



Testimony of

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– On –

“Addressing Close Calls to Improve Aviation Safety”

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Good morning, Chair Duckworth, Ranking Member Moran, and members of the Subcommittee. Thank you for inviting the National Transportation Safety Board (NTSB) to testify before you today regarding the need to address close calls to improve aviation safety.

As you know, the NTSB is an independent federal agency charged by Congress with investigating every civil aviation accident in the United States and significant events in other modes of transportation—railroad, transit, highway, marine, pipeline, and commercial space. We determine the probable causes of the accidents and events we investigate, and issue safety recommendations aimed at preventing future occurrences. In addition, we conduct transportation safety research studies and offer information and other assistance to family members and survivors for each accident or event we investigate. We also serve as the appellate authority for enforcement actions involving aviation and mariner certificates issued by the Federal Aviation Administration (FAA) and the US Coast Guard, and we adjudicate appeals of civil penalty actions taken by the FAA.

The NTSB does not have authority to promulgate operating standards, nor do we certificate organizations, individuals, or equipment. Instead, we advance safety through our investigations and recommendations, which are issued to any entity that can improve safety. Our goal is to identify issues and advocate for safety improvements that, if implemented, would prevent injuries and save lives.

When it comes to aviation, over the last several decades, the critical efforts of operators, manufacturers, labor unions, private aircraft owners and pilots, the FAA, Congress, and the NTSB have led to significant advances in technology and important legislative and regulatory changes that have contributed to the current level of aviation safety. These efforts, many of which have been in response to the lessons learned from NTSB investigations, should serve as an example for a collaborative approach to safety in other modes of transportation.

Let's be clear that aviation is still among the safest modes of transportation for the travelling public.

Since 2010, the US aviation system has experienced a record level of safety, as the number of deaths associated with US civil aviation accidents decreased from 541 in 2009 to, according to our preliminary numbers, 357 in 2022—a decrease of over one-third (see attachment). Approximately 95 percent of aviation fatalities in 2022 occurred in general aviation accidents, with almost all the remainder (19 total) in Title 14 *Code of Federal Regulations* Part 135 commuter and on-demand operations, which include charters, air taxis, air tours, and air medical services flights (when a patient or medical personnel are on board).

However, we cannot become complacent. As recent news on runway incursions, near misses, and other serious safety incidents have made increasingly clear, the current moment is both challenging and pivotal in the realm of aviation safety. The number of runway incursion incidents classified as the most serious by the FAA varies from year to year; the trend, however, is not going in the right direction. The concerning uptick in such incidents is a clear warning sign that the US aviation system is sharply strained.

In the wake of the pandemic, we're experiencing a massive resurgence of air traffic. We're also seeing staffing shortages; fatigue; distraction; deviations from Federal Aviation Regulations; and a lack of meaningful, value added training as the FAA and industry rely more and more on computer-based training and the issuance of bulletins as substitutes for hands-on training. We're also seeing a lack of redundancy around technology to prevent runway incursions and wrong surface landings. Redundancy is the foundation of our stellar safety record, but the aviation workforce is without a technological safety net.

Meanwhile, our airspace—already the most complex in the world—is about to become even more congested as drones, advanced air mobility, and commercial space launches and reentries increase. New fuels are on the horizon, including zero-emission and hydrogen aircraft, as well, and more and more lithium-ion batteries are being transported on cargo planes.

We cannot ignore or avoid the warning signs of strain from all these recent events. We cannot rest on our laurels and assume our safety record will maintain itself. We cannot wait until a fatal accident forces action. We must act *before* there is a tragedy.

NTSB's Longstanding Concerns with Runway Incursions

Since 1973, the NTSB has issued numerous safety recommendations to prevent runway incursions and other airport surface incidents.

On May 6, 1986, the Board published a Special Investigation Report, titled "Runway Incursions at Controlled Airports in the United States" and issued 14 recommendations to the FAA.¹ We also re-classified one recommendation as "Open - Unacceptable Action" and reiterated four previous recommendations.

In 1990, the Board placed airport runway incursions on its first Most Wanted List of Transportation Safety Improvements (MWL); the issue remained on the MWL year after year, in some form, until as recently as 2013, and continues to be of great concern to NTSB.

¹ [SIR8601.pdf \(ntsb.gov\)](#)

In 2000, the Board sent a letter to the FAA with six additional safety recommendations to prevent runway incursions. One of the six recommendations urged FAA to require – at all airports with scheduled passenger service – a ground movement safety system that will prevent runway incursions; the system should provide a direct warning capability to flight crews. In addition, we recommended that the FAA demonstrate through computer simulations or other means that the system will, in fact, prevent incursions (A-00-66). That recommendation remains our oldest “open” recommendation to FAA related to runway incursions; meaning, the FAA has not taken acceptable action on it.

In September 2017, nearly three months after Air Canada Flight 759 lined up to land on an active taxiway at San Francisco International Airport and overflew four airplanes, the Board held a forum on runway incursion safety issues. And in May 2023, we held a roundtable on runway incursions and wrong surface landings. As a result of that roundtable, we plan to hold three additional public meetings focused on mental health care in aviation, technology, and workforce training and development.

In my testimony today, I want to detail some of the NTSB’s current investigations into runway incursions, wrong surface landings, and related incidents, discuss available technologies for reducing and avoiding these types of incidents, and address further work that needs to be done to implement even just a few of the NTSB’s nearly 300 open aviation recommendations.² Specifically, I want to highlight the need for more technology for runway and cockpit alerting. I also want to revisit ongoing concerns related to the air traffic control (ATC) workforce and efforts to right-size that workforce, and issues related to other aviation industry workers.

Finally, I would be remiss if I did not take this opportunity to address the importance of right-sizing the NTSB itself and ensuring we can continue to successfully investigate these near-miss aviation incidents—and many other safety incidents—in our national transportation system to promote lessons learned and help keep our skies and the travelling public safe.

NTSB Incident Investigations

The NTSB’s Office of Aviation Safety currently has six particularly relevant investigations open into runway incursion events that occurred this year.

- On January 13, 2023, an American Airlines 777 crossed an active runway at JFK without clearance, causing a Delta 737 to abort takeoff. The two aircraft came within 1,400 feet of each other, putting 308 lives at risk.

² A report of all [currently open safety recommendations](#) related to aviation is available via the CAROL query tool on our website.

- On January 23, 2023, a United Airlines flight at Inouye International Airport in Hawaii crossed the same runway where a Kamaka Air flight was landing. The aircraft came within 1,173 feet of each other, putting 303 lives at risk.
- On February 4, 2023, a Southwest passenger jet and a FedEx cargo plane were less than 200 feet from colliding at Austin-Bergstrom International Airport in Texas, putting 131 people in danger.
- On February 16, 2023, in Sarasota, Florida, an Air Canada Rouge A-321 was cleared for takeoff from the same runway where an American Airlines B-737 was cleared to land. The two planes came within 3,168 feet of each other, putting 372 lives at risk.
- On February 22, 2023, in Burbank, California, a Mesa Airlines jet initiated a go-around while a SkyWest jet was still departing the runway. The two planes came within 300 feet of each other, putting 118 lives at risk.
- On August 11, 2023, a Cessna business jet and a Southwest Airlines flight came close to colliding at San Diego International Airport. The planes were about 100 feet from each other, putting at least 117 lives at risk.

We are also investigating a recent collision that occurred on October 24, 2023, in which a Hawker 850XP airplane collided with a Cessna 510 airplane at William P. Hobby International Airport in Houston, Texas. Preliminary information indicates that the tower controller had instructed the crew of the Hawker to line up and wait, but the Hawker started a takeoff roll and its wing collided with the tail of the Cessna, which had landed on an intersecting runway. Luckily, no injuries were reported to any of the four people on the Cessna or to the three people on the Hawker.

In addition to our open investigations, we recently published final investigation reports on a close call this year in Boston,³ as well as two wrong-surface landing events last year—one in Tulsa⁴ and one in Pittsburgh.⁵

³ National Transportation Safety Board. *Aviation Investigation Final Report for DCA23LA192*. Washington, DC: NTSB 2023.

⁴ National Transportation Safety Board. *Aviation Investigation Final Report for DCA22LA126*. Washington, DC: NTSB 2023.

⁵ National Transportation Safety Board. *Aviation Investigation Final Report for DCA22LA133*. Washington, DC: NTSB 2023.

In Boston, Massachusetts, on February 27, 2023, at Boston Logan International Airport, a JetBlue flight initiated a go-around after a Hop-a-Jet flight took off without clearance on an intersecting runway. The planes came within 400 feet of each other.

In Tulsa, Oklahoma, on June 8, 2022, FedEx flight 1170 landed on the wrong runway at Tulsa International Airport. The captain and first officer were not injured, and the aircraft was not damaged. The flight was cleared for a visual approach and landing on runway 18L; however, the airplane landed on runway 18R. The airplane was operated as a Part 121 cargo flight from Fort Worth Alliance Airport in Fort Worth, Texas.

In Pittsburgh, Pennsylvania, on June 21, 2022, United Airlines flight 2627 was cleared for a visual approach and landing on runway 28C at the Pittsburgh International Airport, but instead lined up with and landed on runway 28L. None of the 174 occupants aboard the airplane were injured and the aircraft was not damaged. The regularly scheduled passenger flight was operating under the provisions of Part 121 from the Chicago O'Hare International Airport. The airplane was equipped with a runway awareness and advisory system, or RAAS, but the operator did not select the option to provide crews with an aural alert for the runway that the airplane would be approaching in flight. If the operator had selected this option, the system would have alerted the incident flight crew that the airplane was aligned with a runway that was not consistent with the landing clearance provided by ATC.

Finally, it is also worth recalling one other incident. On July 7, 2017, Air Canada flight 759 was cleared to land on runway 28R at San Francisco International Airport, but instead lined up on a parallel taxiway where four air carrier airplanes were awaiting takeoff clearance.⁶ The flight 759 crew initiated a go-around and reached a minimum altitude of about 60 feet, overflying the second airplane on the taxiway before starting to climb.

Alarming as they are, events like these are incredibly rare. Of the nearly 55 million airport operations in FY 2023, there have been 23 category A and B runway incursions, which are the most serious, up from 16 category A and B runway incursions in FY 2022. And while the rate of all incursions (categories A through E) seems to have slightly improved from 32.98 per million airport operations in FY 2022 to 32.22 in FY 2023, some important nuance is lost by reading too much into this improvement. In fact, the rate of category A and B runway incursions has increased from 0.3050 per million airport operations in FY 2022 to 0.4220 per million airport operations in FY 2023.

⁶ National Transportation Safety Board. [Taxiway Overflight Air Canada Flight 759 Airbus A320-211, C-FKCK](#). Washington, DC: NTSB.

While aviation is still incredibly safe, and commercial aviation is the safest mode of transportation by far, it only takes one missed warning or incorrect response to a warning to become a tragedy and destroy public confidence in our system.

At the NTSB, we are incredibly careful to gather all the facts and evidence of a given incident before drawing conclusions or making safety recommendations. I will not undermine the meticulous work of our skilled investigators by drawing premature conclusions about ongoing investigations. Much more will be known when these investigations are completed.

In the past, for flight crews, we've cited operational errors, deviations from Federal Aviation Regulations, expectation or continuation bias, communication problems, such as misunderstanding clearances or inadvertent entry of a runway because of disorientation from runway and taxiway markings on airport surfaces, inadequate infrastructure or signage, and lack of technologies that can provide redundancy.

For controllers, we've cited staffing shortages which lead to scheduling issues and fatigue, lack of or deficient supervisory oversight, distraction, ineffective scanning, lack of meaningful, value-added training, and lack of technologies that can provide redundancy. Many runway incursions we've investigated are a combination of flight crew and controller factors. Again, these encompass many of the issues we've seen in the past. For now, however, there are a number of points we can consider.

First, trends around these most serious surface incidents and other near misses are not moving in the right direction, and we must respond to these incidents seriously. Any one of these near misses could have been a devastating tragedy. Any one of them could have meant lives lost. The current uptick in these events, and the recent incident in Houston, especially, in which two business jets actually made contact at non-taxi speeds on intersecting runways, should be an unambiguous warning to us all. We must not only continue to draw attention to this issue, but we must make substantive changes at airports across the country so we can maintain the country's strong aviation safety record.

Second, in connection with the above investigations that have already been completed and with prior investigations, the NTSB has made several safety recommendations to the FAA intended to prevent near-miss events. Some of those recommendations have been outstanding for many years without action, and include recommendations on ATC technology, direct flight crew warnings and cockpit alerting, and 25-hour cockpit voice recorders (CVRs).

Finally, the NTSB has found in our investigations of accidents that an effective means for managing and mitigating risks in an aviation operation is the use of a safety management system, or SMS. SMS is a formal, top-down, business-like approach to managing safety risk.

Air Traffic Control Technology

One set of outstanding NTSB safety recommendations involves airport surface surveillance technology, which is a powerful tool to boost situational awareness at airports. The NTSB has recommended increased installation and use of such technology to strengthen runway safety for decades, with our oldest open recommendation on the subject issued to the FAA 23 years ago ([Safety Recommendation A-00-66](#)). And yet, today, airport surface surveillance technology exists at just 43 airports across the country.

Airport Surface Detection Equipment–Model X, or ASDE-X, uses ground radar and other electronic technology to allow air traffic controllers to track surface movement of aircraft and vehicles. It was developed to help reduce critical runway incursions. ASDE-X alerts air traffic controllers of potential runway conflicts by providing detailed coverage of movement on runways and taxiways. According to the FAA, of the approximately 450 US airports with scheduled passenger service, ASDE-X is available at only 35 major airports across the country.

Airport Surface Surveillance Capability, or ASSC, is another system the FAA has developed for runway surface surveillance. It uses Automatic Dependent Surveillance-Broadcast, or ADS-B, data from aircraft to help inform ATC towers of aircraft positions; however, according to the FAA, ASSC is operational at only eight airports across the country (a ninth will be implemented at Joint Base Andrews over the next few years).

Of the runway incursions I mentioned earlier, ASDE-X alerted ATC of an impending collision in three cases: JFK, Boston, and San Diego. ASDE-X also alerted ATC before the runway collision in Houston. All but two of the category A and B incursions from FY 2022 happened at airports that either did not have surface surveillance technology or where the systems were not operational at the time of the incident.

It's clear that more airports across the country installing more of this technology, which was specifically designed to help prevent runway incursions, would dramatically improve safety. Getting lifesaving technology at more of the nation's airports is an essential goal, but it is one that will require significant investment from Congress.

Direct Flight Crew Warnings and Cockpit Alerting

As valuable as they are, ASDE-X and ASSC only warn the ATC tower of impending risks and do not provide the direct cockpit warning to pilots that we have long recommended. In 2000, we recommended that the FAA develop a runway safety

system that provides a *direct flight crew warning* of runway collision risk, similar to what traffic collision avoidance systems (which can be integrated directly into the pilot's navigation display) provide to pilots to avoid a midair collision ([Safety Recommendation A-00-66](#)). The Houston air traffic controller, for example, tried to get the Hawker pilot to stop on the runway, but during interviews after the event, the Hawker pilot stated he did not hear the controller's call. It may be that a direct flight crew warning would have helped avoid this collision.

The FAA has developed runway status lights (RWSL) to provide a direct warning capability to flight crews, but for only one type of runway collision risk. For example, RWSL likely would not warn pilots of the risk of one airplane landing on a runway while another airplane was taking off. As a result, the NTSB does not believe that the FAA's actions to date represent a full response to our 23-year-old recommendation (mentioned earlier in this testimony).

We continue to urge the FAA to require a system that provides direct warning capability to flight crews at all airports with scheduled passenger service, and to collaborate with aircraft and avionics manufacturers and software developers to create the technology for a cockpit system that directly alerts pilots when an airplane is not aligned with the intended runway surface. Such a system would have prevented the 2017 Air Canada overflight at San Francisco International Airport.

Twenty-Five Hour CVR Recommendation

In conjunction with our investigations into runway incursions and many other safety incidents, the NTSB has long been concerned about current FAA requirements for CVRs. Current FAA regulations require 2-hour CVR recording capability and provide guidance to the flight crew on how to safeguard CVR data after an accident or incident. Despite this, valuable CVR data continues to be overwritten and therefore unavailable for safety investigations, as happened in the 2017 incident in San Francisco, the recent runway incursion incident involving two Part 121 operators at John F. Kennedy International Airport in New York, and at least 12 other investigations since 2018. Our ongoing experience with overwritten CVR recordings demonstrates the limitations of the current 2-hour recording requirement, particularly in cases where relevant data were overwritten due to the following:

- a delay in reporting a safety event that was not immediately recognized to be of a serious nature until further data review
- a failure to immediately deactivate the CVR following arrival after a safety event
- the time remaining in the flight after a safety event, which exceeded the CVR's 2-hour recording duration

As a result of these concerns, in 2018, we issued recommendations to the FAA to address the need to install CVRs with a minimum 25-hour recording capability on all newly manufactured airplanes required to have a CVR, and to retrofit the CVRs on existing aircraft required to have flight recorders.⁷ Newly manufactured airliners flying in Europe are already using 25-hour CVRs, following International Civil Aviation Organization standards.

We are very pleased with the FAA's March announcement that it was initiating rulemaking to require all newly manufactured airplanes that must have a CVR be fitted with one with a 25-hour recording capacity. For existing in-service airliners, the FAA told us it was starting an Aviation Rulemaking Committee to discuss the NTSB's recommendations. We are concerned the proposed rulemaking does not address existing aircraft, and, 8 months after the FAA said it initiated rulemaking, a notice of proposed rulemaking has not been published.

Air Traffic Controller Workforce and Training

When air traffic controllers signed up to serve on the frontlines of aviation safety, they knew they were choosing one of the most safety-critical jobs in transportation. Air traffic controllers are currently operating at dangerously low staffing levels. They are working mandatory overtime week after week, year after year, leading to fatigue and burnout, family stress, and work stress. We are putting the psychological stress of the entire aviation safety system on the shoulders of our ATC workforce, and this is unacceptable.

When it comes to recent, high-profile aviation incidents, errors by ATC, flight crews, or ground personnel are sometimes cited as a contributing factor, but only 3 of the nation's 313 air traffic facilities (4 percent) have enough controllers to meet targets set by the FAA and the National Air Traffic Controllers Association (NATCA). Both the pandemic and significant retirements have combined to make an already too-small workforce even smaller and less experienced.

The ATC staffing shortage has had a snowball effect in that we are seeing scheduling practices that have resulted in more fatigue, distraction, and lack of or deficient supervisory oversight,

The last time the NTSB issued recommendations on air traffic controller fatigue was in 2007 (Safety Recommendations [A-07-30](#) and [-31](#) to the FAA, and Safety Recommendation [A-07-32](#) to NATCA), and what we said then is just as true today: controller fatigue decreases aviation safety. The more than 170 fatigue-related safety recommendations that the NTSB has issued as far back as 1989 have addressed topics such as the adequacy of rest periods, scheduling practices, fatigue awareness

⁷ National Transportation Safety Board. *Extended Duration Cockpit Voice Recorders*. Rpt. No. ASR-18/04. Washington, DC: NTSB 2018.

training, and hours-of-service regulations. Even earlier, the NTSB addressed controller fatigue in a 1981 special investigation report on the nation's ATC system. Citing extended work schedules among controllers in the aftermath of the 1981 strike, the NTSB issued Safety Recommendation A-81-145, which recommended that the FAA establish and implement a program to detect the onset of, and to alleviate, controller fatigue and stress. This recommendation was superseded by two more specific recommendations from the Board's 1983 follow-up study of the ATC system. Safety Recommendation A-83-35 urged the FAA to disseminate guidelines for controller stress and fatigue detection and management, and Safety Recommendation A-83-36 asked the FAA to expedite the development and implementation of a controller performance assessment program that would include attention to stress and fatigue.

In developing fatigue risk management practices for air traffic controllers in response to our 2007 recommendations, the FAA encountered problems due to staffing shortages. In some cases, air traffic managers were unable to keep their facilities staffed during operating hours because staffing shortages made it difficult or impossible to assign controllers whose work schedules complied with the fatigue guidelines. These struggles have continued in the years since these recommendations, and evidence from our investigations into runway incursions continues to highlight the impact fatigue can have on controller performance.

The good news is that we know what we need to do to change this dangerous status quo. We need adequate staffing, quality training (including tower simulator training), and significant investments in more of lifesaving technologies I have already discussed, and the funding to make all three of those possible. The FAA is making strides in hiring and training, but the possibility of a government shutdown or flat funding and sequester threatens to pause or undo significant progress.

To be clear, these kinds of problems are not just limited to our ATC workforce. They permeate the entirety of our aviation workforce. At the NTSB's recent event on runway incursions, workers throughout aviation—pilots, mechanics, air traffic controllers, ramp agents, and others—reported dire needs. In fact, pilot fatigue was cited as a contributing cause of the June 2022 FedEx wrong surface landing at Tulsa International Airport. It's important to mention that cargo carriers are currently exempt from federal regulations governing flight and duty time (known as the cargo carveout), which the NTSB strongly opposes. Maintaining the safety of our aviation system means supporting every corner of the aviation workforce.

Safety Management Systems

SMS is a formal, top-down, business-like approach to managing safety risk. It gathers data from routine operations that indicate a risk, but did not result in an accident, injury, or major loss. By looking at these indicators of a safety risk, and developing mitigations *before* an accident happens, and ensuring that the mitigations have been effective, an SMS is an effective tool to increase safety. An SMS

may have highlighted examples of the miscommunications that were involved in the many of the runway safety events we have investigated, or problems with warnings not heard by the flight crew in the Tulsa event. By looking into these occurrences and developing mitigations before lives are lost an SMS is an effective management tool to increase safety.

The NTSB's Role in Maintaining Safety

I would be remiss if I did not take this opportunity to mention the needs of the NTSB itself. All the investigations I have discussed today—all the careful analysis and safety recommendations, and the material benefits they bring to the flying public—would not be possible without the NTSB's meticulous and expert investigators.

The purpose of our aviation investigations is to find safety issues and identify trends that must be addressed to improve aviation safety, as well as to provide information to the flying community and the public about lessons learned.

Our current authorization expired at the end of FY 2022, and earlier this year, we transmitted a reauthorization proposal to Congress, requesting resources and hiring flexibility to increase the number of investigators throughout the agency.⁸ I am happy to report that, over the last 2 years, we have already made great progress toward our goals to ensure that our employees have the right skill set, staffing up to our highest level since 2017 to 444 people on November 6, 2023. In FY 2023, we hired 71 people, the highest number in 10 years. Our reauthorization proposal anticipates adding roughly 15 new employees per year through 2027, in addition to filling the vacancies that will occur through retirements and separations.

Since February of 2022, we have significantly reduced the backlog of investigations open for more than 2 years from 442 to zero as of September 27, 2023, by filling open investigative and technical review positions, reassigning investigations that could be expedited, using reemployed annuitants to broaden the pool of report reviewers in the short-term, enhancing employee performance standards, and developing quality metrics and a means to track them for all investigations.

We cannot keep up the momentum and continue to serve as the global gold standard of aviation investigations without investment. The fact is, we've had the same level of staffing and nearly the same level of funding for almost two decades. Yet we have more complex investigations and government mandates to fulfill. That is why I have advocated strongly for increased authorization levels and increased appropriations to NTSB in FY24 and beyond. The President's budget request seeks \$145 million in FY24, and NTSB is grateful that the House THUD appropriations bill matched that funding level coming out of committee. I urge the Senate to match that level in its negotiations with the House chamber.

⁸ [National Transportation Safety Board Draft Reauthorization Act of 2023](#). Washington, DC: NTSB.

I also urge this committee to consider NTSB reauthorization as you move forward expeditiously on your FAA reauthorization legislation. I look forward to working with you on legislation that will allow us to hire professionals with the needed skills, purchase the equipment necessary for those skilled professionals to do their jobs, and invest in staff training and development. Our workforce is our greatest asset and is essential to our mission to make transportation safer and to maintain our status as a leader in safety—both at home and internationally.

Conclusion

Again, thank you for the opportunity to discuss these critical aviation safety issues and the NTSB's perspectives and recommendations with the committee today. We believe strongly that continued vigilance and investment are needed in our aviation system. We recognize the progress that has been made; yet there will always be room for improvement. We stand ready to work with the committee to continue improving aviation safety, which includes ensuring that the NTSB has the resources needed to carry out our essential mission.

I am happy to answer your questions.