Report,* Federal Aviation Administration (Feb. 26, 2024), *https://www.faa.gov/newsroom/review-panels-final-report-organization-designation-authorizations-oda-design-and.*

[6] *Id* at p. 32.

[7] *Id* at p. 32.

[8] *Id* at p. 32.

[9] *Id* at p. 33.

[10] *Id* at p. 39.

[1] *Section 103 Organization Designation Authorizations (ODA) for Transport Airplanes Expert Panel Review Report,* Federal Aviation Administration (Feb. 26, 2024), *https://www.faa.gov/newsroom/review-panels-final-report-organization-designation-authorizations-oda-design-and.*

[2] *Id* at p. 37.

mands.[3] Many manufacturers have lost employees due to layoffs, retirements, and decisions to leave the industry and are facing difficulties in hiring skilled labor to competition for workers, a lack of skilled and experienced labor supply, and labor cost increases.[4]

Question 1. Would a more robust aviation workforce pipeline, including expanded partnerships with academic institutions, improve Boeing's safety culture?

[My response to this and the following questions posed by Senator Raphael Warnock are based on my last four decades of aviation safety-related research and teaching experience. It should *not* necessarily be construed as representative position(s) of the FAA Organization Designation Authorization (ODA) Expert Panel, of which I was a member.]

Answer. A highly-trained, robust aviation workforce that is treated with dignity and respect, whose "perceived equity of rewards" is considered and addressed, and compensated competitively, is essential for achieving and maintaining a healthy safety culture. Engaging in collaborative efforts and forging partnerships with Boeing's labor unions, *e.g.,* the International Association of Machinists (IAM) and the Society of Professional Engineering Employees in Aerospace (SPEEA), will help ensure growth opportunities and sustain the robustness and retention of the workforce.

Boeing has already established a partnership with the Embry-Riddle Aeronautical University by creating the Boeing Center for Aviation and Aerospace Safety. Although this is a step in the right direction, it is not sufficient enough. There are other academic institutions in the country, such as the University of Southern California, Ohio State University, University of Illinois, Purdue University, George Mason University, and the University of North Dakota, with solid research and teaching experience in aviation safety that could (and should) be potential partners with Boeing for workforce development and enhanced professional training.

Moreover, in addition to technical and engineering education provided by the above universities and many other institutions, there have to be context-specific educational efforts to address all "systemic" facets of aviation safety necessary to find and report hazards, the accountable communication to hear and understand reports, and the effective leadership to use hazard reports to inform and motivate organizational change. Each step taught by this type of education builds a safety management system necessary for an organization as large and complex as Boeing to avoid "errors" and reach the technical standards that customers and the flying public deserve.

Question 2. How would the aviation system benefit from a diverse and representative pipeline of aviation technical experts?

Answer. I firmly believe the more diverse the workforce, the better/stronger the workforce. As mentioned before, various aviation training institutions in the country have diverse foci that could (and should) become "feeders" of the aviation system. A prudent approach is to establish an overarching coordinating entity to identify the strategic needs of the aviation industry and align them with the feeding institutions.

Safety Reporting

During its investigation, the ODA Expert Panel observed a disconnect between Boeing's senior management and employees on safety culture, with some employees questioning the effectiveness of the company's safety reporting systems.[5] The report found that managers who oversee employee performance, salaries, and disciplinary actions might also be tasked with investigating safety reports, which may cause some employees to hesitate reporting safety concerns in fear of retaliation.[6] The Panel also found that Boeing does not have a clear and consistent safety reporting process and employees may lack understanding of which process to use and when.[7] Boeing promotes the Speak Up reporting system as a preferred method of safety reporting for employees, but many employees distrust the anonymity of the system and prefer to report safety issues to their managers.[8] The Expert Panel could not

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verify, however, whether safety concerns reported to managers are captured and resolved in a systematic way.[9] In addition, the Panel found that safety of flight concerns raised by test pilots during the certification process are not adequately addressed when evaluating aircraft design.[10]

Question 1. Has Boeing failed to establish an effective safety culture?

Answer. As the FAA ODA Expert Panel reported, Boeing's safety culture suffered from "inadequate and confusing implementation of the five components of a positive safety culture (Reporting Culture, Just Culture, Flexible Culture, Learning Culture, and Informed Culture)." [*Section 103 Organization Designation Authorizations (ODA) for Transport Airplanes Expert Panel Review Report,* Federal Aviation Administration (Feb. 26, 2024), p. 4.]

Question 2. What has been the result of Boeing's systemic safety culture failures?

Answer. As mentioned in my opening statement, I believe that safety culture is the foundation of every process and operation in an organization; it could make or break the system. And as my mentor, Prof James Reason, succinctly put it, "safety culture . . . can affect all elements in a system for good or ill."

Many of Boeing's recent problems, especially how MCAS was designed, developed, deployed, and certified, could primarily be attributed to the failure of Boeing's errored safety culture, which precipitated inadequate (or lack of) attention to human factors considerations. [For justification and further elaboration, refer to the Expert Panel's report, observation #3.6 on human factors and human systems integration (p. 24), Finding #26, and its associated two recommendations, # 49 and #50 (p. 40).]

Question 3. Would Boeing, and the national airspace system, benefit from more robust oversight from the FAA or independent watchdogs?

Answer. More robust FAA oversight is always welcomed. However, the FAA suffers from the same market trends (competitive environment and workforce demographics) as Boeing. Their direct oversight abilities are thus constrained. However, if they were to partner with outside expertise (similar to what was done with the FAA ODA Expert Panel), their ability to see through the corporate veil would be significantly enhanced.

Furthermore, the advancement of new safety-critical technologies, *e.g.,* flight deck automation, and increasing system complexity, which outpace oversight regulatory agencies' capabilities, has posed a serious challenge. This widening gap could have adverse consequences and serious safety-implications for the users, the public, and society. Controlling and regulating the risks of these technologies requires a new mindset and regulatory paradigms, a proactive strategy, and systems thinking. This paradigm should be based on mutual trust between business—technology vendors and their operating companies-and government oversight agencies, in full transparency with clearly delineated lines of authority, responsibility, and accountability.

The burden and onus for the safety of these advanced systems and devices will be increasingly on the shoulders of the industry. The regulatory agencies will have less and less capability and/or influence because of that monotonically increasing widening gap between the exponential advancement of technology and the plateauing or diminishing capabilities of regulatory agencies, such as the FAA. As such, the ultimate "watchdog" of safety for Boeing should emerge internally and empowered by revamping the structure and overhauling the membership of its Board of Directors, who can initiate, nurture, and sustain a healthy safety culture, which is the foundation of everything else.

Boeing's safety culture has eroded over the last twenty years after its merger with McDonnell Douglas, under the direct watch of its leaders and Board of Directors (BoD), who have been complicit in and ultimately responsible for its present problems. Boeing has also suffered from a series of ill-conceived administrative decisions, including reorganization, decentralization, downsizing, and moving its headquarters away from Seattle.

Boeing's corporate governance and perpetually cloned BoD must be overhauled and diversified; its headquarters should be moved back to Seattle, and all the FAA Expert Panel's 53 recommendations should be systematically implemented. The reimagined BoD should include a member from at least one of Boeing's two major unions, the International Association of Machinists (IAM) and the Society of Professional Engineering Employees in Aerospace (SPEEA), who, along with its pilots, make up the backbone of Boeing's workforce.

Other nationally renowned aviation safety-conscious candidates should also seriously be considered for the election to Boeing's BoD and chairing and populating the Board's Aerospace Safety Committee. Examples of two such candidates of national

[9] *Id* at p. 33.
[10] *Id* at p. 39.

stature with unimpeachable credentials include Dr. Javier de Luis and ex-Congressman the Honorable Peter DeFazio.

Dr. de Luis, who lost his sister in a 737 Max Ethiopian crash, has three degrees in engineering and an MS in management, all from MIT, where he also teaches. He has decades of professional experience in the fields of safety, aerospace research and operations, engineering design and analysis, and technology management. He was a FAA Expert Panel member and testified before the Senate Committee on Commerce, Science, and Transportation on Wednesday, April 17, 2024.

Congressman DeFazio, who chaired the U.S. House of Representatives Committee on Transportation and Infrastructure, is intimately familiar with Boeing's missteps in the past. He conducted extensive hearings on Boeing crashes and produced a seminal report, *The Design, Development & Certification of the Boeing 737 Max* (September 2020), known and referred to in the aviation safety community as the "DeFazio Report."

[I have neither been asked nor solicited by the named entities and individuals (FAA Expert Panel, IAM, SEEPA, Dr. de Luis, and Mr. DeFazio). This recommendation for revamping Boeing's BoD is entirely based on my professional experience and observations.]

Finally, another "independent" layer of technical support and oversight that could significantly help *both* Boeing and the FAA to ensure and advance aviation safety in the future could be the establishment of the specialized "Aviation Research Program" at the National Academies of Sciences, Engineering, and Medicine (NASEM), to be modeled after the exemplary Gulf Research Program (GRP). In the aftermath of the Deepwater Horizon accident in 2010, a criminal settlement agreement led to the creation of the GRP at the NASEM in 2013. The agreement set aside $500 million in penalties for an endowment at the National Academy of Sciences to "carry out studies, projects, and other activities" focused on offshore energy safety, human health, and environmental protection in the Gulf of Mexico and along the U.S. Outer Continental Shelf.

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