

THE NTSB FINAL REPORT ON THE DCA MIDAIR COLLISION

HEARING

BEFORE THE

COMMITTEE ON COMMERCE,
SCIENCE, AND TRANSPORTATION
UNITED STATES SENATE

ONE HUNDRED NINETEENTH CONGRESS

SECOND SESSION

FEBRUARY 12, 2026

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SENATE COMMITTEE ON COMMERCE, SCIENCE, AND TRANSPORTATION

ONE HUNDRED NINETEENTH CONGRESS

SECOND SESSION

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THURSDAY, FEBRUARY 12, 2026

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

The Committee met, pursuant to notice, at 10:17 a.m., in room SR-253, Russell Senate Office Building, Hon. Ted Cruz, Chairman of the Committee, presiding.

Present: Senators Cruz [presiding], Wicker, Fischer, Moran, Sullivan, Blackburn, Budd, Sheehy, Lummis, Cantwell, Klobuchar, Markey, Duckworth, Luján, and Fetterman.

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

The CHAIRMAN. Good morning. The Senate Committee on Commerce, Science, and Transportation will come to order.

Before I begin my opening statement, today marks the 17th anniversary of the Colgan Air Flight 3407 accident in New York. We remember the 50 lives lost as we somberly meet to discuss another deadly aviation accident.

Aviation safety relies on the Swiss cheese model to mitigate and manage risk. Layers upon layers of human intervention and technology are meant to close any vulnerabilities or figurative holes left by the previous layer. Unfortunately, just over 1 year ago, that safety system failed just 3 miles from here at Ronald Reagan Washington National Airport. For more than 15 years, pilots, controllers, and reams of aviation data detected at least one near mid-air collision each and every month at National Airport.

In 2013, after a helicopter and plane on approach to DCA nearly crashed into each other, controllers and helicopter operators formed a working group to improve coordination in the local airspace. That group met often, and at some point, even elevated recommendations to revise and improve mapped flight routes to show known hotspots, but their suggestions were ignored. That's one of the many failures uncovered by the NTSB that, had people responded differently, tragedy would have been avoided last year.

I want to commend NTSB Chairwoman Jennifer Homendy and all of the NTSB staff for their efforts. They did yeoman's work to complete the DCA crash investigation in just 12 months. In addition to examining the causes of the DCA accident, the NTSB made 50 recommendations to improve aviation safety. One of those recommendations, arguably the most impactful one, should be famil-

iar. For the 18th time, let me repeat that, for the 18th time, the NTSB is urging aircraft in busy airspace to have ADS-B on board.

Had the Black Hawk and Bombardier CRJ been equipped to receive ADS-B location signals on January 29, 2025, the pilots would have been warned of each other's exact position nearly one minute before impact, and 67 people would still be alive today. Instead, the CRJ's pilots didn't see the helicopter until a split second before impact, while the helicopter crew, it appears, never saw the CRJ.

The NTSB review revealed another major safety loophole. Military aircraft were routinely ignoring rules that required aircraft flying in busy airspace to transmit ADS-B signals. Although planes don't share locations with each other via ADS-B, they must broadcast such information to air traffic control, but the Army uses a special carve-out so that it didn't have to consistently comply with the broadcast mandate. Moreover, the NTSB discovered that this particular helicopter's ADS-B Out wasn't even configured correctly. After the January crash, the FAA eliminated the military's blanket exemption, but just a few weeks ago, a brand-new loophole was tucked into the annual Defense Authorization Bill, making it easier for the military to continue flying without ADS-B around DCA.

If we learned anything from the DCA crash, it's that you can't have a safe airspace when operators are following different sets of rules. That's why our committee authored and passed the bipartisan ROTOR Act. The ROTOR Act, which passed the Senate unanimously in December, rescinds that new Defense bill loophole and enacts the central NTSB recommendation of this investigation.

The ROTOR Act requires all aircraft in congested airspace to broadcast their location to each other via ADS-B. The ROTOR Act ensures a commercial airliner landing in a major airport has visibility, in daytime or darkness, to any nearby aircraft, whether it's a military helicopter or a general aviation pilot, and vice versa. No more flying blind. The ROTOR Act will begin to protect the flying public now, which is why the House should pass it, and put it on the President's desk for his signature.

Now, I've heard some faint grumbling from stakeholders and others who want to put the same kind of loopholes into the ROTOR Act that caused the DCA crash. Some want exemptions for private jets, while a few airlines quietly carp about the cost of safety-enhancing technology. These criticisms aren't valid, and they are, frankly, disturbing. Flying can only be safe when everybody follows the same standards. Why would we want to exempt regional airlines from ADS-B given that Flight 5342 was a regional airline?

I hope my House colleagues don't wait for another accident or for the NTSB to have to come back and recommend ADS-B for the 19th time before acting. And the notion that somehow private jets should receive a blanket exception makes no sense whatsoever. I don't know how anyone can look in the eyes of the victims' families and justify that argument. I also hope the House doesn't try to resolve the dozens of other safety recommendations from the NTSB, because we know this particular one on ADS-B can start now and save lives.

Today, there are planes taking off from Ronald Reagan National Airport. Today, there are planes landing at Ronald Reagan National Airport. There are planes that may have your loved ones on

them or my loved ones on them, and every single day we delay we are putting our families in danger for no reason whatsoever.

In the room with us today, are loved ones of the 67 men, women, and children who were killed in last January's crash. I'm encouraged and inspired by your tireless advocacy for safer skies. It pains all of us to know that your lives have been irreparably changed. There's nothing we can do to bring back your spouses, your children, your parents, your cousins, or your friends, but I hope that we can turn your grief into action. Thank you for working so hard to make sure that no other family has to suffer the kind of tragedy that you're feeling, the pain of each and every day.

I now turn to Ranking Member Cantwell.

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

Senator CANTWELL. Thank you, Mr. Chairman, and this is a very important hearing this morning. I feel like it's almost a culmination of years to finally get a report so crisp and clear about the failures of the FAA, and what it needs to do to change its culture.

I, too, want to remind and remember the individuals here about the Colgan Air crash. Our heart still goes out to the families affected by that incident, including people from Seattle. I also want to say that the Colgan families have been a constant presence in this room, and while that is not the way the political system is supposed to work, where the victims have to come and be the biggest advocates for safety, that is certainly what the Colgan Air families have done. So, we certainly remember them today.

And I want to also just say, Mr. Chairman, that yesterday's incident at El Paso reminds me of why this interagency coordination is so important. If we can get into this kind of conflict where the FAA is saying that we're going to shut down airspace for 10 days, and then another agency is saying something different, and there's concern about what is happening in the airspace, it just seems to me that we have a real problem of coordination between DOD and FAA, so we need to resolve that. I hope that your calls for an interagency briefing will be heeded, and that we will get to the bottom of this. Not one more day needs to go by without that kind of information and oversight for the public.

But we are here today to thank Chair Homendy and the NTSB, and to thank them for their recommendations and findings after a thorough, long investigation into the tragic crash in DCA last year. The loss of 67 souls when an Army helicopter collided with American Airlines 5342 has weighed heavily on many of us, but certainly the families who are most affected. Our hearts go out to you.

Many of the family members are here today, and I know they will be following today's discussion very closely. You have stood with us to make our aviation system safer, including your support for the ROTOR Act, which was critical in trying to push this legislation through the U.S. Senate, and, hopefully, to get it to the President's desk.

I want to thank Chair Homendy again for her work with her team tirelessly delivering answers to these families. I know that you deliver a lot of answers and information to us. I think no one knows how hard that is in delivering the information to the fami-

lies. I know from our own air accidents with the seaplane in Seattle, how trying to find the victims of that crash, there's just so much work that goes into communicating with the families, and so we thank you for that as well. These answers demonstrate that this tragedy was a result of many systematic failures and that that failed everyone on Flight 5342, and the Army helicopters, and the air traffic controllers. And so, this is part of a larger trend where we have to be the ones that put a stop to this finally.

We have witnessed multiple near misses between commercial airline flights and military flights, including a helicopter flying too close to DCA traffic last May, exposing communication failures between the Pentagon air traffic control tower and the DC tower, and a near mid-air collision between an Air Force tanker and JetBlue flying from Curacao back to the United States.

These incidents are just unacceptable. So, we look forward to the 14 recommendations that you are making today, especially the issue of NTSB and the larger FAA reforms. I am concerned that the NTSB found that the FAA and Army are dangerously over-reliant on pilots to see-and-avoid. How can a congested airspace rely on see-and-avoid other traffic around the National Capital Region?

The NTSB found these practices created an unacceptable risk, especially without the help of a key safety technology that we've already implemented in so many other aspects of our airspace: ADS-B In and ADS-B Out. NTSB has also emphasized having TCAS is not enough. Not enough. The CRJ pilots did not get air traffic alerts at lower altitudes below 900 feet, and pilot alerts are more limited if ADS-B In data is not feeding into the system.

Last week, the NTSB issued their 18th recommendation in 20 years on this type of technology: ADS-B In and Out. That basically is the alert system that we expected in the digital age to be implemented 20 years ago. So, recommending that all aircraft are required to fly in a controlled airspace with this to ensure pilots have real-time awareness and traffic alerts both in the air and on the ground is just the last piece of an aviation safety system safeguard that has been recommended for years, and the question is why hasn't someone been doing it?

Money cannot be the answer because the cost of lives has been too great. The bipartisan ROTOR Act also is key in the NTSB recommendations and it will help to save and strengthen the oversight. NTSB reinforced that the FAA and Army had access to safety data in years leading up to the crash that warned of heightened risk of mid-air collisions in D.C., but the FAA failed to act on that, as did the Army.

So, NTSB's investigation of the DCA collision and the Air Alaska door plug accident showed that the FAA's Safety Management System has been superficial at best. While the FAA has mandated SMS, a Safety Management System, which means when you have a safety problem, you have to stop and fix it, that's all that safety management system means. It means you have to stop and fix it. It means don't keep going on production, don't keep going on your system until you fix the safety risk. But if you don't have a real SMS, then it really doesn't stop to fix the safety concerns.

That is why the legislation we passed this morning is a start. We will hear from experts about why the FAA needs to do this, similar

to the expert witnesses that provided us so much information about the MAX crashes. With the Committee's vote on this today, I think we are one step closer, and we certainly know that controllers who voiced safety concerns about helicopter routes and stressful controller workloads were also ignored by FAA managers. So, we have to fix this as well.

Mr. Chairman, I stand ready to work with you on getting the ROTOR Act onto the President's desk. This is critical legislation that will help now, and we also have more work to do because this sequence of events and the events at El Paso show us that we have real communication issues, and we must do our oversight role. So, thank you, Mr. Chairman, and I look forward to Chair Homendy's important testimony this morning.

The CHAIRMAN. Thank you. I now recognize Chairman Moran for an opening statement.

**STATEMENT OF HON. JERRY MORAN,
U.S. SENATOR FROM KANSAS**

Senator MORAN. Mr. Chairman, thank you, and I join in supporting and commending your opening statement, you, and the Ranking Member. I appreciate the demands and sentiments that you both expressed. I appreciate the way that you both have carried out this—conducting the hearings of allowing our subcommittee to take a significant role in pursuing safety measures, and really directing the leadership, providing the leadership to this committee to take concrete actions to prevent other accidents from occurring in the future.

We continue to mourn the losses of the victims. We express our condolences on behalf of citizens of my state. We express our condolences to the members of the family who are present here today and those who are not. We remember the heroism that was displayed on the night of January 29 at DCA at Reagan National Airport as the heroic efforts were made to find and save lives.

And I commend NTSB Chair Homendy and her team for their significant and diligent work, the calls for action that have been made by the Chairman and the Ranking Member. It seems to me that I can't remember the circumstance in which we had the factual basis to be more unified in a response than what we have with the presence of what Chair Homendy and her team have provided us.

In so many instances in Congress, we get this point of view, and this point of view, and then we try to hash out who's telling us the truth and what matters in the conversation. And Chairman Homendy, I can't find a circumstance in which NTSB didn't do its job in a way that none of us should have doubts about the conclusions you reached and the recommendations you have provided. There is no excuse for us not to achieve the goal of those recommendations by passing legislation, and perhaps as important, maybe even more importantly, to insist that once we pass legislation, that legislative effort is rewarded by action by the FAA and others so that it is implemented fully in a way that makes a difference.

I've been in Congress enough to see the circumstances in which we often pass legislation. We issue the press release and say we've

done something, but we haven't done anything until we've done something. And that means the administration, the execution of those laws have to be fully fulfilled. It's our responsibility, our responsibility in this committee and as members of the U.S. Senate, to turn the conclusions of the NTSB report into action. Congress must determine what steps we need to take following those recommendations, and we need to make sure that the FAA, the Army, and all others are following those recommended and enacted safety measures.

Following a yearlong investigation, NTSB has affirmed again that passing and implementing the ROTOR Act could have, and I would say, would have, saved lives on January 29, 2025. The passage and implementation of the ROTOR Act is critical to achieving the safety of our skies. I urge the House not to delay in its passage.

The Chairman made the point that every day that goes by creates a greater risk for others. If there's something that needs to be addressed in the ROTOR Act, don't delay. Let's have the conversation and fix something. If there's something missing or wrong, that doesn't mean watering it down. It means fully implementing the ROTOR Act as passed just as soon as we make certain we've got it right.

Additionally, Congress must continue to provide the funding that is necessary to further modernize our aviation system, advance new technologies. At the FAA, the FAA Administrator was in front of us with a roundtable discussion yesterday about implementation of advanced technologies in the system, and we must continue to recruit, train, and support air traffic controllers. No steps back. Moving forward. Act on the recommendations and make sure that January 29 never occurs again. Mr. Chairman, I thank you. I appreciate the opportunity I've had to work with you, Senator Cantwell, and Senator Duckworth in this regard.

The CHAIRMAN. Thank you. Ranking Member Duckworth.

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

Senator DUCKWORTH. Thank you, Mr. Chairman. Thank you also to Ranking Member Cantwell, and to my Chairman of the Subcommittee, Senator Moran, who has been a joy to work with as a partner on this issue.

Chair Homendy, I want to thank you and the entire team at the NTSB for carrying out your mission without fear or favor to independently investigate the DCA mid-air collision. You provided FAA, DOD, Congress, and most importantly, the families of the victims of Flight 5342, clear answers explaining how this deadly crash happened, and you've given us a framework to ensure such utterly preventable tragedies never happen again.

Many of the NTSB's findings from the DCA mid-air collision point to issues that have persisted for years: the urgent need to address the air traffic controller shortage, the need for advanced safety technology, and the unacceptable lack of coordinated communications between the FAA and the DOD. I've repeatedly sounded the alarm on these issues and I haven't been the only one. The NTSB found that in prior years, rank-and-file controllers working in the DCA tower sought spacing of at least 4 miles in trail, while

Potomac TRACON controllers asked for a decrease in DCA's dangerous airport arrival rate. Yet, FAA management failed to act on the warnings being raised by an understaffed and overworked controller workforce that was clearly struggling to manage the busiest, most congested runway in the United States.

FAA's failure in the face of blaring alarm bells screaming out that it was a matter of when, not if, one of the near misses at DCA would become a deadly tragedy is, unfortunately, emblematic of a chronic crisis that's plagued FAA for years under multiple administrations. An unacceptable culture of complacency.

Chair Homendy, 826 days ago, you sat in that very chair in this very room to testify alongside FAA at a hearing I convened on addressing close calls to improve aviation safety. That day, your message could not have been clearer as you warned everyone, and I'm quoting you, "The concerning uptick in such incidents is a clear warning sign that the U.S. aviation system is sharply strained. We cannot wait until a fatal accident forces action. We must act before there is a tragedy." And your message was embraced by many in this chamber in a bipartisan way.

As I recall, I opened that hearing by stating that our Nation is experiencing an aviation safety crisis. Near misses are happening way too frequently, and I refuse to be complacent in waiting to act until the next runway incursion becomes a fatal collision. Eight hundred and twenty-six days ago, we had that exchange.

That recognition is why I fought so hard to protect the 1,500-hour rule, and to stop Congress from adding more flights to DCA. Unfortunately, on that latter fight, I and the members of Virginia and Maryland delegations were soundly defeated. And as the NTSB report found, the intense traffic demand in the region forced Potomac TRACON to routinely reduce the trail spacing between aircraft, which increased the workload on DCA air traffic controllers.

Tragically, the one audience that refused to hear these messages was the one entity with the authority to act: the FAA. And it seems as if the FAA's complacency has only hardened over time, regardless of which political party controls the White House. Again, this is a bipartisan failure.

The NTSB report showed that the FAA failed to conduct annual reviews of helicopter routes in the DCA airspace leading up to the DCA mid-air collision, reviews that would have shown the helicopter route was too close to an approach runway. A review of helicopter routes would have also potentially prevented some of the 15,000 close calls between airplanes and helicopters in the DCA airspace that took place between October 2021 and December 2024.

We have long known about the mounting strain on air traffic controllers. That is why I will continue to reiterate that any investment in our ATC system must be informed by and prioritize the most important asset of the ATC system: its people.

The FAA needs to improve how it reviews relevant safety data on hotspots, how critical feedback from frontline controllers is funneled to decisionmakers, and most importantly, how to ensure enough rested, well-trained employees are at work every day with all the tools that they need.

The House must also act to pass the ROTOR Act so we can codify many of the NTSB's recommendations. But even if that happens,

there is more work to do because the bottom line is that any system that repeatedly forces pilots to take emergency evasive actions to save lives is a broken system. We need to prevent the conditions that will lead to even a near miss.

So, I thank you again, Chairwoman Homendy. You have been a wonderful resource to this committee. I also thank the leadership of the Committee, the Chairman, the Ranking Member, and again my partner on the Subcommittee, Chairman Moran.

Thank you, I yield back, Mr. Chairman.

The CHAIRMAN. Thank you. I now want to introduce our witness, Ms. Jennifer Homendy, the Chairwoman of the National Transportation Safety Board. The NTSB investigates all civilian aviation accidents and other major roadway, pipeline, rail, and marine accidents. We thank Chairwoman Homendy and the NTSB staff for their work to complete the investigation of the D.C. mid-air collision in one year.

Chairwoman Homendy, you're recognized for five minutes.

**STATEMENT OF HON. JENNIFER HOMENDY, CHAIRWOMAN,
NATIONAL TRANSPORTATION SAFETY BOARD**

Ms. HOMENDY. Chairman Cruz, Ranking Member Cantwell, Chairman Moran, Ranking Member Duckworth, and members of the Committee, thank you for the opportunity to be here today to discuss our investigation of the mid-air collision that occurred just over a year ago near Ronald Reagan Washington National Airport.

As we discuss NTSB's thorough fact-finding, extensive analysis, and comprehensive safety recommendations, I want to make one thing abundantly clear. We should not be here today. In this room, sitting with us or watching online, are family members of the 67 people who died on January 29. We are so sorry for your loss. You should not have to be here, because as I've said many times, this was 100 percent preventable. It was preventable.

In fact, now that our investigation has concluded, I can say without a shadow of a doubt that we've seen this before. We've investigated similar mid-air collisions going back decades, and we've issued safety recommendations like ADS-B In over, and over, and over again aimed at preventing just these kinds of collisions, recommendations that have been rejected, sidelined, or just plain ignored.

As Chairman Cruz and Congressman Onder recently wrote, "Last year's crash was not an isolated incident. It was the fatal result of years of unheeded warnings." Years.

Fifty-seven years ago, in 1969, we investigated a mid-air collision between Allegheny Airlines Flight 853 and a small Piper Cherokee outside Shelbyville, Indiana. Eighty-three people died. Soon after, the Board held a hearing and issued 14 recommendations aimed at preventing future mid-air collisions, including our first ever recommendation for FAA to expeditiously develop and implement a collision avoidance system in all civil aircraft.

For perspective, that same year we put a man on the moon, and yet, it took another two decades and a congressional mandate for FAA to finally implement TCAS. TCAS didn't prevent this accident, but there are technologies that are readily available that could have. If I could pull up my slide—while that's coming up, with

ADS-B In and what I'm—maybe I'll give it a second. With ADS-B In—hopefully it'll come up: technical difficulties. I'll continue on and when it comes up, I'll explain.

With ADS-B In—

Senator CRUZ. I don't do the AV.

Ms. HOMENDY. Yes, me, too. There we go. So, on the left side is the PAT25, and on the right side is Flight 5342. We did a laser scan of exemplar aircraft, and so the gray around is the structure, and then, of course, you see the night vision goggles on the left side.

With ADS-B In, the helicopter pilots would have gotten an audible alert, if it was in their headset, at 48 seconds prior to collision when they were over Hains Point, allowing them to take action. They never got a single alert. They had no idea that it was—that 5342 was coming from the left, and we can talk about that in the hearing, if you'd like.

On the right side, outside—looking out of 5342, the CRJ would have gotten their first alert with ADS-B In at 59 seconds prior to collision. Instead, they got a TCAS alert that just said, "Traffic, traffic," and what they need to do is look out, and figure out where that traffic is, and take action, which is very difficult to see in many circumstances. And we can talk about why that is, too.

But, "Traffic, traffic," 19.5 seconds prior to collision. They didn't actually recognize that the helicopter was there until 1 second, 1 second prior to collision. Had they gotten ADS-B In, they would have gotten something more along the lines of, "Traffic 12 o'clock, 2 nautical miles, 500 feet below," then they could have taken action. What we're talking about here is lifesaving information for pilots. It's information.

In 2008, we again called on the FAA to implement ADS-B In. We stated, "The Safety Board believes that the benefits of ADS-B technology warrant rapid adoption," and that, "the equipage of aircraft with ADS-B In capability will provide an immediate and substantial contribution to safety underline, especially in and around airports." We said that in 2008. What if the FAA had acted?

I want to be clear though: What happened at DCA could happen anywhere in our airspace. The NTSB has for years, long before this tragedy at DCA, been sounding the alarm about the safety risks of see-and-avoid. Yet we continue to rely on see-and-avoid to separate traffic throughout the national airspace when technology is available to provide pilots with the situation awareness they need and deserve to ensure safety.

See and avoid is exactly what it sounds like. A pilot has to visually acquire an approaching aircraft, recognize a collision course, decide on action, execute the control movement, and allow the aircraft to respond in a matter of seconds.

Since 2008, we've investigated 211 aviation accidents and incidents resulting from a mid-air collision or loss of separation, which killed 281 people and injured 12 others. In almost half, we raised concerns with see-and-avoid. These include many in your home states. And I know not all the Senators are here, but I'm going to pretend they are because we have—we investigated since 2008 where we stated our concerns.

Sixteen in Texas, one in Kansas, 15 in Alaska, including the 2019 tragedy in Ketchikan where six people died and 10 were injured, and I was the Board Member on scene. And we discussed at length in that report, “the lack of ADS-B In requirements for Part 135.” Two in North Carolina, one in Missouri, two in Utah, one in Ohio, one in Wyoming, one in Michigan, two in Wisconsin, one in Illinois, 12 in Nevada, seven in Colorado, two in Pennsylvania, four in New Jersey, and now, one in D.C.

The fact is, our aviation system is the safest in the world for a reason. Thanks to the work of you all, the work of the entire Congress, our work at NTSB, the work of our partners at FAA, redundancy has been built into the system to prevent catastrophe, but that doesn’t mean system flaws don’t exist.

Our aviation system is complex. The National Airspace System is complex, but it is generally safe, which means many, many things have to go wrong for a tragedy like this to occur, and we have an obligation to fix those vulnerabilities.

The question before us is: How many more people need to die before we act? How many more people need to die before we act? I’ve heard others say it can’t be done. It’s too expensive. The technology isn’t available. The risk is only at DCA. None of that is true. Absolutely none of it. The technology is available with an iPhone, or an iPad, a headset—this is mine—and a cable, and a few hundred dollars for a receiver. That’s what this is: ADS-B In receiver. Even the oldest general aviation planes can be outfitted with ADS-B In.

The gentleman behind me who is the Director of our Office of Aviation Safety has no electricity in his plane. This is what he has. He has ADS-B In with an iPad. In commercial aviation, American Airlines has equipped its entire fleet of more than 300 Airbus A321 aircraft with ADS-B In. I was in the cockpit to look at it. Flew to Phoenix from here. Do you know how much it cost them? I asked the COO: less than \$50,000 per plane to retrofit.

Boeing offers it on new planes. Airbus offers it on new planes. Gulfstream includes it. It is possible the technology is available so we can solve this problem and save lives. We should not have to be here, and we wouldn’t be if the NTSB’s warnings had been heeded.

Exactly 17 years ago, Colgan Air Flight 3407 crashed in New York. 50 people died. In response to that accident, we issued 25 new safety recommendations to the FAA. Ten were closed, unacceptable action, because they weren’t going to do anything about it. In the letters they told us don’t ask anymore. One is open, unacceptable.

We cannot allow this to happen again. Every single one of the 50 safety recommendations we issued in response to the DCA catastrophe must be acted on immediately. The FAA has had multiple, multiple opportunities to implement NTSB recommendations. Time after time, they’ve declined. Now, we need action. Whether that’s through the FAA—and they can implement a lot of the recommendations we just issued, some of them are simple, and we can talk about that—Army, Department of War, or an Act of Congress.

We cannot accept having to be here years from now lamenting yet more inaction. Not only must we do this for the 67 people who died on January 29, we must do this for all those who lost their

lives in accidents that the NTSB has investigated. We must do this for their families. We must do this for future generations, lives we can still save.

Chairman Cruz, Ranking Member Cantwell, Chairman Moran, Ranking Member Duckworth, I am immensely grateful to you and the members of this committee for your robust advocacy via the bipartisan ROTOR Act. Not only do I want to thank you for your incredible leadership, but I mean this from the bottom of my heart: thank you for your willingness to stand up and do what's right for safety.

I look forward to working with you to create a future where no family ever has to endure such tremendous loss. Thank you.

[The prepared statement of Ms. Homendy follows:]

PREPARED STATEMENT OF JENNIFER HOMENDY, CHAIRWOMAN,
NATIONAL TRANSPORTATION SAFETY BOARD

Good morning. My name is Jennifer Homendy, and I'm honored to serve as Chairwoman of the National Transportation Safety Board (NTSB).

As you know, the NTSB is an independent Federal agency charged by Congress with investigating and establishing the facts, circumstances, and cause or probable cause of all civil aviation accidents and serious incidents in the United States and defined accidents in all other modes of transportation, including roadway accidents, grade crossing incidents, railroad accidents, pipeline accidents, major marine casualties occurring on or under the navigable waters, internal waters, or the territorial sea of the United States, and other accidents related to the transportation of individuals or property when the Board decides the accident is catastrophic, the accident involves problems of a recurring character, or the investigation of the accident would carry out our statutory requirements. In addition, the NTSB carries out special studies concerning transportation safety and coordinates the resources of the Federal government and other organizations to aid victims and their family members impacted by major transportation disasters.

Thank you for the opportunity to appear before you today to discuss our investigation of the midair collision between a Sikorsky UH-60L helicopter, operated by the U.S. Army under the callsign PAT25, and an MHI (Mitsubishi Heavy Industries) RJ Aviation (formerly Bombardier) CL-600-2C10 (CRJ700), N709PS, operated by PSA Airlines as American Airlines flight 5342. These aircraft collided in flight about 0.5 miles southeast of Ronald Reagan Washington National Airport (DCA), Arlington, Virginia, about 8:48 pm eastern standard time on January 29, 2025.

The 2 pilots, 2 flight attendants, and 60 passengers on board the airplane and all 3 crewmembers on board the helicopter died. Flight 5342 was operating under the provisions of Title 14 Code of Federal Regulations Part 121 as a scheduled domestic passenger flight from Wichita Dwight D. Eisenhower National Airport, Wichita, Kansas, to DCA. PAT25 originated from Davison Army Airfield (DAA), Fort Belvoir, Virginia, for the purpose of the pilot's annual standardization evaluation flight with the use of night vision goggles (NVGs). Night visual meteorological conditions prevailed in the area of DCA at the time of the accident.

PAT25 departed DAA and landed at sites in Virginia and Maryland before the crew turned south toward Washington, DC, and was cleared by the DCA tower controller (who was working combined local control and helicopter control positions) to transition the DCA airspace via helicopter Routes 1 and 4 before proceeding back to DAA. The helicopter joined Route 1 near Cabin John, Maryland, and followed the Potomac River southbound at low altitude, passing the Key Bridge, Memorial Bridge, Tidal Basin, and Hains Point before continuing onto Route 4.

At the same time, flight 5342 was approaching DCA on an instrument flight rules flight that had been uneventful during departure, cruise, and initial descent. The airplane was inbound from the south on a visual approach to runway 1 when the DCA tower controller asked the flight crew if they could accept runway 33 instead.

Our final investigation report is being formatted for an anticipated public release date of February 17, 2026. To enable the Committee to adequately prepare for the hearing, we are providing the analysis section of the report in full here:

Analysis

Introduction

The accident occurred when PAT25, which was transiting southbound on Helicopter Route 4, impacted flight 5342, which had just turned onto final approach for runway 33 at DCA. At the time of the accident, the DCA local control (LC) controller was working both the LC and helicopter control (HC) positions. About 5 minutes before the collision, the first officer (FO) of flight 5342 contacted the tower while inbound on approach for landing on runway 1. The LC controller asked if they could switch to runway 33. After deliberation, the crew determined that they could accept the runway change and the FO informed the controller, who then instructed the flight crew to circle to runway 33 and issued a landing clearance.

About 2 minutes before the collision, when the aircraft were about 6.5 nautical miles (nm) apart, the LC controller issued a traffic advisory to PAT25, informing them of a “C–R–J just south of the Wilson Bridge circling to runway three three”; however, the helicopter’s cockpit voice recorder (CVR) captured this transmission as, “PAT two five traffic just south of Wilson Bridge is a C–R–J at one thousand two hundred feet for runway three three,” indicating that the PAT25 crew did not receive the word “circling” as part of the advisory due to degraded radio reception. At this time, PAT25 was crossing the Tidal Basin, and flight 5342 was one of five airplanes approaching DCA in darkness from the south. The PAT25 instructor pilot (IP) stated to the controller that they had the traffic in sight and requested visual separation, which the controller approved.

The LC controller contacted the helicopter crew again about 20 seconds before the collision and asked the crew if they had the CRJ in sight, followed by instructions to “pass behind that C–R–J”; however, the helicopter CVR indicated that the “pass behind that” portion of the transmission was blocked by a 0.8-second mic key from within the helicopter. The IP indicated that they had the airplane in sight and requested visual separation, which the controller again approved. About 6 seconds before the collision, the IP stated to the pilot, “alright kinda come left for me ma’am, I think that’s why he’s asking . . . we’re kinda . . . out towards the middle.” The pilot acknowledged and the helicopter subsequently started to move left. The aircraft collided at an altitude about 278 feet mean sea level (msl) about 2,500 feet from the runway 33 threshold.

The analysis discusses the accident sequence and evaluates the following safety issues:

- the extensive use of pilot-applied visual separation and the inherent limitations of the see-and-avoid collision avoidance concept;
- controller workload, position combining, and communications practices;
- the design of the Washington, DC, area helicopter routes and operators’ awareness and interpretations of route structure and limitations;
- the limitations of the traffic awareness and alerting systems on both aircraft;
- shortcomings in Federal Aviation Administration (FAA) and U.S. Army safety assurance and risk management processes; including lack of proactive data sharing and analysis to identify and mitigate midair collision risk; and
- deficiencies in FAA safety culture and postaccident drug and alcohol testing procedures.

The NTSB investigation’s comprehensive review of the accident circumstances determined that the following factors did not contribute to the cause of the accident:

Flight 5342 crew qualifications. The pilots of flight 5342 were certificated and qualified in accordance with Federal regulations. [FINDING 1]

Flight 5342 crew medical factors. The pilots of flight 5342 were medically qualified for duty, and available evidence does not indicate that they were impaired by effects of medical conditions or substances at the time of the accident. [FINDING 2]

*Flight 5342 crew fatigue.*¹ Review of the flight 5342 pilots’ time since waking and sleep opportunities in the days before the accident indicated that the pilots were unlikely to have been experiencing fatigue. [FINDING 3]

¹In this report, “fatigue” is used consistent with human performance science to describe performance impairment associated with insufficient sleep, circadian disruption, and/or extended time awake. Operational factors such as high workload, sustained attention demands, stress, and task saturation can also degrade vigilance and situational awareness, but these effects are analytically distinct from fatigue and are addressed separately in the report.

PAT25 crew qualifications. The pilot, IP, and crew chief onboard PAT25 were qualified and current in their positions as designated by the unit commander in accordance with Army regulations. [FINDING 4]

PAT25 crew medical factors. The pilot, IP, and crew chief of PAT25 were medically qualified for duty, and available evidence does not indicate that they were impaired by effects of medical conditions or substances at the time of the accident. [FINDING 5]

PAT25 crew fatigue. Review of the PAT25 three crewmembers' time since waking and sleep opportunities in the days before the accident indicated that the crew were unlikely to have been experiencing fatigue. [FINDING 6]

Airplane mechanical factors. The airplane was properly certificated, equipped, and maintained in accordance with 14 *Code of Federal Regulations (CFR)* Part 121. The airplane was operated within its weight and balance limitations throughout the flight. Examination of the airplane revealed damage consistent with an in-flight collision and subsequent impact with water, and there was no evidence of any structural, system, or powerplant failures or anomalies. Review of surveillance videos indicated that the airplane's wing navigation, landing/taxi, and anti-collision strobe lights were operating at the time of the collision. [FINDING 7]

Helicopter flight controls, rotor system, and powerplants. The helicopter was properly certificated, equipped, and maintained in accordance with U.S. Army regulations. Review of helicopter maintenance records did not reveal any open discrepancies or anomalous trends that contributed to the accident. The helicopter was operated within its weight and balance limitations throughout the flight. Examination of the helicopter revealed damage consistent with an in-flight collision and subsequent impact with water, and there was no evidence of any structural, main or tail rotor system, flight control system, or powerplant failures or anomalies. Review of surveillance videos indicated that the helicopter's right and tail position lights, the landing light, as well as both upper and lower anti-collision lights, were operating at the time of the collision. [FINDING 8]

Air traffic controller qualifications and tower staffing. The operations supervisor (OS) and four controllers who were working in the DCA airport traffic control tower (ATCT) cab at the time of the accident were properly certified, qualified in accordance with Federal regulations and facility directives, and current. [FINDING 9] Although the DCA ATCT facility was not staffed to its target level at the time of the accident, the number of staff in the tower at the time of the accident was adequate and in accordance with FAA directives. [FINDING 10] Therefore, the NTSB concludes that the decision to combine the HC and LC positions was not the result of insufficient staffing, and personnel were available to staff the HC and LC positions separately had the OS chosen to do so. [FINDING 11]

Controller medical factors. The LC controller, assistant local control (ALC) controller, and OS were medically qualified for duty, and available evidence does not indicate they were impaired by effects of medical conditions at the time of the accident. [FINDING 12]

Controller fatigue. Review of the LC and ALC controllers' and OS's time since waking and sleep opportunities in the days before the accident indicated that the controllers, including the OS, were unlikely to have been experiencing fatigue. [FINDING 13]

Weather conditions. Visual meteorological conditions prevailed in the area at the time of the accident. A review of observations recorded throughout the night of the accident revealed no evidence of any local atmospheric pressure anomalies that would have impacted barometric altimeter readings. [FINDING 14]

Airport response. Metropolitan Washington Airports Authority (MWAA) aircraft rescue and firefighting (ARFF) and airport operations staff responded immediately and in accordance with applicable emergency plans and regulatory requirements, deploying land-and water-based resources, and coordinating mutual aid under complex nighttime and on water conditions. [FINDING 15]

Accident Sequence

Controller Performance

Workload and Resource Management

Because the LC and HC positions were combined on the night of the accident, the LC was not only responsible for providing services to the arriving and departing fixed-wing aircraft, but had the added responsibility of providing services to numerous helicopters that were transitioning the airspace. In the 20 minutes before the accident, the total number of aircraft that the LC controller was handling fluctuated between 7 and 12 aircraft. In a postaccident interview, the LC stated that he felt "a little overwhelmed" about 10 to 15 minutes before the accident, and that he felt

the volume was manageable when “one or two helicopters” left the airspace. This statement was consistent with a peak in observed traffic volume of 10 aircraft around this time (5 helicopters and 5 airplanes); 1 helicopter subsequently departed the airspace at 2040:28, or 7:31 before the collision. The LC controller reported that he would have asked to have the HC and LC positions staffed separately if he received two more helicopters.

In the 2 minutes before the accident, there were a total of 29 transmissions between the LC controller and airplanes/helicopters on his frequency, and about 90 seconds before the collision, the number of aircraft on the LC controller’s frequency increased to 12. During that time, the controller spoke to or received communications from six of those aircraft: three inflight helicopters, one inflight airplane, and two airplanes on the ground. The other six aircraft, with which the controller did not directly communicate during the 2 minutes before the accident, but which he was still responsible for maintaining awareness of, included two inflight helicopters, two inflight airplanes, and two airplanes on the ground.

Human factors research has consistently shown that in air traffic control (ATC) operations, voice communications reliably capture and direct controller attention toward the aircraft involved. Several studies have shown that auditory communication events—including issuing clearances and receiving pilot readbacks—function as attentional anchors that trigger cognitive focus and updates to the controller’s mental representation of that aircraft’s trajectory and status (Endsley and Rogers 1997; McGee, Mavor, and Wickens 1997). Therefore, the LC controller’s moment-to-moment subject attention allocation can be reasonably inferred from the aircraft with which he was communicating at any given point in time.

The complexity of the airspace and limited airfield surface area at DCA require controllers to carefully coordinate the flight paths and timing of aircraft taking off, landing, and transitioning through the airspace and to issue instructions and clearances as necessary to efficiently facilitate these various flight operations. The LC controller’s communications in the 2 minutes before the accident are consistent with his continuous shifting of priorities between airborne, ground, and transitioning aircraft.

After initially approving PAT25’s request to maintain visual separation from flight 5342, he turned his attention to an airplane waiting to depart, informing them about traffic three miles out circling to runway 33 (flight 5342) and additional traffic on a six-mile final approach for runway 1, and instructing them to line up and wait on the runway. At 2046:29.1 (about 1:30 before the collision), an Air Force helicopter checked in on the frequency, along with a simultaneous transmission from an inbound American Airlines airplane. The LC controller instructed the Air Force helicopter to standby, then instructed a landing airplane to continue their landing roll to “taxiway November.” A medical transport helicopter then contacted the tower. The LC controller cleared the airplane waiting to depart runway 1 for an “immediate takeoff,” as the airplane needed to be clear of the intersection of runways 1 and 33 before flight 5342 crossed the runway 33 threshold for landing. About 2046:58, the LC controller replied to the Air Force helicopter, which was west-southwest of the airport, and approved their requested route of flight. About 45 seconds before the collision, the American Airlines airplane that had attempted to contact the tower at the same time as the Air Force helicopter transmitted their location on the runway 1 approach; however, that transmission was stepped on by the medical transport helicopter’s second transmission to tower. The LC controller then approved the medical transport helicopter’s request to transition through the Class B airspace. A conflict alert was audible during two brief mic keys from the controller at 2047:37.8, and would have been visible on the controller’s control tower radar display (CTRD). Less than 2 seconds later, about 20 seconds before the collision, the LC controller asked PAT25 if they had the CRJ in sight. Three seconds later, the LC instructed PAT25 to pass behind the CRJ. PAT25 said it had the aircraft in sight and requested visual separation; the LC controller stated, “vis separation.” The American Airlines airplane inbound on the runway 1 approach then contacted the tower a third time, and the LC controller was communicating with that airplane when the collision occurred.

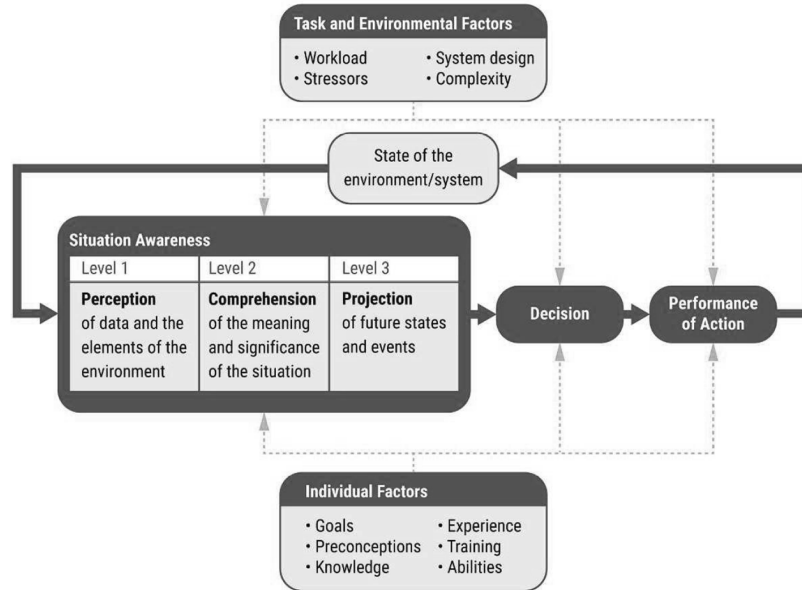
Given the LC controller’s statement that he felt “a little overwhelmed” with a traffic volume of ten aircraft, it is likely he began to feel overwhelmed again in the 2 minutes before the accident when traffic volume increased. A review of the DCA ATCT standard operating procedures (SOPs) and training documents did not indicate any guidance specifically related to controller workload and how and when controllers should ask for relief.

Where a controller’s attention is focused can influence the amount of time it takes to recognize and respond to an unexpected event. A study that evaluated scanning patterns and detection times of expert tower controllers to abnormal events found

that the controllers’ average detection times, beginning from the onset of the abnormal event, ranged from 14 seconds to 204 seconds (Crutchfield *et al.*, 2021), which could lead to adverse outcomes for time-critical safety events. The conflict alert system acts as a safety net to assist controllers responding to traffic conflicts in a timely manner. During the 2 minutes before the accident, the LC controller was communicating with aircraft located primarily south and west-southwest of the airport; therefore, his attention would have been focused in that direction. Just before the conflict alert activated, the LC controller was communicating with a medical transport helicopter located about 16 miles west of the airport. The LC controller likely would have looked at the CTRD to confirm that helicopter’s location. The LC controller recalled that he noticed the conflict between PAT25 and flight 5342 during his scan and queried PAT25 to ensure that they still had the airplane in sight, which PAT25 confirmed.

Situation awareness forms a basis for decision-making and is defined as the “perception of the elements in the environment within a volume of time and space [Level 1], the comprehension of their meaning [Level 2], and the projection of their status in the near future [Level 3]” (Endsley, 1988).² Figure 1 presents an illustration of the situation awareness concept. Situation awareness is not only what the controller is perceiving in the current air traffic situation (level 1) but how they interpret that information (level 2) and use it to project the future state of air traffic (level 3) moving in their airspace. Levels 2 and 3 are especially critical in the air traffic environment because it is dynamic and constantly changing.

Figure 1. Diagram of the situation awareness concept.



Recognizing an impending collision requires information to be perceived from the environment, stored in working memory, and interpreted against knowledge stored in long term memory, allowing controllers to identify familiar situations, predict future events, and determine an appropriate response (Wickens, Mavor, and McGee, 1997). Controllers must routinely monitor the current state of an aircraft and predict its future location in relation to other aircraft (Endsley, 1995). Conflicts that develop slowly, particularly at night, are inherently difficult for people to recognize

²These three levels of situation awareness, which are sequential, are followed by decisions and performance of actions.

due to reduced visual cues and the fact that gradual change can reduce situation awareness and delay recognition.

Controllers must maintain awareness of each aircraft they are managing (to include, for example, location, altitude, and airspeed) and anticipate where that aircraft will be in the seconds and minutes to follow. A controller's ability to maintain situation awareness is impacted by their workload and divided attention. As remaining cognitive resources are reduced with increasing workload (such as increasing traffic complexity, traffic volume, and/or radio communications), a controller's ability to maintain situation awareness is reduced. Because the LC was working the combined LC and HC positions, he was required to manage and maintain awareness of fixed-wing aircraft arrivals and departures as well as the movements of helicopters in the airspace, which required dividing his attention between airborne, ground, and transiting traffic. The NTSB concludes that *keeping the HC and LC positions continuously combined on the night of the accident increased the LC controller's workload and negatively impacted his performance and situation awareness.* [FINDING 16]

It is also likely that the controller was using expectation-driven processing, which directs a person's attentional focus. When events occur as expected or are routine, such as a pilot correctly reading back a clearance or adhering to a published flight path, information processing occurs rapidly with minimal effort. This expectation can lead to errors if a pilot or aircraft does not behave as expected. In this case, the controller expected that PAT25 would remain clear of flight 5342 because the PAT25 IP stated that they had the airplane in sight and would maintain visual separation. The frequent use of pilot-applied visual separation reinforces the expectation that the pilot of one aircraft will maintain separation from another aircraft, and because it has repeatedly worked as expected, it can be more difficult for a controller to notice deviations, especially when workload is high. It is likely that the controller did not expect the conflict between PAT25 and flight 5342 to occur, and felt comfortable dividing his attention between the accident aircraft and the numerous other aircraft under his control at the time of the accident.

The primary duties of the ALC control position were to alert the LC controller of any unusual situations or traffic conflicts, maintain surveillance of the local traffic pattern and landing area, and assist the LC controller with monitoring of aircraft on final via the CTRD. These duties would be accomplished by scanning the airspace as well as the tower displays. When the HC and LC positions were combined, the ALC position had the additional duty of monitoring the helicopter and airplane frequencies. In a postaccident interview, the ALC controller recalled that she was "writing down what the different helicopters were doing" when she heard the conflict alert and the LC controller asking PAT25 if they had the CRJ in sight, then instructing PAT25 to pass behind the CRJ.³ Monitoring traffic is a workload-intensive task, and, like the LC, the ALC was also subject to high workload in the minutes before the accident. If the LC and HC positions had been staffed separately, the LC and ALC would have only been working fixed-wing traffic, and another controller would have been working helicopter traffic. This would have reduced the number of aircraft the LC and ALC were controlling and monitoring—for example, about 90 seconds before the accident, the LC/ALC would have been handling 7 airplanes while a separate helicopter controller handled the 5 helicopters on frequency at the time. This would have reduced cognitive loading and enabled the HC controller to more easily keep track of the movement of the helicopters and their potential conflicts with arriving airplanes. It is possible that if the positions had been staffed separately, a standalone HC controller could have detected the potential conflict between PAT25 and flight 5342 earlier, enabling an earlier and more effective traffic advisory to PAT25. The NTSB concludes that *had the HC and LC positions been staffed separately, PAT25 might have received a more timely and effective traffic advisory.* [FINDING 17] The NTSB further concludes that *the LC and HC positions should have been separated at the time of the accident given traffic volume and complexity.* [FINDING 18]

The NTSB also concludes that *in the 2 minutes before the accident when traffic volume was increasing, the ALC should have prioritized surveillance of aircraft in the air in order to assist the local controller, rather than diverting her attention to the lower priority task of documenting helicopter information, which could have been completed when traffic volume and complexity had subsided.* [FINDING 19]

³Note taking and recording aircraft information are routine components of local and assistant local controller duties, along with radio communications, coordination, and traffic sequencing. Such tasks require temporary shifts of attention between displays, communications, and the out-the-window visual scan.

The primary duties and responsibilities of the OS included providing operational supervision, directing the tower operation to ensure efficiency, and determining when the HC and LC positions should be combined or separately staffed. The DCA ATCT SOP stated that the OS, as the watch supervisor, must maintain situation awareness of traffic activity and operational conditions in order to provide timely assistance to controllers and ensure that available resources are deployed for optimal efficiency. To do this, the OS must not only maintain a general awareness of traffic volume and complexity within the airspace, but also continuously assess the risk of the operation to determine when a controller needs assistance and when the HC/LC positions should be separately staffed. The OS should also scan the airspace and CTRD to identify any potential conflicts.

The HC and LC positions were combined when the OS came on duty earlier on the day of the accident. Why the positions were combined earlier that day was not determined, as facility SOP had been revised in June 2024 to remove the requirement for documentation of the reason for combining. Some controllers interviewed felt that combining the HC and LC positions resulted in better situation awareness and reduced workload, because they did not have to coordinate with another controller the way they did when the positions were separately staffed. Controllers stated that the benefits to staffing the positions separately were having another set of eyes scanning traffic, less frequency congestion, and a controller dedicated to helicopters only. In other words, duties and responsibilities would be divided between two controllers, allowing for more focused attention to aircraft on their respective frequencies to recognize the development of a potential conflict. Although the DCA ATCT SOP specified hours during which the HC position “should normally be decombined,” the SOP allowed the OS to combine or separately staff the position at their discretion after considering factors such as staffing, weather conditions, and traffic volume. The LC controller stated he was feeling a little overwhelmed about 10 to 15 minutes before the accident and had thought about asking for the HC/LC positions to be staffed separately, but did not because a helicopter left the airspace. Helicopter and airplane traffic volume subsequently increased again in the 2 minutes before the accident; however, the OS stated in a postaccident interview that there was no need to staff the positions separately in the hour before the accident, as they only had one helicopter at a time.

The OS had been working multiple control positions for over 4 hours and had been working the OS position for over 2 hours at the time of the accident. From the OS position in the tower, he was listening to the LC controller’s transmissions, which were broadcast on a speaker in the tower cab, and “look[ing] out the window.” He could not recall the specifics of the traffic situation at the time of the accident, and did not recall the conflict alert activating, but witnessed the collision.

To provide timely assistance to controllers and ensure that available resources are deployed for optimal efficiency, the OS should continuously assess the risk of ongoing factors in the operation, including traffic volume and complexity, controller experience, time on position, nighttime conditions, and any other factors deemed relevant. However, given his extended time on position, it is likely that the OS was experiencing reduced alertness at the time of the accident, which decreased his ability to effectively assess operational risks. Research in a simulated air traffic control room showed that extended time on task (over 90 minutes) increased detection latency for complex events such as two aircraft at the same altitude on the same flight path (Thackray and Touchstone, 1989).

The OS’s reduced alertness and attentiveness would be consistent with his extended time on position at the time of the accident and his not recognizing the increases in traffic volume that occurred 10 to 15 minutes before the accident and again in the 2 minutes before the accident. In addition, he did not recognize the developing traffic conflict as PAT25 continued toward flight 5342. The NTSB concludes that *due to extended time on position at the time of the collision and his complacency, the OS was likely experiencing reduced alertness and vigilance, which decreased his awareness of the operational environment and reduced his ability to proactively assess the risks posed by the traffic and environmental conditions at the time of the accident. [FINDING 20]*

FAA Order 7210.3DD, “Facility Operations and Administration”; the collective bargaining agreement (CBA) between the National Air Traffic Controllers Association (NATCA) and the FAA; and DCA ATCT SOPs outline the duties and responsibilities of supervisors, including the requirement to ensure that adequate relief opportunities are provided to all operational staff. However, none of these documents detail how a supervisor is expected to manage the supervisor’s own relief periods throughout the duty day or shift. The CBA states that employees should not be required to spend more than 2 consecutive hours performing operational duties with-

out a break from operational areas.⁴ While breaks for controllers in accordance with the collective bargaining agreement (CBA) are closely monitored and strictly enforced, the CBA does not cover supervisory personnel such as operations supervisors and controllers-in-charge; therefore, individuals performing these duties are not subject to the same break requirements.

A supervisor's duties are extensive, and providing oversight in an operational environment can be as mentally taxing as working a control position. Under current rules, supervisors are often conducting supervisory duties for hours, and in some cases, entire shifts, but are not provided the same relief periods as operational personnel. The NTSB concludes that *the lack of mandatory relief periods for supervisory air traffic control personnel is contrary to human factors research that shows clear performance deterioration in situations of prolonged time on task. [FINDING 21]* Therefore, the NTSB recommends that the FAA *develop and implement time-on-position limitations for supervisory air traffic control personnel, including guidance for district and facility level management to adapt these limitations to account for their own staffing and local standard operating procedures. [RECOMMENDATION 1]*

Traffic Advisories

The LC controller's first advisory to PAT25 regarding flight 5342 occurred about 2 minutes before the collision. This advisory was consistent with air traffic policy. In response to the controller's traffic advisory, the PAT25 IP stated that they had the traffic in sight and requested visual separation. The controller did not issue a corresponding traffic advisory to the crew of flight 5342.

The controller later stated that he had other priority duties at the time he issued the initial advisory to PAT25 and that he intended to go back and issue an advisory to flight 5342. However, because he was attending to other priority tasks, he did not return to the airplane before the conflict alert activated about 1 1/2 minutes later. Although the crew of flight 5342 had other contextual clues about the presence of PAT25 (see discussion in section 0), they never received an advisory from the controller about the helicopter, which would have increased their situation awareness. The NTSB concludes that, *although the LC controller provided an initial traffic advisory to the crew of PAT25 in accordance with FAA Order JO 7110.65, he did not provide a corresponding advisory to the crew of flight 5342 regarding PAT25's location and intention, which could have increased situation awareness for the crew of flight 5342. [FINDING 22]*

FAA Order JO 3120.4, "Air Traffic Technical Training," conveys instructions, standards, and guidance for the administration of air traffic technical training (FAA, 2024c). The order lists "positive control" as a job subtask, which it defined, in part, as taking command of control situations and not acting in a hesitant or unsure manner. The LC controller reported that, after the conflict alert activated, he noted that the helicopter was "way closer" to the airplane than it was supposed to be. In response, the controller contacted the crew of PAT25 and stated, "PAT two five do you have that C-R-J in sight?" The controller then instructed PAT25 to "pass behind that C-R-J." The PAT25 IP replied that they had "a-aircraft" in sight and again requested visual separation, which the controller approved.

FAA Order JO 7110.65AA, "Air Traffic Control," paragraph 5-1-4, Merging Target Procedures, stated that controllers must provide traffic information to any turbojet aircraft whose target appears likely to merge with another aircraft, unless those aircraft are separated by more than the appropriate vertical separation minima. Safety alert procedures and phraseology requirements, contained in paragraph 2-1-6, stated that controllers should immediately issue a safety alert to an aircraft that is in unsafe proximity to another aircraft, and to offer the pilot an alternative course of action if feasible, ending the transmission with the word "immediately."

When the LC controller recognized that the two aircraft were in unsafe proximity, the most appropriate action would have been to issue safety alerts to both aircraft regarding the other aircraft's position and distance, and to issue positive control instructions to the pilots that would have prevented their courses from converging, such as climb, descend, or turn, as appropriate. However, the controller's traffic call to PAT25 at this time provided no information that could have assisted the crew in visually locating and positively identifying the airplane, nor did it contain positive control instructions that the crew could have taken to resolve the conflict. Additionally, the controller did not issue a safety alert to flight 5342, contrary to merging target procedures. Timely issuance of positive control instructions by the controller and subsequent compliance with those instructions by the flight crew(s) could have averted the impending collision. The NTSB concludes that *if the LC controller*

⁴A break is defined in the CBA as, "a period of time during which no duties are assigned and offer employees opportunities to attend to personal needs or rejuvenate their mental acuity."

had issued a standard safety alert to the flight crews of either aircraft as prescribed in FAA Order JO 7110.65, providing the conflicting aircraft's position and positive control instructions, the crew of either aircraft could have taken immediate action to avert the impending collision. [FINDING 23]

Threat and Error Management

The primary purposes of the ATC system are to prevent a collision between aircraft operating in the system and to provide a safe, orderly, and expeditious flow of traffic. FAA Order 7110.65, Air Traffic Control, paragraph 2-1-2, "Duty Priority," states, that controllers should "give first priority to separating aircraft and issuing safety alerts as required in this order. Good judgment must be used in prioritizing all other provisions of this order based on the requirements of the situation at hand."

Because there are many variables involved, it is virtually impossible to develop a standard list of duty priorities that would apply uniformly to every conceivable situation. Controllers must evaluate each on its own merit, and when more than one action is required, exercise their best judgment based on the facts and circumstances known to them. According to FAA Order JO 7110.65AA, "That action which is most critical from a safety standpoint is performed first." One way that controllers may do this is to use recognition primed decision making, which allows for quick and effective decision making in complex situations. Recognition primed decision making relies on pattern matching of the current situation with past experiences to identify a course (or courses) of action, and mental simulation of how the course(s) of action will play out (Klein, 1998).

In this accident, when the LC controller recognized that PAT25 and flight 5342 were converging after the conflict alert activated, he should have issued a safety alert to both aircraft; however, the LC controller asked PAT25 if they had the airplane in sight. Under high workload and time pressure, controllers have reduced cognitive capacity for responding to unusual situations (Damos, 1988). The LC controller knew he had to resolve the conflict, but had limited time and capacity to do so. Asking if PAT25 still had the CRJ in sight, then instructing PAT25 to pass behind the CRJ, required less processing load than issuing a safety alert, which should include a clock position or location of the traffic, distance, and an action for the pilot to take.

In November 2016, the NTSB issued Safety Recommendation A-16-51, asking the FAA to provide initial and recurrent training for air traffic controllers on controller judgment, vigilance, and/or safety awareness with specific reference to two midair collisions that occurred in 2015 to be used as case studies.⁵ The FAA responded that, in July 2017, it delivered instruction to controllers on threat and error management (or TEM, which the FAA described as the practice of applying controller judgment, vigilance, and safety awareness) as part of instructor-led recurrent training and stated that the training would also be required training for future controllers. The FAA also stated that they delivered a web-based "Emergencies" training in July 2017 to highlight accidents similar to the two midair collisions cited in the recommendation. After reviewing this training, the NTSB determined that the materials did not highlight the safety issues identified in the 2015 midair accidents, nor did the training provided discuss those or similar accidents as recommended. When the FAA indicated that it did not plan to take further action, Safety Recommendation A-16-51 was classified Closed—Unacceptable Action in 2023.

A vast majority of the time, controllers perform very effectively and reliably; however, human vulnerabilities such as fatigue, increased workload, time pressure, and biases can increase errors. A controller's ability to anticipate, detect, and mitigate risks is essential. TEM provides a strategy to combat these vulnerabilities. TEM is a process for identifying safety risks—threats, errors, and undesired states—in the environment and mitigating those risks. In the context of air traffic control, threats include many of the complexities faced by controllers, such as airspace congestion, pilot errors, terrain or obstacles near the airport, and adverse weather conditions. Some threats can be anticipated, while others occur unexpectedly. Errors are actions or inactions by the controller that result in a deviation from the controller's intention or expectation, such as instructing an aircraft to taxi across an occupied runway, not detecting a pilot readback error, or providing an incorrect clearance, heading, or altitude. Undesired states are operational conditions where the margin of safety is reduced. An undesired state often results from mismanaged or missed threats and errors and is often considered the "last stage" before an accident or inci-

⁵ Additional information about the two accidents and the findings that led to our recommendations may be found, respectively, in the reports of the investigations (ERA15MA259A/B and WPR15MA243A/B) and the safety recommendation report (ASR-16-6).

dent. To restore the margin of safety, a controller must act to mitigate the risk by addressing the undesired state rather than the error (ICAO 2005).

In an observational study performed by the FAA at two air traffic control centers, they found that communication was the most frequent threat identified, resulting primarily from frequency congestion, simultaneous transmissions, incorrect pilot readback, or failure of a pilot to respond. On average, 15 percent of threats lead to an error and 13 percent of errors lead to an undesirable state (Eurocontrol, 2011). A review of United Kingdom incident data identified controller scanning patterns of radar and flight strips to be a primary contributor.

None of the controllers involved in this accident were familiar with the term “threat and error management” during postaccident interviews, nor were they familiar with the concepts that would be included in such training, suggesting that they did not receive training on this method of safety management. The NTSB requested and received controller training materials related to identifying and mitigating risk. Review of this material did not reveal any formal TEM training other than the 2017 workshop, and there was no evidence to indicate that the workshop or the subject matter it contained had been offered in any training since 2017.

Adequate training on the use of TEM can strengthen situation awareness by teaching controllers to continuously monitor their environment to more quickly identify threats; promote team communication to ensure that communications are clear, timely, and assertive; emphasize effective scanning habits; recognize patterns in the development of adverse events; and enhance decision making under stress by developing habits that balance procedural compliance with problem solving to mitigate the risks of threats and errors. TEM would have likely improved the situation awareness of all controllers in this event, which may have allowed for earlier conflict recognition or encouraged the OS to conduct a risk assessment of the steady helicopter traffic and its resulting workload on the LC and ALC controllers.

The NTSB continues to believe that including case studies in initial and annual air traffic controller training and highlighting situations in which controller judgment, vigilance, and safety awareness could be improved would enhance controllers’ ability to identify and manage threats and errors. FAA guidance on the use of good judgment is vague, and case studies provide the opportunity to examine a real chain of events that had resulted in an accident, imparting valuable lessons without exposing participants to the potential risk of adverse outcomes inherent to on-the-job training, which the FAA often relies upon for controller training. The NTSB also believes that providing controllers the opportunity to discuss and practice applying TEM using scenario-based training is critical, as repetition of skills through training leads to automaticity of behaviors (Wickens *et al.*, 2004), thus freeing up working memory.⁶ Automaticity has been demonstrated to improve speed and accuracy (Wickens *et al.*, 2004), situation awareness (Endsley, 2010), and decision making (Haith and Krakauer, 2018). Therefore, the NTSB concludes that *initial and recurrent scenario-based training in threat and error management would help controllers identify and mitigate risks and strengthen situation awareness. [FINDING 24]* Therefore, the NTSB recommends that the FAA develop instructor-led, scenario-based training on threat and error management that trains controllers to continuously monitor their environment to more quickly and accurately identify threats; promote team communication to ensure that communications are clear, timely, and assertive; emphasize effective scanning habits; recognize patterns in the development of adverse events; and enhance decision-making under stress by developing habits that balance procedural compliance with problem solving to mitigate the risks of threats and errors, and provide this training to all air traffic controllers annually. [RECOMMENDATION 2]

TEM training would also benefit controllers performing supervisory duties, who are responsible for overseeing facility operations and making operational decisions, such as when to combine or de-combine control positions, provide additional monitoring of a position or frequency, or rotate controller positions to allow for adequate break opportunities. When making these decisions, OSs must balance safety and risk management with the operational demands of the facility, which are continually changing based on factors such as traffic flow and weather conditions. Other than the list of factors that the accident OS was to consider when combining the HC and LC positions, there was no guidance or tool available in the DCA ATCT SOP to support supervisors in identifying risk, analyzing the potential impact of that risk on individual controllers or the overall operation, prioritizing risks based on likelihood and impact, or developing strategies to reduce or eliminate the identified risks. Additionally, no such tool or guidance was available in the Air Traffic Or-

⁶“Automaticity” refers to highly learned skill performance driven by schemas that does not require much controlled attention.

ganization (ATO) *ATO SMS Manual* or in FAA Order 7110.65, which prescribes air traffic control procedures. There were several factors that increased risk to DCA ATCT operations on the night of the accident, including nighttime conditions, the steady volume of helicopter traffic, and the lack of requested miles-in-trail spacing from Potomac TRACON that resulted in offloading airplanes to runway 33. The NTSB concludes that *a risk assessment or decision making tool would likely have benefited the accident OS in identifying and mitigating the operational risk factors that were present on the night of the accident.* [FINDING 25] A risk assessment tool that could be tailored to the operational needs of each facility would benefit supervisory air traffic control personnel throughout the National Airspace System (NAS). Therefore, the NTSB recommends that the FAA ATO *develop and implement a risk assessment tool for supervisors that incorporates the principles of threat and error management to assist in risk identification, mitigation, and operational decision making.* [RECOMMENDATION 3]

PAT25 Operations

Helicopter Radio Quality

Review of recorded ATC communications on the night of the accident revealed that the transmissions made by PAT25 were accompanied by static interference, which likely made intelligibility of their transmissions difficult for both ATC and other aircraft. The helicopter's CVR also captured a conversation between the pilots earlier in the flight regarding the poor quality of the transmissions received from the controller, many of which were incomplete or broken. Most critically, the portion of the controller's initial traffic advisory regarding flight 5342, in which he stated that the airplane would be "circling runway 33," was not received in its entirety by the PAT25 crew; radio interference characteristic of that experienced by the helicopter crew throughout the flight caused the transmission to sound like, "for runway 33" inside the helicopter, omitting the word "circling."⁷

If the PAT25 crew had heard the word, "circling," it possibly would have served as a salient cue alerting the crew to the airplane's intended flight path and allowed the IP to better anticipate its subsequent movement. Without hearing the word "circling," the IP had to infer the circling pattern from the airplane's stated destination of runway 33. Interviews with other The Army Aviation Brigade (TAAB) pilots indicated that they were not very familiar with fixed-wing approaches to runway 33. Although the IP likely knew that airplanes landing on runway 33 approached from the southeast due to the runway's orientation, and although this implied that traffic landing on runway 33 had to cross over Route 4, anticipating this would have required the IP's deliberate thought and attention. The NTSB concludes that, *due to degraded radio reception, the crew of PAT25 did not receive salient information regarding flight 5342's circling approach to runway 33.* [FINDING 26]

Clear and effective communication is essential for safe air traffic control operations and pilot situation awareness. When radio quality is degraded, pilots and controllers can miss important information, and having to repeat control instructions can result in time lost for other safety-critical tasks. Given the importance of clear radio communications and the evidence presented in this accident, in which poor radio reception quality may have affected the PAT25 crew's awareness of flight 5342's position and intentions, the NTSB recommends that the Department of War Policy Board on Federal Aviation *conduct a study to evaluate the quality of radio transmissions and reception for those aircraft operated within the National Airspace System (NAS) to identify factors that degrade communications equipment performance and adversely affect the safety of civilian and military flight operations.* [RECOMMENDATION 42] The NTSB further recommends the Department of War *implement appropriate enhancements, based on the findings of the study recommended in Safety Recommendation [42], to remediate identified deficiencies in air-ground radio communications performance.* [RECOMMENDATION 43]

Flight Crew Performance

Visual meteorological conditions prevailed in the DCA area on the night of the accident, and the recorded wind about the time of the accident was from 300° at 14 kts with gusts to 23 kts, with the wind direction varying between 270° and 330°. These wind conditions would constitute a right quartering tailwind for the accident helicopter, which was traveling on a southerly course at the time of the collision. The helicopter's CVR captured several comments between the pilots throughout the accident flight regarding the wind and turbulence. The comments suggested that

⁷ This instance of interference was different from the subsequent 0.8 second mic key that resulted in the PAT25 flight crew not hearing "two five pass behind that."

maintaining helicopter trim, altitude, and heading required the flying pilot's close attention.

During a postaccident simulator observation, investigators asked a current and qualified Army pilot with over 600 hours of flight experience in the UH-60L to retrace the accident helicopter's flight path in conditions programmed to simulate those present on the night of the accident. When asked to rate the workload, he reported that he had insufficient capacity for "easy attention" to additional tasks due to the conditions.

It is likely that the accident pilot, as the pilot flying, was experiencing similar workload during the accident flight and was relying on the IP, as the pilot monitoring, to respond to the controller and look for traffic. The IP's prompt reply to the controller that he had the aircraft in sight likely further reassured the pilot that he had visually acquired the airplane, although there was no discussion between the crew to confirm this.

At the time of the controller's initial traffic advisory to PAT25, four other airplanes were approaching runway 1 for landing, and flight 5342 would have appeared among them when viewed from the helicopter. None of these airplanes would have been discernable from PAT25's position at the time of the initial traffic advisory as anything other than a point of light in the distance. These airplanes were about 3, 7.5 (flight 5342), 11, 15, and 20 statute miles from PAT25. In the investigative hearing, an Army standardization instructor pilot stated that, when he was flying over Cabin John, Maryland, at night when wearing NVGs, he was able to see airplanes "lined up" at the Wilson Bridge, a distance of about 14 miles. He also stated that it was difficult to discern any individual aircraft's sequence in a group of airplanes, because the brightest landing or position light did not necessarily correspond to the closest aircraft. NTSB observations of airplane traffic at DCA from the roof of a building on the southwest Washington, DC, waterfront (near the location where PAT25 received the first traffic advisory) confirmed that investigators were able to see airplanes over 16 miles away when using NVGs. It is likely that the accident IP was able to see at least four, and possibly five, airborne targets on the horizon in the direction of the Wilson Bridge when the controller issued the initial traffic advisory. The NTSB visibility study determined that these targets would have appeared as lights in a tight cluster near the horizon south of the airport.

During the NTSB NVG observation, investigators found it difficult to determine which of several tightly spaced approaching airplanes was closest to the Wilson Bridge; thus, the IP's task of identifying the "CRJ just south of the Wilson Bridge," would have been challenging. However, despite the ambiguous visual scene at the time, the IP responded almost immediately that he had the traffic in sight and requested visual separation. The speed of the accident IP's reply suggests a rote response that occurred without positively identifying flight 5342. This also seems likely because the IP never pointed out or discussed the traffic with the pilot, despite extensive discussions of other nearby targets earlier in the flight. This issue will be discussed further in section 0. The NTSB concludes that *the PAT25 IP did not positively identify flight 5342 at the time of the initial traffic advisory despite his statement that he had the traffic in sight and his request for visual separation. [FINDING 27]* The NTSB further concludes that, *with several other targets located directly in front of the helicopter represented by points of light with no other features by which to identify aircraft type, and without additional position information from the controller, the IP likely identified the wrong target. [FINDING 28]*

Several other reasons support the plausibility that the IP's response to the initial traffic advisory was automatic and that he likely did not fully realize the implications of the controller's message. First, the IP was busy. In the 47 seconds before the controller's transmission, the IP made a position report to the controller, instructed the pilot to apply additional right pedal, advised the pilot to begin a turn, corrected the pilot's altitude, and called out a nearby obstacle (a crane). Second, at the time of the initial traffic advisory, the IP knew that the airplane was at the Wilson Bridge, a distance that did not pose an immediate conflict. Finally, the IP understood that accepting visual separation was the most efficient means of transitioning the DCA Class B airspace. This factor will be discussed in additional detail in section 0.

The NTSB visibility study indicated that, from the IP's point of view, the airplane would have been visible in the right windshield for most of the 2 minutes before the collision, except for brief periods when it was obscured by aircraft structure, and would have appeared as a small dot of light low on the horizon among an area of bright cultural lighting. As the helicopter neared the approach path of runway 33, the lights of flight 5342 would have appeared in the helicopter's center windshield, outside the IP's NVG field of view when looking straight ahead. Spotting the airplane in the 30 seconds before the collision would have required the IP to turn his

head to the left and perform a focused visual search of the sky in the approach area for runway 33. That he did not see the airplane at that time suggests that he did not scan the area in the center windshield, which in turn indicates that it did not occur to him that the airplane might be to his left. In the absence of a focused search in the proper area, it is unlikely that the PAT25 pilots would have spontaneously noticed the airplane because it was outside the NVG field of view in an area of very low visual acuity and would have appeared against a complex background of ground lighting. Further, because the airplane was on a collision course with the helicopter, it would have exhibited little relative motion.

The IP's visual search for traffic was likely hindered by the informational content of the LC controller's second traffic callout. If the controller had provided information about the location of the airplane in relation to the helicopter (for example, "ten o'clock"), the IP would have known where to look; however, the controller merely asked if the PAT25 crew had the "C-R-J in sight."

Review of the helicopter's CVR indicated that the IP did not verbally discuss with the pilot the location of flight 5342 after the controller's initial advisory about 2 minutes before the collision nor after the second call from the controller about 20 seconds before the collision. The helicopter CVR recording suggests that his attention was subsequently focused on coaching the pilot on the use of the rudder pedals to compensate for a quartering tailwind and on monitoring radio conversations between the local controller and two other helicopters. His instruction to the pilot to "kinda come left" following his final interaction with the controller just before the collision occurred reinforces the idea that he believed the "CRJ" referenced by the controller was among the airplanes approaching runway 1; however, he was likely unsure which of those airplanes was the airplane in question. Thus, the IP did not positively identify the location of the airplane and he did not communicate his uncertainty about its location to the pilot.

Information provided by the Army indicated that the accident IP and pilot received aircrew coordination training during Army Helicopter Flight School in 2019 and 2021, respectively. The crew also received annual aircrew coordination training. A TAAB standardization pilot stated that the 2024 aircrew coordination training involved the discussion of several class A mishaps (as defined by the Army, occurrences that are fatal or cause permanent disability or more than \$2.5 million in damage) and what each accident crew could have done to improve the situation. Additionally, the accident IP was an aircrew coordination instructor and, according to the B Company safety officer, had provided aircrew coordination training 5 days before the accident.

The Army's *H-60 Series Aircrew Training Manual*, chapter 7, Aircrew Coordination Training, stated that crews "must use clear, concise terms that can be easily understood and complied with in an environment full of distractions," and further defined preferred terms for communicating about traffic. Terms included, "visual" to indicate that a target, traffic or obstacle was seen or identified; "traffic," indicating an aircraft that presented a collision hazard, followed by clock position, distance, and reference to altitude; and "no joy," indicating that a target, traffic or obstacle was not positively seen or identified. As an aircrew coordination training instructor, the accident IP would have been familiar with these terms.

Additional guidance was available in chapter 4, H-60 Crewmember Tasks, which stated that aircrews should "immediately inform other crewmembers of all air traffic or obstacles that pose a threat to the aircraft" using the "clock, altitude, and distance method." Although the IP could have used other methods to point out the airplane to the pilot, he most likely did not do so because he was uncertain about the airplane's position and assumed that it was one of the airplanes in front of the helicopter on approach to runway 1, as evidenced by his lack of a verbal affirmation to the pilot that he had located the airplane.

Another factor that contributed to the PAT25 crew not positively identifying flight 5342 was the lack of an integrated traffic awareness and alerting system in the helicopter that could have provided aural alerts to the crew's headsets and depicted traffic information on an instrument panel display in the pilots' primary field of view as part of their normal instrument scan. Although the crew had the capability to display ADS-B In traffic information on a moving map display on portable tablets using the ForeFlight application, The Army Aviation Brigade (TAAB) pilots told investigators that they did not typically monitor their tablets during low-level operations on the DC helicopter routes because the flying task was too demanding. They also stated that any aural alerts from the device could not be heard because of the high level of ambient noise in the helicopter and because their helmets were not equipped to receive audio from the tablets.

In the absence of an accurate mental model of the airplane's expected flight path to runway 33, the lack of instruction from the controller to direct his visual scan,

and without an integrated traffic awareness system, the IP's baseline expectations about traffic flow in the DCA area likely drove his visual search. Aggregated flight tracking data from the FAA showed that, in the year before the accident, only 5–7 percent of northbound arrivals at DCA had landed on runway 33. Anecdotal statements from other TAAB pilots indicated that some had never encountered an airplane landing on runway 33 while traveling on Route 4.

Thus, the more common flight path for airplanes during a north operation at DCA was, by far, a straight-in approach to runway 1, and the IP's baseline expectation would have been for conflicting traffic to approach from the south for runway 1 (to the right of the helicopter) rather than from the southeast (to the left of the helicopter) for runway 33. The numerous airplanes on approach for runway 1 likely reinforced this expectation, making it likely that the IP considered one of them as the conflicting traffic. This scenario would be consistent with his statement to the pilot just before the collision, "alright kinda come left for me. . . I think that's why he's asking," because moving left would have increased the helicopter's separation from traffic approaching runway 1.

Expectations drive attention, and people sometimes have difficulty noticing a variance between what they usually see and the actual state of things. When expectations are strong, people tend to seek out and attend to confirmatory visual information while overlooking indications that the current situation is different. This phenomenon, known as expectation bias, not only influences perception in the present, it also influences perception of past events by promoting recollections that conform more closely to typical patterns. Expectation bias is a well-known vulnerability in human performance. In this case, expectation bias likely played a role in the IP's ineffective scan following the controller's traffic callouts. The NTSB concludes that *interference that obscured the controller's "circling to" call, the microphone keying that blocked the PAT25 crew from receiving the instruction to "pass behind," ambiguous visual cues, and the lack of an integrated traffic awareness and alerting system likely reinforced the PAT25 crew's expectation bias that the airplane was among the traffic approaching runway 1 and did not pose a conflict. [FINDING 29]*

It could not be determined whether the PAT25 pilots received specific training addressing DCA runway use and traffic patterns, including fixed-wing approach and departure procedures. However, given the proximity and routine interaction of published helicopter routes with DCA fixed-wing traffic flows, additional airspace-specific training on DCA arrival and departure corridors and runway configurations would likely have improved the PAT25 crew's understanding of the risks inherent in the Army's routine mission-related operations in this environment. Therefore, the NTSB concludes that *the absence of documented training on DCA fixed-wing procedures and the mixed-traffic operating environment represented a safety vulnerability for Army flight crews operating in the DCA Class B airspace. [FINDING 30]* As a result, the NTSB recommends that the U.S. Army *revise training procedures for flight crews assigned to operate in the Washington, DC, area to ensure that they receive initial and recurrent training on fixed-wing operations at DCA, including approach and departure paths, runway configurations, and the interaction of those traffic flows with published helicopter routes. [RECOMMENDATION 34]*

Helicopter Altimetry

Aircraft pitot-static systems and barometric altimeters have defined performance specifications. These include allowable instrument errors, which are tolerances for allowable errors after manufacture and during operation. They also include tolerances for position errors, which are errors caused by external aerodynamic effects from the airflow over the aircraft and (on helicopters) the main rotor downwash. Although cockpit instruments are designed to be accurate, in general it is not feasible to design barometric altimeters to be perfectly accurate in all flight conditions or throughout their entire service life. Older design mechanical barometric altimeters, such as those on the accident helicopter, have multiple types of allowable errors that can accumulate while still remaining within design and performance criteria. Additionally, changes to the aerodynamic shape of the aircraft, such as adding external stores support system (ESSS) tanks, change the pressure effects on the pitot-static system and can increase the position error. Altimeter testing showed that the 100-ft pressure altitude discrepancy seen in the flight data recorder data for the accident flight was observed on three other UH–60L helicopters operated by the 12th Aviation Battalion. These altimeter testing results also showed that the pressure altitude data recorded by the helicopters' FDRs, when corrected for local conditions, was representative of what was indicated on the right side altimeter. Therefore, the FDR pressure altitude data for the accident helicopter, when corrected for local conditions, was likely representative of what was indicated on the IP's barometric altimeter during the accident flight.

The allowable tolerances are additive, with the total error having the potential of exceeding 100 ft. These tolerances are not unique to military aircraft; they apply to civil aircraft as well. While a difference of 100 ft would have little consequence at higher altitudes, given the low altitudes prescribed along portions of the DC helicopter routes and Army procedures that stated that flight should be conducted no lower than 100 ft agl, such a discrepancy resulted in the increased likelihood of altitude exceedances along these routes.

Although the instrument error specific to the accident helicopter could not be determined, disassembly and examination of the internal components did not reveal any anomalous wear that would have prevented normal operation. Additionally, the CVR recording did not capture any conversations between the flight crew regarding any malfunction of the barometric altimeters during the accident flight. It is likely that the behavior of the accident helicopter's static system position error and barometric altimeter instrument error were similar to that observed on other 12th Aviation Battalion UH-60L helicopters. The NTSB concludes that, *due to additive allowable tolerances of the helicopter's pitot-static/altimeter system, it is likely that the crew of PAT25 observed a barometric altimeter altitude about 100 ft lower than the helicopter's true altitude, resulting in the crew erroneously believing that they were under the published maximum altitude for Route 4. [FINDING 31]*

The accident helicopter's FDR should have contained a radio keying parameter; however, these data were not present on the accident helicopter's recorder. The radio keying parameter is needed to synchronize timing between the FDR and CVR, and accurate parametric data from the FDR is crucial for accident investigation purposes as well as for flight operations quality assurance (FOQA) programs used to support a safety management system (SMS). The investigation found that after the initial installation of the helicopter's FDR, there was no scheduled recurrent task to verify the continued accuracy of the recorded data. FAA Advisory Circular (AC) 20-141B recommends that operators of aircraft equipped with a digital FDR perform a "reasonableness check" at an interval not to exceed 18 months (FAA, 2010). The NTSB concludes that *a recurrent task to verify the continued accuracy of recorded flight data for U.S. Army aircraft would help ensure the data integrity needed to support quality assurance and safety programs and accident investigations. [FINDING 32]* Therefore, the NTSB recommends that the U.S. Army develop and implement a recurring procedure, at an interval not to exceed 18 months, to verify the continued accuracy of recorded flight data. *[RECOMMENDATION 35]*

The Washington, DC, helicopter route altitudes, particularly the low altitudes specified for Routes 1 and 4 in the vicinity of DCA, did not account for the errors inherent to barometric altimeters, nor did they account for human error tolerances—both Army standards and FAA commercial pilot standards require pilots to maintain altitude within ± 100 ft while in flight. Review of aggregated aircraft flight track information for helicopters on the DC helicopter routes from January 1, 2024, through January 30, 2025, indicated that helicopters regularly exceeded published maximum route altitudes. For the northern segment of Route 4, which included the area of the collision, of the 523 flights analyzed, 260 flights (49 percent) were identified as exceeding route altitude limitations at some point during the flight. Had the error tolerances of barometric altimeters been considered during design of the helicopter route maximum altitudes, the incompatibility of a 200-ft ceiling and barometric altimeter errors may have been identified. Although the data did not attribute an exact number or rate of altitude exceedances specifically to Army helicopters, the data indicated that military users comprised about 79 percent of the helicopter flight track data; therefore, it is reasonable to assume that at least some Army helicopters were exceeding maximum route altitudes. The NTSB concludes that *the FAA and the Army failed to identify the incompatibility between the helicopter routes' low maximum altitudes and the error tolerances of barometric altimeters, which contributed to helicopters regularly flying higher than published maximum altitudes and potentially crossing into the runway 33 glidepath. [FINDING 33]*

Despite helicopter manufacturer flight testing that showed increased barometric altimeter position errors with the ESSS installed, the Army's UH-60L operator's manual did not contain an altimeter correction chart for the ESSS configuration. The lack of this information in the operator's manual would result in UH-60L pilots being unaware that the ESSS could result in a greater-than-anticipated position error in flight. Neither maintenance checks nor the pilot's preflight check against local field elevation would detect this error, as these checks are not performed with the helicopter's main rotor turning.

The U.S. Army issued Standardization Communication message 25-02 to inform pilots of the potential for increased position error in UH-60 helicopters equipped

with ESSS.⁸ This message included instructions to maintain a minus 50-ft margin when flying with a clearance with a maximum altitude to ensure the maximum altitude is not exceeded. However, at the time of this report, the U.S. Army has not incorporated information into the UH-60 series operator's manuals to inform pilots of the increased position error with the ESSS configuration. The NTSB concludes that *pilots need all available information on the potential total error, allowed by design, that could occur in flight on an airworthy barometric altimeter.* [FINDING 34] Therefore, the NTSB recommends that the U.S. Army *incorporate information within the appropriate operator's manual for all applicable aircraft on the potential total error allowed by design that could occur in flight on an otherwise airworthy barometric altimeter, including the increased position error associated with the ESSS configuration.* [RECOMMENDATION 36]

Helicopter Transponder

Postaccident examination of the helicopter's transponder revealed that it was transmitting the incorrect aircraft address during the accident flight due to a broken solder connection, which was the result of an incomplete bond at the time of the unit's manufacture. This incorrect address was not a factor in the accident flight, because no other aircraft in the geographic area was transmitting an identical address, but it could pose a safety risk if two aircraft in the same vicinity were to broadcast the same address.⁹ The examination also revealed that the transponder Automatic Dependent Surveillance—Broadcast (ADS-B) squitter was off and the time source was incorrectly set, which prevented the transponder from broadcasting ADS-B Out. Given that there was no historical ADS-B data for the accident helicopter following the installation of the transponder in April 2023, it is likely that either the squitter or time source setting, or both, were incorrectly set at the time of installation. A functional check of the transponder that was required after its installation should have detected that ADS-B Out was not broadcasting. Therefore, the NTSB concludes that *the Army's post-installation functional check of the transponder on the accident helicopter was insufficient to detect that it was not broadcasting ADS-B Out.* [FINDING 35] Inspection of other helicopters from the 12th Aviation Battalion found incorrect time source settings on several aircraft equipped with APX-123A transponders, resulting in the Army directing a one-time inspection of transponders to verify ADS-B Out functionality. It could not be determined how or why the time source setting was changed following installation of the transponders. At the time of the accident, the Army had no established recurrent procedure for verifying transponder ADS-B functionality or confirming that it was transmitting the correct address. The NTSB concludes that *the Army's lack of a recurrent transponder inspection procedure resulted in the incorrect aircraft address being transmitted by the accident helicopter's transponder, and the incorrect ADS-B settings on several other helicopters being undetected.* [FINDING 36] As of the date of this report, the Army has not yet developed a recurring procedure for this task, and it is possible that future ADS-B Out or aircraft address issues could go undetected. Therefore, the NTSB recommends that the U.S. Army *develop and implement a transponder inspection procedure on all aircraft with transponders capable of transmitting Mode S and ADS-B and operated in the NAS, at least annually and upon each aircraft's entry into service in the NAS, that ensures*

- 1) *the transponder ADS-B settings are correct,*
- 2) *the transponder is transmitting ADS-B, and*
- 3) *the transponder is transmitting the correctly assigned address.*

[RECOMMENDATION 37]

Additionally, the NTSB concludes that, *because the APX-123A transponder is designed for use on multiple aircraft platforms, it is possible that incorrect settings may be present on other aircraft used throughout the Department of War armed services.* [FINDING 37] Therefore, the NTSB recommends that the Department of War Policy Board on Federal Aviation *require the Department of War to verify on all aircraft with transponders capable of transmitting Mode S and ADS-B and operated in the NAS, at least annually and upon each aircraft's entry into service in the NAS, that*

- 1) *the transponder ADS-B settings are correct,*
- 2) *the transponder is transmitting ADS-B, and*

⁸The message was signed by the Director of the U.S. Army Aviation Center of Excellence's Evaluation and Standardization Directorate on August 5, 2025.

⁹Although there is a very low probability that two aircraft in the same geographical vicinity and covered by the same radar may broadcast the same aircraft address, the scenario is not impossible.

3) the transponder is transmitting the correctly assigned address.
[RECOMMENDATION 44]

Flight 5342 Operations

FDR and CVR information from the airplane indicated that the airplane's control columns rapidly moved aft and the crew indicated surprise and alarm about 1 second before the impact; these actions are consistent with the crew of flight 5342 not detecting the helicopter until it was too late to avoid a collision. The limitations of see-and-avoid, discussed in section 0, likely explain the crew's late detection. Factors particularly relevant in this case include a complex background of dense cultural lighting behind the helicopter until about 10 seconds before impact, which would have made the helicopter's external lighting inconspicuous, and the helicopter's minimal relative motion in the flight 5342 crew's field of view, which also would have made it difficult to spot. The crew's moderate to high workload during the final stage of the circling approach, as shown in simulator studies conducted as part of this investigation, likely also reduced the odds of the flight crew detecting the helicopter.

The CVR recording indicated that the crew did not verbally communicate about the traffic alert and collision avoidance system (TCAS) traffic advisory (TA) they received 19.2 seconds before the collision. Guidance provided by PSA Airlines did not specify standard callouts pilots were required to make in response to a TA. PSA's *Flight Operations Manual (FOM)* stated that, upon receiving a TA, a crew should "attempt to see the reported traffic" and "should not maneuver based on a TA alone." The *FOM* referred to FAA AC 120-55, which contained guidance indicating that crews should "respond to TAs by attempting to establish visual contact with the intruder aircraft and other aircraft which may be in the vicinity." The AC also included the statement, "coordinate to the degree possible with other crewmembers to assist in searching for traffic. Do not deviate from an assigned clearance based only on TA information." Thus, crew members were advised to search for the conflicting traffic and coordinate with each other as workload allowed, but were not permitted to maneuver in response to a TA without seeing a target that posed a collision risk.

The TA aural alert activated when the airplane was 1.05 nm from the helicopter and as the captain was turning the airplane left to align it with the runway 33 final approach path about 450 ft radio altitude. Simulator observations with current and qualified PSA CRJ pilots indicated that this was a visually demanding task that required the captain to control the airplane's lateral path, thrust, airspeed, and glide-path (as indicated by the precision approach path indicator or PAPI). It is unlikely that he had spare capacity to perform an extensive visual search for traffic at this time. The FO was also performing visually demanding tasks, such as monitoring the airplane's lateral alignment, glidepath, and energy state to ensure that the approach remained stable, and monitoring the position of an airplane that had been cleared for takeoff on runway 1 to ensure that it would not pose a conflict. That airplane was still on or near the surface of the runway at the time the TA occurred, and it did not cross the centerline of runway 33 (thus no longer posing a conflict) until 4 seconds after the TA. The FO also would have been required to adjust the airspeed indicator bug for the airplane's final approach speed as soon as the captain had aligned the airplane with the runway. Thus, both pilots were busy and had limited opportunity to search for traffic in response to the TA.

If, despite this workload, the FO had promptly reacted to the TA, it is likely that he would have glanced at the multifunction display (which was set to show traffic within a 5 nm radius) to determine the traffic's location. This would have revealed a traffic icon 1 nm mile in front of the airplane at a relative altitude of -200 feet. He would then have looked directly in front of the airplane. For 9 seconds after the TA occurred, the helicopter was surrounded by, and likely indistinguishable from, a dense array of both steady and flashing lights that stretched along the horizon to the right of the airport. Given the complexity of this background and the helicopter's lack of apparent motion when viewed from the airplane, it is likely that the FO would have been unable to spot it during a brief search. Even if the crew was unsuccessful in visually locating the helicopter, they were trained not to maneuver unless they received an resolution advisory (RA). Many of the PSA pilots interviewed were unaware of the altitude below which RAs were inhibited.

It is also possible that the radio transmissions audible to the flight crew reduced the extent of their visual search for the helicopter. Although the crew could not hear PAT25's transmissions to the controller, they could hear the controller's transmissions to the helicopter. These transmissions would have been reassuring if the crew heard them and recognized their airplane as the "CRJ" being referenced. One second before they received the TA aural alert, they would have heard the LC con-

troller transmit, “PAT two five you got the C–R–J in sight?” followed by, “PAT two five pass behind the C–R–J.” A few seconds later, they would have heard the LC controller transmit “vis sep.” The crew of flight 5342 undoubtedly understood the terminology associated with approving visual separation. Thus, these transmissions (if listened to) would have indicated to the crew that the helicopter had their airplane in sight and intended to avoid them. The fact that the controller did not issue them any advisories or instructions would also have been reassuring, because it would have indicated that the responsibility for deconfliction had been assigned to the helicopter. If heard and attended to, the radio communications audible to the flight 5342 crew could have reassured them that the helicopter was not a significant threat and that they could focus their attention on completing their approach and landing. However, because the CVR did not contain any discussions between the crew about these transmissions or the potential of a conflict with the helicopter, their level of awareness of the transmissions and their involvement in the traffic conflict could not be determined.

The NTSB concludes that *the crew of flight 5342 did not see the helicopter until it was too late to avoid a collision because of the high workload imposed during the final phase of their approach, and due to the helicopter’s low conspicuity and lack of apparent motion.* [FINDING 38]

DCA Air Traffic Control Tower Facility

Traffic Management, Volume, and Flow

Postaccident interviews and investigative hearing testimony provided by DCA ATCT and Potomac terminal radar approach control (TRACON) personnel, as well as FAA Air Traffic Organization (ATO) leadership, indicated that managing the flow of traffic at DCA had been a longstanding challenge that could be attributed to several factors, one of which was DCA’s airport arrival rate (AAR).

Potomac TRACON and DCA ATCT personnel stated in interviews and investigative hearing testimony that managing the rate of arrivals into DCA while providing adequate MIT spacing between arriving aircraft was a continual issue. Potomac TRACON and DCA ATCT had agreed that aircraft would arrive at the runway threshold at DCA with a spacing of 4 miles in trail (MIT); however, the FAA found through a systematic review conducted after the accident that DCA ATCT controllers were provided with less than 4 MIT about 40 percent of the time. This spacing was critical because it allowed adequate time for departures to take place between arriving aircraft, thereby reducing backups on DCA’s limited taxiway surface area.

In 2023, Potomac TRACON requested a decrease to the existing AARs due to changes to the mix of aircraft types serving DCA over the previous decade, flight schedule increases that did not allow for use of reduced separation of aircraft on final approach, airspace and weather constraints, and an inability to regulate traffic flow based on time, also referred to as “metering.” The Potomac TRACON air traffic manager (ATM) stated in postaccident interviews that the request to reduce DCA’s AARs was not forwarded to higher levels because it was “too political.” The FAA’s denial of the documented request to change the AAR at DCA without feedback to the requester effectively eliminated what could have been an important operational safety improvement and violated their established review process.

Another factor that DCA ATCT controllers cited as contributing to traffic complexity was that airlines often grouped their allotted departures or arrivals for a given 2-hour period into the last 30 minutes of the first hour and the first 30 minutes of the second hour rather than spreading them evenly throughout the hour, which resulted in times of “compacted demand” on controllers to accommodate traffic surges. The NTSB concludes that *times of compacted demand as a result of air carrier scheduling practices increased operational complexity and required mitigations by controllers to maintain spacing and surface movement.* [FINDING 39] Other airports, including New York’s LaGuardia Airport, have mitigations in place to prevent this practice through Federal regulations contained in 14 CFR 93 Subpart K, which prescribes air traffic rules for aircraft operating to and from high density traffic airports. The regulation specifies the number of operations that can occur during any 30-minute period or any two consecutive 30-minute periods. In order to alleviate the effects of compacted demand at DCA, the NTSB recommends that the FAA *initiate rulemaking in 14 CFR Part 93 Subpart K, High Density Traffic Airports, that prescribes air carrier operation limitations at DCA in 30-minute periods, similar to those imposed at LaGuardia Airport, to ensure that the airport does not exceed capacity and to mitigate inconsistent air carrier scheduling practices.* [RECOMMENDATION 4]

A time-based flow management (TBFM), or metering, system had been in place at Potomac TRACON for at least 10 years before the accident and controllers had been trained in its use; however, the system was never activated. The core function

of TBFM is the ability to schedule aircraft to reach a defined point at a specified time, creating a time-ordered sequence of traffic.

According to testimony provided in the investigative hearing by the FAA’s Washington District traffic management officer, TBFM would allow for better management of the compacted demand at DCA. A representative of American Airlines testified that TBFM was in use at several of the airline’s other hub airports and that it “smooths out the volume” of traffic while providing more accurate MIT. Information provided by the FAA indicated that, as of February 2025, the TBFM project at Potomac TRACON was on hold until further notice due to budget constraints. A manager at Potomac TRACON testified that they had “not seen it yet, and it is supposed to come in March of [20]26.”

In interviews with DCA ATCT personnel, as well as review of ATC audio and personal observation by investigators, “offloading” arrivals to another runway was common practice at DCA to build spacing between aircraft, particularly during times of heavier traffic flow and when the airport was in a north configuration (airplanes landing on runway 1).

The DCA ATCT operations manager at the time of the accident stated that controllers routinely offloaded traffic on approach to runway 1 by having them circle to runway 33. Although other methods were available to DCA controllers to build additional spacing between aircraft, the operations manager stated that offloading traffic to runway 33 was a preferred mitigation at DCA ATCT because it continued the flow of arrivals and departures during compacted demand times.¹⁰ In contrast, having an airplane decrease airspeed on final approach to increase separation would cause traffic buildup behind that aircraft that would also affect Potomac TRACON.

Many of the factors that contributed to DCA’s uniquely complex traffic situation were present on the night of the accident and contributed to high controller workload. The LC controller stated in a postaccident interview that a traffic “push,” or compacted demand, had begun about 2000 that night, but he believed that traffic was decreasing around the time of the accident. He also stated that the tower “wasn’t getting spacing on final” at the time of the accident, referring to the 4 MIT agreement with Potomac TRACON. Further, he had traffic on the ground waiting to depart. As a result, he was asking pilots of aircraft inbound for landing whether they could switch to runway 33 as a means of increasing space between arrivals to allow for departures. The NTSB concludes that *DCA ATCT routinely received less than the requested miles in trail spacing from Potomac TRACON, which increased controller workload by requiring them to generate additional spacing to prevent delays or gridlock. [FINDING 40]* The NTSB also concludes that *the practice of “offloading” arrival traffic on approach to runway 1 by asking pilots if they could accept a circling approach to runway 33 was a routine mitigation strategy for DCA controllers to generate spacing that was not provided by Potomac TRACON. [FINDING 41]* The NTSB further concludes that *TBFM, or metering, would provide Potomac TRACON and DCA ATCT with a consistent flow of traffic with more accurate spacing and greater predictability, thereby reducing controller workload. [FINDING 42]*

The NTSB recognizes that, according to the FAA, Potomac TRACON began limited operational use of TBFM in October 2025; however, TBFM had not yet been implemented at the Potomac TRACON or the DCA ATCT at the time of the accident, and full implementation and operational use of TBFM in both facilities is expected by March 2026. Therefore, the NTSB recommends that the FAA *fully implement operational use of the TBFM system at Potomac TRACON and its associated air traffic control towers. [RECOMMENDATION 5]* The NTSB also recognizes that FAA also made a temporary adjustment to the AAR following this accident, which remains in effect as of the date of this report. In order to fully address the traffic management, volume, and flow issues in the DCA airspace, the NTSB recommends that the FAA *reassess the DCA AAR with special consideration to its airspace complexity, airfield limitations, mixed-fleet operations, and traffic volume. [RECOMMENDATION 6]*

The NTSB is concerned also that the spacing issue observed in this accident may exist elsewhere in the NAS. Therefore, the NTSB also recommends the FAA *require each Class B or Class C ATCT facility to evaluate its existing MIT procedures or agreements to ensure that the spacing provided is appropriate for operational safety, and make the results publicly available. [RECOMMENDATION 7]*

During the course of the investigation, the NTSB learned that the DCA ATCT had been downgraded from a level 10 facility to a level 9 facility in 2018. Facility level

¹⁰ During the NTSB’s investigative hearing, the ATO’s acting deputy COO testified that other methods included slowing aircraft after check-in on final approach, instructing aircraft to perform S-turns on final approach, and “demand[ing]” that Potomac TRACON provide a certain MIT interval between aircraft, if needed.

is a factor that determines controller compensation, and controllers stated that the downgrade at DCA ATCT impacted employee morale and resulted in the loss of experienced controllers, who left for higher paying facilities. Despite several requests from the NTSB during this investigation, the FAA did not provide documentation of the criteria or formula it used in its determination to downgrade DCA ATCT's facility level.

The NTSB is concerned about the impacts of the downgrade on the DCA ATCT's long-term facility health and by the FAA's lack of transparency regarding the metrics used to define facility levels throughout the NAS. Although the DCA ATCT's facility level downgrade could not be directly correlated to the circumstances of this accident, the NTSB concludes that *DCA ATCT has significant airspace, airfield, mixed fleet, and operations complexities that appear to be inconsistent with its current facility level classification. [FINDING 43]* Therefore, the NTSB recommends that the FAA *define objective criteria for the determination of air traffic facility levels considering traffic and airspace volume, operational factors unique to each facility, and cost of living. [RECOMMENDATION 8]* Using this criteria, *determine whether the classification of the DCA ATCT as a level 9 facility appropriately reflects the complexity of its operations. [RECOMMENDATION 9]*

Visual Separation

The FAA's Pilot-Controller Glossary states that visual separation is a means employed by ATC to separate aircraft in terminal areas and enroute airspace in the NAS. In the terminal, or airport, area, visual separation can be either tower-applied, in which the tower controller sees the aircraft involved and issues instructions to effect separation; or pilot-applied, in which a pilot sees the other aircraft involved and provides their own separation by maneuvering as necessary to avoid it. Visual separation does not require a certain minimum separation distance between aircraft; therefore, pilots are permitted to determine their own spacing. In the absence of visual separation at DCA, Class B radar separation minimums would apply, which require 1 1/2 mile lateral or 500 ft vertical distance between IFR (airplane) and VFR (helicopter) traffic.

Postaccident interviews with controllers and testimony provided in the NTSB investigative hearing revealed that visual separation was the primary means of separating helicopter and fixed-wing traffic in the DCA area when weather conditions permitted. One controller testified that the use of visual separation was "paramount" to efficient operations at DCA given the volume of traffic and the complexity of the airspace. Due to the proximity of the helicopter routes and zones to the approach and departure corridors for fixed-wing traffic, applying standard Class B separation minimums at all times would likely require controllers to frequently issue holds to helicopter traffic and, depending on traffic priority, could also result in controllers frequently issuing go-around instructions to fixed-wing traffic, all of which would increase controller workload and contribute to additional airspace congestion and traffic complexity. To avoid these difficulties, controllers were motivated to provide a traffic advisory and authorize visual separation for helicopters transiting DC airspace as early as possible, and interviews with controllers indicated that this practice had become the norm.

Previous external compliance verifications (ECVs) at the DCA ATCT identified issues such as shortcutting standard phraseology, instances in which the HC position was combined or de-combined without required documentation in the facility logs, and occurrences in which helicopters flew in close proximity to arriving fixed-wing aircraft and traffic information was not issued to either aircraft. The team also observed occasions where fixedwing traffic was not advised regarding helicopters operating in close proximity to the final approach course.-wing traffic was not advised regarding helicopters operating in close proximity to the final approach course.

During a November 2024 ECV, the ECV team noted "a few occurrences" in which the LC controller advised aircraft on final approach that helicopters operating near the final approach course had them in sight and were maintaining visual separation. However, at the time these transmissions were made, the helicopter had not reported the traffic in sight and had not been advised to maintain visual separation. The LC controller appeared to be anticipating that the helicopters would visually acquire the arrival traffic, report traffic in sight, and then be instructed to maintain visual separation.

A retired FAA air traffic specialist who was subsequently employed as a contractor to perform ECVs at DCA ATCT stated that, during his 9 months at the facility, he had concerns about potential conflicts with the helicopter routes, which he raised to the ATM at the time.

In the NTSB's investigative hearing, the DCA ATCT operations manager (OM) at the time of the accident stated that the controllers at DCA would "just make it work" by utilizing all available tools to compensate for the traffic volume.

Because DCA was a high volume, complex airport with "not a lot of real estate," controllers had to "keep things moving" in order to provide safe and efficient service. He stated that this "make it work" mentality had become normalized at DCA ATCT before the accident and that, "it can be taxing on a person. . . constantly having to give, give, or push, push, push in order to efficiently move traffic." He further stated that, "Whenever the controllers at DCA just make it work, they are going above and beyond to approach the limit of the rules and regulations. They're pushing the limits of what can be done to safely and efficiently move the aircraft and/or helicopters at DCA. . . you're pushing the line."

The issues identified by previous ECVs at DCA should have served as symptoms of a controller workforce under constant pressure to "make it work." Controllers relied on the use of pilot-applied visual separation in order to accommodate helicopters operating on the routes and zones while moving a high volume of aircraft through complex airspace into and out of an airport with limited surface area. The NTSB concludes that *the FAA ATO failed to recognize ECV results as indicators of systemic traffic management, volume, and flow issues at DCA for which controllers were required to compensate. [FINDING 44]*

Interviews and testimony from helicopter operators in the DCA area indicated widespread understanding that visual separation allowed more efficient traffic flow and that requesting and receiving approval for visual separation was normal practice. Helicopter operators reported receiving traffic advisories at distances that made it difficult to identify specific targets. Nevertheless, they were generally comfortable using pilot-applied visual separation, particularly on clear nights and when using NVGs, which allowed aircraft lights to be seen from long distances.

The expectation that helicopter crews would maximize use of visual separation to facilitate traffic flow likely promoted a pattern of automatic responses when flight crews received traffic advisories. An Army standardization instructor pilot stated in a postaccident interview that he sometimes responded to traffic advisories before visually acquiring the traffic if he knew that it was far away and was not an imminent threat. The accident IP's significant experience flying on the DC helicopter routes and the speed of his reply to the controller's traffic advisory support the likelihood that he had also developed this habit. This practice was contrary to FAA requirements that a crew should visually identify aircraft before requesting visual separation.

The acceptance of a gap between typical operating practices and formal operating requirements has been described as normalization of deviance. Coined after the Space Shuttle Challenger disaster in 1986, "normalization of deviance" refers to the gradual shift away from standards or acceptable practices (Vaughan 1996). Such deviations originate from frontline personnel trying to manage conflicting goals, such as maximizing production, protection, and minimizing workload (Rasmussen, 1999). When such gaps develop, they can become incrementally larger if they persist without negative consequences, and this can lead to systemic safety vulnerabilities.

In this case, controller expectations that a helicopter crew would have a specific aircraft in sight before requesting and receiving approval for visual separation were not necessarily valid. As a result, there was potential for controllers to overestimate the level of traffic awareness a helicopter crew had, following a traffic advisory, and to underestimate the level of information and assistance they might subsequently require to ensure collision avoidance.

The NTSB concludes that *the longstanding practice of relying on pilot-applied visual separation (see-and-avoid) as the principal means of separating helicopter and fixed-wing traffic in the Washington, DC, area by DCA tower, the Army, and other helicopter operators led to a drift in operating practices among controllers and helicopter crews that increased the likelihood of a midair collision. [FINDING 45]*

There are inherent limitations to seeing and avoiding other airborne traffic. These include the limited field of view from the cockpit, including the obscuring effects of aircraft structures or, in this accident, the limited field of view provided by NVGs. Even the positioning of aircraft in a pilot's field of view near the cockpit structure reduces the odds of detection due to the effect of nearby objects on visual accommodation (Chong and Triggs 1989).

In this accident, both aircraft were located adjacent to or within a field of background lights when viewed from the other's perspective. Aircraft superimposed on or adjacent to complex backgrounds are more difficult to detect (Steedman and Baker 1960). Although aircraft lighting may improve the conspicuity of aircraft flying at night, the effect of a complex background of ground lighting may offset the advantages of such lighting. An Army standardization instructor pilot testified dur-

ing the investigative hearing that, although it was easy to identify airplanes on approach to runway 1, it would be much more difficult to maintain visual contact with an airplane circling for runway 33, particularly as the helicopter descended to 200 ft. He also testified to the challenges inherent to NVG use, including the limited field of view and the difficulty in identifying aircraft operating near or below the horizon against dense cultural lighting.

Attentional limitations also play a role. Research indicates that fixed-wing pilots spend, on average, 30 percent to 35 percent of their time scanning outside, and even less time when engaged in tasks that demand their attention inside the cockpit (Wickens *et al.*, 2001). When pilots do scan outside for traffic, they are biased toward the area directly in front of them, or toward outside features most pertinent to their current task (Colvin *et al.*, 2005). Aircraft on a collision course lack relative motion in a pilot's field of view, which makes them less likely to attract visual attention because peripheral vision is more sensitive to motion than fine detail (Gibb *et al.*, 2010).

These and other factors contribute to delays in detection that can lead to a midair collision when crews are visually self-separating. Research involving actual test flights indicates that most unalerted visual acquisitions of conflicting aircraft occur after two aircraft have closed to within 1 to 2 nm of each other. Mathematical modeling of the probability of visual acquisition based on these studies has indicated that, for a closure rate of 120 kts, the probability of detecting an intruder aircraft in the daytime does not reach 85 percent until 12 seconds before a collision (Andrews 1991). In this accident, CVR and FDR data indicate that the crew of flight 5342 detected the helicopter about 1 second before the collision, and that the crew of PAT25 had no awareness of the impending collision.

The NTSB has highlighted the limitations of see-and-avoid in previous investigations and argued that these limitations cannot be overcome by recommending greater pilot diligence and scanning for traffic. Traffic awareness and alerting technologies with aural alerts, however, can significantly improve detection and reaction times (Andrews 1991). This underscores the importance of such technology in airspace with a high concentration of commercial air traffic.

This accident, in which neither the crew of PAT25 nor the crew of flight 5342 detected each other in time to avoid a collision, amplifies the serious inherent limitations of the see-and-avoid concept, a primary means of separation between helicopters and commercial airplanes at DCA. The NTSB concludes that *reliance on pilot-applied visual separation (see-and-avoid) as a primary means of separating mixed traffic introduced unacceptable risk to the DCA Class B airspace. [FINDING 46]*

Although this accident occurred in the uniquely complex DCA Class B airspace, the underlying limitations of pilot-applied visual separation are inherent to human performance and are present wherever see-and-avoid is used as a means of aircraft separation in the NAS. Because controllers nationwide routinely apply visual separation in mixed-traffic environments, mitigating this risk requires consistent, systemwide training that emphasizes the limitations of see-and-avoid and the conditions under which its use may introduce unacceptable risk. Therefore, the NTSB recommends the FAA *develop a new and comprehensive instructor-led, scenario-based training on the proper use of visual separation, both tower-and pilot-applied. This training should include information on the inherent limitations of see and avoid, responsibilities when applying visual separation, and guidance for controllers on factors, such as current traffic volume, workload, weather or environmental factors, experience, and staffing, that should be considered when applying visual separation. Require this training for all controllers and include on a recurrent basis thereafter in annual simulator refresher training. [RECOMMENDATION 10]*

Radio Frequency Management

The DCA air traffic control tower utilized a discrete frequency for communicating with helicopters to avoid interference and frequency congestion. When the HC and LC positions were combined, it was normal practice to keep helicopters on their own frequency rather than directing all traffic to use the same frequency. This also made the process of de-combining the helicopter and local control positions easier. When the HC and LC positions were combined, all pilots could hear all transmissions made by the controller; however, the use of separate frequencies meant that transmissions made from helicopters were not audible to airplanes and transmissions made from airplanes were not audible to helicopters. Pilots indicated that there were advantages and disadvantages to this practice. The advantages included reducing non-pertinent transmissions that could impede communication between crewmembers and alleviating frequency congestion; however, pilots reported that being able to hear transmissions from all other aircraft would be an asset to flight crew

situation awareness. Had the accident crews been able to hear each other's transmissions to the controller, PAT25 would have heard flight 5342's acceptance of the runway 33 circling approach and their subsequent readback of the landing clearance. Flight 5342 would have heard PAT25's position report at the Memorial Bridge. These transmissions contained additional salient information regarding each aircraft's position and intentions, which may have increased the crews' awareness of the potential for a traffic conflict. The NTSB concludes that *DCA tower's procedure of maintaining a discrete helicopter frequency when the local and helicopter control positions were combined decreased overall situation awareness for pilots operating in the area. [FINDING 47]* Therefore, the NTSB recommends the FAA *conduct a comprehensive evaluation, in conjunction with local operators, to determine the overall safety benefits and risks to requiring all aircraft to use the same frequency when the helicopter and local positions are combined in the DCA ATCT. [RECOMMENDATION 11]*

The very high frequency (VHF) radio communications used by air traffic control do not allow for simultaneous transmissions. If a pilot or controller attempts to broadcast on the same frequency at the same time as another pilot, one or both transmissions may be garbled, incomplete, or blocked from reception entirely. This leads to missed control instructions, lack of clarity, loss of situation awareness, or readback errors; however, there is currently no system in use that allows controllers to know when a simultaneous broadcast has occurred.

Review of the helicopter's CVR indicated that the controller's instruction 17 seconds before the collision, which stated, "PAT two five pass behind that C-R-J," was interrupted by a 0.8-second microphone key from one of the helicopter crewmembers, which resulted in much of the transmission being interrupted, and the crew did not receive the instruction to "pass behind."

In 1984, the FAA was petitioned to enact rulemaking requiring two-way radio communication systems employing anti-blocking and stuck microphone protection circuitry. In response, the FAA issued Technical Standard Order (TSO) C128, which provided standards for preventing blocked channels used in two-way radio communications due to unintentional transmissions, and TSO C122, which provides standards for equipment designed to prevent blocked channels in two-way radio communications caused by simultaneous transmissions. TSO-C128 and its subsequent revision has proven effective and popular with VHF radio manufacturers; however, only one manufacturer had been issued a letter of TSO design approval under TSO-C122 since its original issuance in 1994. In June 2012, the FAA issued a Notice of Intent to Cancel C122a, the current revision, citing the lack of design approvals and "the eventual obsolescence of TSO-C122a equipment"; however, the FAA has not finalized the cancellation of the TSO. In July 2025, citing the circumstances of this accident, the FAA announced that it was withdrawing its previous intent to cancel TSO-C122a and was reopening the associated comment period. The FAA stated that it welcomed comments on whether TSO-C122a and the standard it references, RTCA/DO-209, are obsolete, as well as input to identify current technologies that may have replaced these standards.

The NTSB recognizes that implementing same-frequency communications for airplanes and helicopters in a high traffic volume area such as DCA increases the risk of simultaneous radio transmissions that prevent critical information from being transmitted or received by both pilots and controllers. Therefore, the NTSB recommends that the FAA *implement anti-blocking technology that will alert controllers and/or flight crews to potentially blocked transmissions when simultaneous broadcasting occurs. [RECOMMENDATION 12]*

Conflict Alert System

The conflict alert system is designed to draw the controller's attention to a potential conflict and is presented in three ways, an aural alert, a flashing conflict alert "(CA)" on the display, and a conflict list on the display, which indicates in red the aircraft involved. The activation criteria comprises three algorithms that each detect conflicts independently, sensing potential linear, maneuver, and proximity conflicts. Some of these logics predict where the aircraft is going, while others consider where the aircraft is located at that time; however, the CA presented to the controller is the same regardless of which algorithm is activated. This requires the controller to identify and interpret the severity of the conflict and evaluate the action they should take based on other available information. Interviews with DCA ATCT personnel indicated that CAs were heard "often" and were "pretty common" at DCA. In the 30 minutes before the accident occurred, the conflict alert could be heard in

the background during 18 controller transmissions.¹¹ Controllers reported that they often received CAs for non-conflicts, such as when aircraft were on diverging paths, or that the CA would continue to activate even after the controller had taken action to mitigate the conflict. In this accident, the controller responded about 6 seconds after the alert activated. There was a slight delay in the LC controller's response, as he was completing a transmission with another helicopter when the CA activated, and he did not query PAT25 until after the other helicopter had responded.

Allendoerfer *et al.*, (2007) analyzed 607 CAs from 5 enroute and 17 terminal ATC facilities and categorized controller responses to the alerts and the timing of the responses. Their research indicated that the majority of CAs (44 percent in the terminal area) received no response from controllers; many are so brief that controllers have resolved the situation before the alert activated, or that the situation resolved itself without any controller input. They noted that no operational errors nor deviations occurred in these instances. Alerts that activate and require no controller action may increase workload, as the alert directs the controller's attention away from their current tasks and toward the aircraft involved in the alerting event. Of the alert situations where controllers acted, they most often acted before the alert activated (67 percent of the time). This suggests that, while many alerts are valid according to the alert algorithms, they do not provide useful information to controllers; that nuisance alerts are common (81–87 percent of CAs are estimated to be nuisance alerts); and that high nuisance alert rates may desensitize controllers and lead to poor responses to critical alerts.

The current system displays all CAs in the same manner regardless of the algorithm that triggered the alert. In the absence of any salient information conveying the severity of the conflict, controllers must make their own determination regarding whether the conflict alert requires immediate action, thus increasing cognitive load. The FAA's Human-Systems Integration Branch manager stated during the NTSB's investigative hearing that improvements are available to the CA software that could provide color coding or various aural alerts depending on which of the three conflict alert algorithms was activated. The NTSB concludes that *providing controllers with additional salient cues regarding the perceived severity of a potential conflict would reduce controller cognitive load and would likely improve reaction time to the most critical conflict alerts. [FINDING 48]* Therefore, the NTSB recommends that the FAA *develop and implement improvements to the conflict alert system to provide more salient and meaningful alerts to controllers based on the severity of the conflict triggering the alert. [RECOMMENDATION 13]* Once the improvements to the conflict alert system discussed in Safety Recommendation [13] are implemented, *provide training to controllers on its use. [RECOMMENDATION 14]*

Postaccident Drug and Alcohol Testing

The LC controller, ALC controller, and OS underwent U.S. Department of Transportation (DOT) workplace postaccident drug testing about 18 hours, 20 hours, and 18 hours after the accident, respectively. This testing did not detect any tested-for substances indicative of prohibited drug use. They did not undergo alcohol testing.

The 14 tested-for substances on the DOT workplace drug testing panel in effect at the time of the accident may be detectable in urine for a day or more after last drug use. As such, the testing was worthwhile, although it was less sensitive for identifying pre-accident prohibited drug use than it would have been if it was conducted sooner after the accident. There was no evidence to indicate that any of the controllers were under the influence of alcohol at the time of the accident; however, had timely postaccident alcohol testing been conducted, controller alcohol use might have been definitively excluded as a factor in the accident. Unfortunately, postaccident alcohol testing was not conducted, so there was no toxicological evidence available to support such a determination. The NTSB concludes that *there was no evidence that the LC controller, ALC controller, or OS were under the influence of alcohol or prohibited drugs at the time of the accident; however, evidence was substantially limited by the lack of postaccident alcohol testing, and evidence was of somewhat lower quality than it would have been if drug testing had been conducted sooner following the accident. [FINDING 49]*

DOT Order 3910.1D, "Drug and Alcohol-Free Departmental Workplace Program," stated that air traffic controllers must undergo postaccident drug and alcohol testing as soon as possible after a fatal accident, any accident that involved a need for medical treatment away from the accident site, or following an accident which resulted

¹¹As previously noted in section 1.7.8.4, these instances did not necessarily represent 18 distinct CA activations. Review of available radar display replay data for the final 18 minutes before the accident identified five separate CA activations, several of which persisted long enough to be audible across multiple transmissions.

in substantial damage to aircraft or other vehicles or property. The order also required that, whenever possible, alcohol testing must take place within 2 hours after the accident, and drug testing within 4 hours after the accident. Review of documentation provided by the FAA indicated that the drug and alcohol testing determination was not made until almost 3 1/2 hours after this accident, when the FAA ATO determined that there was a requirement to test the LC controller, ALC controller, and OS. By that time, the controllers had left the facility. Although DOT Order 3910.1D permitted alcohol testing for another 4 1/2 hours after the determination was made and stated that controllers must remain readily available for testing, the ATO decided to test for drugs only, and the testing was scheduled for late the following afternoon. Thus, the NTSB concludes that *the FAA ATO's drug and alcohol testing determination did not meet DOT timeliness requirements; furthermore, the ATO's decision to not conduct drug testing as soon as possible after the testing determination, and to not conduct alcohol testing at all, violated DOT requirements. [FINDING 50]*

FAA Order JO 1030.3B, "Initial Event Response," outlines ATO procedures following an accident, to include the postaccident/incident drug and alcohol testing determination being made concurrently with the ATO's Services Rendered Telephone Conference (SRT), which is a management review to assess air traffic services associated with an event (FAA, 2014a). However, initiating an SRT requires multiple initial notifications and preliminary review of the event, to include preparing audio and radar display recordings of the event for playback. These administrative and investigative actions take time. When possible, SRTs are convened the administrative day following the accident to allow time for such actions to be completed, though major air carrier accidents or fatal accidents involving air traffic control services require an SRT to be convened no later than 3 hours following initial notification. However, an SRT conducted 3 hours after an accident is already outside the 2-hour postaccident alcohol testing window outlined by the DOT, and an SRT conducted the next administrative day is likely to fall outside both the 4-hour postaccident drug testing window and the 8-hour maximum time for alcohol testing.

Additionally, there was evidence that ATO staff lacked a complete understanding of DOT postaccident drug and alcohol testing requirements. First, the testing determination itself violated DOT requirements. Also, a DOT-required memorandum as to why testing was not performed in a timely manner was not prepared, which an ATO representative attributed to staff's lack of awareness of this requirement.¹²

The NTSB concludes that *the delayed and inappropriate drug and alcohol testing determination was due in part to the ATO's determination process being inadequately designed to routinely meet DOT requirements for timely testing, and in part to ATO staff's incomplete understanding of those requirements. [FINDING 51]*

A primary intended purpose of DOT workplace drug and alcohol testing is to deter and identify abuse of alcohol and use of certain illegal drugs by individuals performing security- and safety-sensitive duties, with the recognition that those substances may have impairing effects on the performance of those duties (US Congress, 1991). Systemic obstacles to accomplishing timely and appropriate postaccident and postincident testing weaken the ability of such testing to serve its intended safety purpose. Accordingly, the ATO's inadequately designed determination process presents a public safety risk that extends beyond any single accident investigation.

The ATO representative testified at the NTSB's investigative hearing that the FAA had begun efforts to revise the initial event response procedures outlined by FAA Order JO 1030.3B. As of the date of this report, those initial event response procedures have not been revised. In this process, the FAA could consider the example of drug and alcohol testing requirements for FAA-regulated employers such as airlines, which are closely related to the requirements for FAA-employed air traffic control specialists.

The DOT requires the FAA to conduct postaccident testing of FAA-employed controllers whose performance is thought to have contributed to an accident or cannot be completely discounted as a contributing factor, and the FAA imposes similar requirements on its regulated employers. FAA regulations contain language clarifying

¹²This accident was not the only recent NTSB investigation to identify delayed drug testing and missed alcohol testing of an air traffic controller who was providing services during a serious safety event. The NTSB's investigation of a 2023 runway incursion involving a Southwest Airlines passenger airplane and a Federal Express cargo airplane identified that the controller who had been communicating with both airplanes had not undergone postincident alcohol testing, and did not undergo postincident drug testing until the day after the event. In response to NTSB queries about the drug testing determination in that event, the FAA provided a copy of an FAA e-mail request to "please test" the controller that had been sent more than 8 hours after the event, by which time the window for alcohol testing had closed.

the permissive intent of the requirement imposed by the FAA on regulated employers, stating that the employer's decision not to administer a test must be based on a determination, using the best information available at the time of the determination, that the employee's performance could not have contributed to the accident.¹³

There is no requirement in the DOT's workplace drug and alcohol testing program, or in DOT/FAA regulations for regulated employers, for each drug and alcohol testing determination to be based on upper managerial consensus after investigation. DOT's own workplace drug and alcohol testing guidance states, "the decision to subject an employee to a postaccident test shall be made using the best information that is reasonably available to management at or about the time of the accident." DOT's guidance to DOT/FAA-regulated employers is more explicit:

The supervisor at the scene of the accident/event should know the testing criteria and make a good-faith effort decision to test or not test based on the information available at the time [emphasis in original]. The supervisor may consult with others, but the supervisor is the person who has to make the decision.

If the FAA were to adopt a process whereby on-site supervisors are empowered to make postaccident/incident testing determinations using available information independently from SRTs, this would not only remove many of the barriers to timely decision making but also would achieve parity with DOT's guidance on best practices for DOT/FAA-regulated employers. Any such process change would need to be effectively communicated throughout the ATO, including by revising FAA Order JO 1030.3B, leveraging existing training procedures, and possibly developing new tools, to ensure that ATO staff possess a strong understanding of associated requirements. This institutional understanding would need to be resilient to workforce turnover, and to the relative infrequency of events triggering postaccident and incident testing. Therefore, the NTSB recommends that the FAA *revise the Air Traffic Organization's initial event response procedures so that an appropriate on-site supervisor makes each postaccident and postincident drug and alcohol testing determination, based on their assessment of whether the event meets testing criteria and which controllers had duties pertaining to the involved aircraft, without needing to wait for investigation or approval.* [RECOMMENDATION 15]

The NTSB additionally recommends that the FAA *at least annually, provide training on the revised postaccident and postincident drug and alcohol testing determination procedure discussed in Safety Recommendation [15] to all staff who have responsibilities under that procedure; this training should include a post-learning knowledge assessment.* [RECOMMENDATION 16]

FAA ATO procedures that limit the timeliness of postaccident/incident testing determinations also limit opportunities to evaluate potential downstream barriers to timely testing. It is possible that successful revision of ATO procedures might expose other weaknesses—for example, in contractor availability to conduct timely testing once a timely drug and alcohol testing determination is made. The DOT, including the Assistant Secretary for Administration and the Departmental Drug Office (DDO), has the responsibility to oversee FAA adherence to DOT workplace drug and alcohol testing requirements and associated required training of supervisors. To enforce its workplace drug testing requirements effectively, the DOT should ensure that the FAA systematically identifies and addresses barriers to timely postaccident and postincident drug and alcohol testing at its facilities. Importantly, addressing these barriers likely would require administrative support from the DOT DDO, not just oversight.

Accordingly, the NTSB recommends that the DOT *require the FAA to demonstrate at least annually that each air traffic control facility it operates has the routine capability to accomplish required postaccident and postincident drug and alcohol testing within the U.S. DOT's specified timeframes of 2 hours for alcohol and 4 hours for drugs, and implement a process to ensure that any facility without such capability will demonstrate timely remediation.* [RECOMMENDATION 47]

Helicopter Route Design and Information

Preliminary investigative findings of this accident revealed that, when flown at the recommended maximum altitude of 200 ft, a helicopter operating over the eastern shoreline of the Potomac River on Helicopter Route 4 would have about 75 ft of vertical separation from an airplane approaching runway 33. This vertical separation decreases the farther west of the shoreline the helicopter is flown, or if the air-

¹³For corresponding DOT/FAA workplace testing language, see DOT Order 3910.1D, Chapter III, paragraph 6.i(2). For corresponding language pertaining to safety-sensitive employees of FAA-regulated employers, see 14 CFR 120.109(c) and 14 CFR 120.217(b)(1).

plane is operating below the 3° visual glidepath provided by the runway 33 precision approach path indicator (PAPI).

In an urgent safety recommendation report published on March 11, 2025, the NTSB concluded that the separation distances between helicopter traffic operating on Route 4 and aircraft landing on runway 33 that existed at the time of the accident were insufficient and posed an intolerable risk to aviation safety by increasing the chances of a midair collision. The NTSB also concluded that it was critical for public safety helicopter operators to have an alternate route available for operating in and around Washington, DC, without increasing controller workload.

As a result of our findings, we issued two urgent safety recommendations to the FAA. Urgent Safety Recommendation A-25-1 asked the FAA to prohibit operations on Helicopter Route 4 between Hains Point and the Wilson Bridge when runways 15 and 33 were being used for departures and arrivals, respectively, at DCA. Urgent Safety Recommendation A-25-2 asked the FAA to designate an alternative helicopter route that could be used to facilitate travel between Hains Point and the Wilson Bridge when that segment of Route 4 was closed.

Immediately following the accident, the FAA implemented temporary airspace restrictions around DCA. On March 14, 2025, the FAA removed from helicopter route charts the section of Helicopter Route 4 between Hains Point and the Wilson Bridge. Additionally, the FAA prohibited use of runways 15/33 and 4/22 at DCA during “specific, limited helicopter operations” in the vicinity of DCA. The NTSB responded that these actions exceeded the intent of Safety Recommendation A-25-1 and classified it Closed—Exceeds Recommended Action.

In correspondence dated March 26, 2025, the FAA stated that it would collaborate with stakeholders to develop a new helicopter route connecting the Wilson Bridge to the Anacostia River and would provide updates on the alternative route designation process as it progresses. The NTSB stated that this planned work was responsive to Safety Recommendation A-25-2 and, pending its completion, the recommendation was classified Open—Acceptable Response.

FAA Order JO 7210.3DD listed criteria and procedures for the development and modification of helicopter route charts. One of the listed criteria was that, “Care should be exercised to avoid recommending altitudes or flight ceilings/floors which would cause helicopters operating on a designated route to encounter inflight wake turbulence generated by large, fixed-wing traffic.” The order stated that Terminal Operations Service Area Directors were responsible for reviewing and approving new or revised helicopter route chart proposals and assuring that they complied with all prescribed criteria. These directors were also responsible for conducting annual reviews of existing visual flight rules (VFR) helicopter route charts to determine their accuracy and continued utility; however, the FAA was unable to provide documentation of the required annual reviews for the Baltimore-Washington Helicopter Route Chart. As of the date of this report, no information has been provided regarding annual reviews conducted, including criteria used, if such reviews were conducted. The NTSB concludes that *annual reviews of helicopter route charts as required by FAA Order 7210.3DD would have provided an opportunity to identify the risk posed by the proximity of Route 4 to the runway 33 approach path, but there is no evidence to support that these reviews were being performed at DCA.* [FINDING 52] The NTSB is concerned that the lack of documentation of annual reviews for the Baltimore-Washington Helicopter Route Chart may be an indication that these annual reviews are not occurring at other locations throughout the NAS. Therefore, the NTSB recommends that the FAA *ensure that annual reviews of helicopter route charts are being conducted throughout the NAS as required by FAA Order.* [RECOMMENDATION 17]

Although the FAA took immediate action following this accident to remove the portion of Route 4 between Hains Point and the Wilson Bridge, the NTSB remains concerned about the potential for other areas of conflict within this airspace. Following the accident, the FAA published a NAS Helicopter Operations Helicopter Route Analysis, which summarized the ATO’s safety analysis of domestic airports with charted helicopter routes. Using Performance Data Analysis and Reporting System (PDARS), TCAS events, and Near Midair Collision System (NMAC) data, the FAA reviewed charted routes and high-traffic-volume areas for possible conflicts with traffic patterns and reviewed the descriptions for charted and agreement-established routes. The analysis identified hazards in the airspace encompassing the routes and proposed actions to address priority concerns. This analysis, however, did not include DCA.

The NTSB reviewed PDARS data provided by the FAA regarding encounters between fixed-wing airplanes and helicopters operating on Routes 1 or 4 from January 2018 to February 2025. During this time, there were 4,067 encounters (65.6 encounters per month) in which separation was less than or equal to 1,000 ft and 348 en-

counters (5.6 encounters per month) in which separation was less than or equal to 500 ft. A heat map depicting the frequency of these events showed several areas where encounters between helicopters and fixed-wing aircraft were concentrated, including the area of the accident site, as well as north of DCA, consistent with encounters with aircraft on approach to runway 19, and south of DCA, consistent with encounters with aircraft on approach to runway 1.

In unofficial correspondence dated January 16, 2026, the FAA reported that it had conducted an in-depth analysis of the helicopter operations within DCA's airspace and made additional changes to the Baltimore-Washington Helicopter Route Chart. As of the date of this report, that analysis has not been provided to the NTSB. Therefore, the NTSB recommends that the FAA *conduct an SRM process to evaluate whether modifications to the remaining DCA helicopter route structure are necessary to safely deconflict helicopter and fixed-wing traffic and provide the results to the NTSB. [RECOMMENDATION 18]* In addition, the NTSB recommends that the FAA *amend their helicopter route design criteria and approval process to ensure that current and future route designs or design changes provide vertical separation from airport approach and departure paths. [RECOMMENDATION 19]* Once the criteria and approval process referenced in Safety Recommendation [17] are developed and implemented, *review all existing helicopter routes to ensure alignment with these updated criteria. [RECOMMENDATION 20]*

According to testimony provided by personnel from the FAA's Aeronautical Information Services office during the NTSB's investigative hearing, the routes depicted on a helicopter chart do not have lateral limitations unless explicitly outlined on the chart's route description. The routes were described as "recommended paths" that served to streamline traffic flow and facilitate easier communication between pilots and controllers regarding expected flight paths, reporting points, and area ingress and egress locations. According to the FAA, helicopter routes were not specifically designed to provide separation between helicopters and fixed-wing traffic.

The Baltimore-Washington Helicopter Route Chart included depictions of each helicopter route and associated altitudes; however, it provided inconsistent guidance on route altitudes, showing the depicted altitudes as both "maximum" and "recommended" in the chart legend, textual route description, and additional information sections. The chart did not describe any lateral boundaries associated with the helicopter routes nor were the visual depictions of each route on the chart associated with any specific measurement or scale. The description of Route 4 stated that pilots should fly "via east bank of Potomac River" between the Anacostia River north of DCA and the Wilson Bridge south of DCA. The version of the Baltimore-Washington Helicopter Route Chart effective October 2, 2025, removed language in the route descriptions that stated, "All Route Altitudes are Maximum."

Three pilots from the 12th Aviation Battalion stated in postaccident interviews that they assumed that the published helicopter route altitudes provided separation from the flow of fixed-wing aircraft, and, as long as they remained at or below the published altitude, they would be deconflicted from fixed-wing traffic. In testimony provided at the NTSB investigative hearing, a standardization instructor pilot stated that the battalion did not have written guidance regarding the proximity to the east bank that they were required to maintain, but that "tribal knowledge" was to "hug the shoreline" along this portion of the route unless it was necessary to deviate for traffic avoidance.

Given the low altitudes of the routes, the fact that these route altitudes decreased nearer to DCA, and that the battalion's letter of agreement with the DCA ATCT required adherence to the published route altitudes, it is understandable that helicopter pilots would conclude that the purpose of the route altitudes was to separate fixed-wing and helicopter traffic; and the FAA provided no warnings or advisories on the helicopter route chart to ensure that they understood this was not the case. The NTSB concludes that *the information published by the FAA regarding Washington, DC, area helicopter routes was insufficient to provide helicopter and fixed-wing operators with a complete understanding of the helicopter route structure and its lack of procedural separation from fixed-wing traffic. [FINDING 53]*

Interviews with four DCA-based PSA pilots revealed that only one of the pilots, who was previously a military pilot in the area, had specific knowledge of the helicopter routes, locations, and altitudes. Another pilot was aware that there were helicopter routes but was not aware of their associated lateral or altitude limitations. The other two pilots had no knowledge of the helicopter routes. FAA-published terminal procedures did not contain any information to inform fixed-wing pilots operating at DCA about the presence or location of the helicopter routes, and DCA-specific airport and approach information published by PSA also did not include information about the helicopter routes.

Without this information, fixed-wing pilots were left uninformed to the potential that they may come in close proximity to or conflict with helicopters utilizing visual separation on published helicopter routes underlying the DCA approach and departure corridors. The NTSB concludes that *current aeronautical charting does not provide information on VFR helicopter routes that may conflict or come in close proximity to approach and departure corridors, which reduces pilot situation awareness.* [FINDING 54] Although the flight 5342 crew's awareness of the helicopter routes could not be determined, other PSA pilots interviewed displayed a varying level of knowledge about the routes. Including helicopter route information on approach procedure charts would increase pilot situation awareness of the operating environment and potential risk. Therefore, the NTSB recommends that the FAA *incorporate the lateral location and published altitudes of helicopter routes onto all instrument and visual approach and departure procedures to provide necessary situation awareness to fixed-wing operators of the risk of helicopter traffic operating in their vicinity.* [RECOMMENDATION 21]

ADS-B and Collision Avoidance Technologies

The accident helicopter was equipped with a transponder that could transmit ADS-B Out information. This capability was tied to the Mode S function of the transponder such that, when Mode S was selected, the helicopter should have broadcasted ADS-B Out information. As of January 1, 2020, all aircraft operating above 10,000 ft msl or in Class B and C airspace are required to transmit ADS-B Out; however, Federal regulations exempt Department of War aircraft from broadcasting ADS-B Out when performing sensitive government missions.

Due to the routes and landing sites used during the accident flight, the Department of War considered PAT25's flight path sensitive and, therefore, the helicopter was not required to be broadcasting ADS-B Out at the time of the accident. Radar data indicated that the helicopter's transponder switched from Mode 3/A and C to Mode S near Cabin John, Maryland, before proceeding south along the Potomac River about 8 minutes before the accident, but the helicopter was not broadcasting ADS-B Out despite the crew's selection of the Mode S function. Although the helicopter's CVR did not capture any crew conversation about activating Mode S, it is likely that the crew turned on the transponder's Mode S function before flying south on Helicopter Route 1 toward the high-traffic airspace near DCA in order to provide ADS-B Out data to air traffic control and other aircraft; however, the crew's activation of Mode S during the flight was contrary to Army SOP, which stated that flight crews should not change transponder modes during flight.

The TAAB commander testified during the NTSB's investigative hearing that the reason for the prohibition on changing transponder modes during flight was due to the amount of "heads down" time required to change the transponder mode; however, the UH-60L operator's manual, as well as testimony by a former TAAB standardization pilot at the NTSB's investigative hearing, indicated that activating Mode S required just two button pushes.

Although the helicopter was not transmitting ADS-B Out, its position and speed was available to the DCA local controller because its transponder was responding to Mode S interrogations, and ADS-B Out information would not have appreciably changed the timing of the conflict alert the controller received before the collision. Flight 5342 was not equipped with ADS-B In, nor was its TCAS II system capable of receiving ADS-B In information as part of its activation algorithm. The NTSB concludes that *the lack of ADS-B Out from the accident helicopter did not contribute to this accident, as the helicopter was still being tracked by radar, and ADS-B Out would not have provided improved traffic alerting for the DCA controller or the crew of flight 5342, because the airplane was not equipped with ADS-B In.* [FINDING 55]

Although the lack of ADS-B Out information from the accident helicopter did not change the circumstances of this accident, collision avoidance technologies that leverage ADS-B In information are most effective if all aircraft broadcast ADS-B Out at all times. The NTSB concludes that *the Army's standard operating procedures that prevent flight crews from enabling ADS-B Out while in flight, when not performing sensitive missions that require ADS-B to be disabled, limit the visibility of military aircraft on collision avoidance technologies that leverage ADS-B information.* [FINDING 56] Therefore, the NTSB recommends that the Department of War Policy Board on Federal Aviation *require armed services to amend their operational procedures to allow flight crews to enable ADS-B Out while in flight.* [RECOMMENDATION 45]

The accident airplane was equipped with TCAS II, and information obtained from the airplane's FDR and CVR indicated that the crew received a TA regarding PAT25 about 20 seconds before the collision, which was within TCAS system alerting specifications. This TA remained active until the collision occurred; however, the crew

had been trained not to maneuver based solely on a TA, and their workload at the time they received the TA was high, resulting in limited available capacity to look for and visually acquire the traffic. The TCAS system did not generate a subsequent RA even though the two aircraft continued to converge, because TCAS II inhibit logic was designed to suppress RAs below 900 ft above ground level during descent. A known limitation of TCAS II is that it often issues RAs during some normal and routine operations, including when visual separation is being applied. The TCAS II RA inhibit altitude threshold was established based on the technological limitations available at the time it was developed to maximize effective alerting while minimizing these types of nuisance alerts.

PSA crews were trained to respond promptly to RAs and maneuver as indicated by the advisory, even if such a maneuver conflicted with ATC instructions. Therefore, it is probable that the crew of flight 5342 would have maneuvered in accordance with the instructions provided by the RA had they received one, which may have prevented the collision. The NTSB concludes that *although the airplane's TCAS operated as designed, it was ineffective in preventing the collision because of current activation criteria and resolution advisory inhibit altitudes. [FINDING 57]*

The NTSB has previously advocated for the FAA to require ADS-B In technology on the basis that equipping aircraft with ADS-B In capability would provide an immediate and substantial contribution to safety, especially near airports. Simulations using the circumstances of this accident reaffirm this conclusion and demonstrate the value of ADS-B In-derived traffic information in improving pilots' situation awareness and supporting earlier identification of potential traffic conflicts.

ADS-B traffic advisory system (ATAS) is an ADS-B application intended to reduce the number of midair collisions and near midair collisions involving general aviation aircraft. ATAS utilizes ADS-B information to generate verbal alerts indicating the clock position, relative altitude, range, and vertical tendency of proximate traffic.

In this accident, the TA that the flight 5342 crew received consisted simply of the annunciation, "Traffic, traffic." No information about the location of the traffic threat relative to the airplane was annunciated, and the crew would have had to refer to the TCAS display to determine the relative position of the threat before directing their visual scan in the appropriate area. Given the crew's high workload at the time they received the TA, it is unlikely that they performed a focused visual search for the helicopter at this time.

The NTSB performed a simulation to determine how an ADS-B based system capable of providing ATAS-style alerts would have performed in the accident scenario. The simulation indicated that the crew of flight 5342 would have received two alerts concerning PAT25 had it been equipped with such a system. The first aural and visual alert would have occurred 59 seconds before the collision, annunciating "Traffic, 12 o'clock, low, three miles, descending." A second aural alert would have occurred 35 seconds before the collision, annunciating "Traffic, 12 o'clock, low, two miles." These two alerts would have occurred 40 and 16 seconds, respectively, before the TCAS TA that the crew received before the collision, providing the crew with additional awareness of the helicopter.

While TCAS TAs provide a verbal annunciation that a potential traffic conflict exists, the annunciations do not include the position and range of the target, requiring the pilot to first refer to the TCAS display inside the cockpit to determine the direction in which they need to direct their visual search. An ATAS-style TA indicating the clock position, relative altitude, range, and vertical tendency of nearby traffic would allow pilots to immediately direct their visual search in the proper direction outside the aircraft. The NTSB concludes that *TA aural alerts that include additional information about the location of traffic could reduce the time pilots need to visually acquire target aircraft. [FINDING 58]* The NTSB recommends that the FAA modify airborne collision avoidance system (ACAS) TA aural alerts to include clock position, relative altitude, range, and vertical tendency. [RECOMMENDATION 22]

The crew of flight 5342 could have intervened in the accident sequence if they had more knowledge about the level of the threat posed by the traffic that triggered the TCAS TA. While a TCAS display does depict traffic targets, a pilot must monitor the display over time to determine in what direction the target is moving. By leveraging ADS-B In traffic information, an ACAS display can depict the ground track of traffic targets, increasing pilots' awareness of the movements of nearby traffic and providing more timely information to help a pilot determine whether that target may become a collision threat. The NTSB concludes that *had the airplane been equipped with an airborne collision avoidance system that used ADS-B In information to show directional traffic symbols, the crew of flight 5342 would have received enhanced information about the risk posed by the helicopter, which could have enabled them to take earlier action to avert the collision. [FINDING 59]* Therefore,

the NTSB recommends that the FAA *require existing and new TCAS I, TCAS II, and ACAS X installations to integrate directional traffic symbols.* [RECOMMENDATION 23]

The helicopter was not equipped with an integrated cockpit display of traffic information (CDTI), nor was it required to be under current regulations. As previously discussed, the pilot and IP onboard PAT25 had tablets that were capable of displaying ADS-B traffic information from other aircraft and providing visual and aural alerts.¹⁴ A simulation of the ForeFlight CDTI display available on the tablets indicated that the application would have generated a visual and aural alert concerning the airplane at 2047:11, or 48 seconds before the collision. The tablets, which would likely have been strapped to the pilots' thighs, were normally referenced in flight by the pilot monitoring (in this accident, the IP); however, statements from Army helicopter pilots indicated that it was unlikely that the accident crew were referring to the tablets for traffic information at the time of the accident given the demands of visual, low-level flight at night under NVGs. Simulator testing indicated that, when using a tablet secured to a thigh, a pilot would be required to divert their attention below a normal scan of the cockpit instruments in order to view the tablet screen. Additionally, the aural alerting that could have been provided by the tablets was not integrated into the crew's helmets and would not have been heard by the crew over the ambient noise inside the helicopter, even if the application had been configured to provide aural traffic alerts. At the time of the accident—and still as of the date of this report—the DOW had no requirement for military aircraft to receive ADS-B In, or to be equipped with any integrated cockpit display of traffic information derived from ADS-B In data. The NTSB concludes that, *although the pilot and IP onboard PAT25 were equipped with tablets that had the ability to display traffic transmitting ADS-B Out, it is unlikely that the pilots were using the tablets to monitor or identify traffic at the time of the accident due to the workload associated with low-altitude flight.* [FINDING 60]

The NTSB has investigated numerous midair collision accidents that occurred within controlled airspace or in which air traffic control was in contact with at least one of the involved aircraft. In many of these investigations, the NTSB noted that a CDTI with ADS-B In information would enhance pilots' situation awareness by providing information regarding traffic conflicts that may otherwise go undetected due to the numerous documented limitations of see-and-avoid.¹⁵

Following the investigation into a midair collision between two air tour airplanes in Ketchikan, Alaska, in 2019, the NTSB issued several safety recommendations to the FAA, asking them to identify areas with a high concentration of air tour traffic and to require that CFR Parts 91 and 135 air tour operators which operate within those areas be equipped with an ADS-B Out-and In-supported traffic advisory system that includes visual and aural alerts (NTSB, 2021). We also recommended that the FAA require all aircraft operating within those high density traffic areas, not just those conducting air tours, be equipped with ADS-B Out.

In an October 24, 2023, follow-up letter regarding Safety Recommendation A-21-17, the NTSB emphasized that the absence of an ADS-B In requirement for Part 135 passenger-carrying operations fails to take advantage of the demonstrated safety benefit of ADS-B In traffic awareness and alerting and is inconsistent with the "appropriate level of public safety" the FAA itself expects for operations in which passengers bear no responsibility for the aircraft's operation (NTSB, 2023). In a response dated November 2024, the FAA stated that they had determined that, "current ADS-B requirements continue to adequately address the needs of aviation safety," and that they would "not pursue additional ADS-B operator requirements at this time" (FAA, 2024e).

During the NTSB's investigative hearing for this accident, the FAA ATO's acting deputy chief operating officer (COO) stated that the agency supported requiring that newly manufactured aircraft in the United States be equipped with ADS-B In. He also stated that the agency supported requiring that aircraft operating in airspace where they are required to transmit ADSB Out, also be required to install and operate ADS-B In.-B Out, also be required to install and operate ADS-B In.

The circumstances of this accident illustrate that the additional information provided by an ACAS system supplemented with ADS-B In information, including ATAS alerts and directional traffic displays, further enhance the safety benefit pro-

¹⁴Although tablets and other portable traffic-display devices can provide helpful supplementary awareness, they are not a functional substitute for an integrated CDTI within the normal instrument scan or for timely ATC traffic advisories and safety alerts—particularly in complex Class B environments.

¹⁵Examples include ERA09MA447, CEN19MA141AB, ANC20LA074, ERA22FA318, CEN22FA081, and ERA23FA142.

vided by ACAS. For all pilots, ADS-B In information provided on a CDTI with alerting that is audible to the pilot would provide critical situation awareness to help mitigate the risk of midair collisions, even if their aircraft are not equipped with an ACAS. In order to take full advantage of the safety benefits provided by ADS-B, the NTSB recommends that the FAA *require all aircraft operating in airspace where ADS-B Out is required to also be equipped with ADS-B In with a cockpit display of traffic information that is configured to provide alerting audible to the pilot and/or flight crew.* [RECOMMENDATION 24] In order to provide the same situation awareness advantages to military flight crews, the NTSB recommends that the Department of War *require all military aircraft operating in the NAS be equipped with ADS-B In with a cockpit display of traffic information that is configured to provide alerting audible to the pilot and/or flight crew, and that such requirement apply wherever in NAS the FAA requires any aircraft to operate with ADS-B Out.* [RECOMMENDATION 46]

Advances since the development of TCAS II standards allow ACAS X, the next generation of airborne collision avoidance systems, to provide improved alerting. Among other enhancements, ACAS X systems utilize ADS-B In information in addition to transponder interrogations, and include improved algorithms to more accurately reflect actual collision risk.

A series of simulations conducted using the circumstances of this accident showed that the crew of flight 5342 would have received a TA about 8 seconds earlier if the airplane had been equipped with ACAS Xa, an ACAS X variant for airplanes, even though ADS-B information from the helicopter was unavailable. However, although ACAS Xa can deliver earlier and more accurate alerts than TCAS II, the current RA inhibit altitudes under ACAS Xa are the same as those of TCAS II, and would also have prevented ACAS Xa from issuing a RA under the accident circumstances. The results of the simulation indicated that the risk of a NMAC was reduced by more than 90 percent when the ACAS Xa logic was modified to allow RAs down to 300 ft, because it is possible that the crew would have taken the action prescribed by the RA to avoid the collision. The NTSB concludes that *technological advances since the development of TCAS II operating standards may allow ACAS Xa with reduced inhibit altitudes to have an expanded alerting envelope while reducing nuisance alerts.* [FINDING 61] Furthermore, the NTSB believes that ACAS X, as the standard is currently defined, would improve the safety of aircraft that are currently required to be equipped with TCAS. Therefore, the NTSB recommends that the FAA *require the use of the appropriate variant of ACAS X on new production aircraft that are subject to TCAS equipage regulations* [RECOMMENDATION 25] and that the FAA *require existing aircraft that are subject to TCAS equipage regulations be retrofitted with the appropriate variant of ACAS X.* [RECOMMENDATION 26] Given the results of the TCAS and ACAS X simulation study, which showed a significant reduction in the risk of a NMAC when the RA inhibit altitude was lowered, the NTSB also recommends that the FAA *evaluate the feasibility of decreasing the TA and RA inhibit altitudes in ACAS Xa to enable improved alerting throughout more of the flight envelope.* [RECOMMENDATION 27] If the FAA's evaluation resulting from Safety Recommendation [27] finds that inhibit altitudes can be safely decreased, the NTSB further recommends that the FAA *require retrofitting of the applicable ACAS X variant incorporating the reduced TA and RA inhibit altitudes on all aircraft that are subject to TCAS equipage regulations.* [RECOMMENDATION 28]

The ACAS simulations using the circumstances of this accident also showed that, had the helicopter been equipped with ACAS Xr, a version of ACAS X that is still under development and intended specifically for rotorcraft, the risk of a NMAC was reduced by more than 50 percent, with no changes to the TCAS or ACAS Xa inhibit altitudes. This information would have been provided to the crew via a cockpit display that would have been part of their normal instrument scan and also would have provided aural alerting integrated with the helicopter's internal communications system. Therefore, the NTSB concludes that, *although not yet commercially available, had the helicopter been equipped with ACAS Xr with integrated aural alerting, the crew could have received an alert regarding flight 5342 and could have taken action to avert the collision.* [FINDING 62]

Given the significant reduction in the risk of a NMAC as shown in the simulations when the helicopter was equipped with ACAS Xr, the NTSB recommends that the RTCA Program Management Committee *finalize and publish the minimum operational performance standards for ACAS Xr for rotorcraft.* [RECOMMENDATION 50] The NTSB also recommends that the FAA *require that all rotorcraft operating in Class B airspace be equipped with ACAS Xr technology once the ACAS Xr standard has been published.* [RECOMMENDATION 29]

Safety Management Systems and Safety Data

Indicators of Midair Collision Risk

Multiple safety occurrence reporting systems contained reports from pilots and controllers about close calls between airplanes and helicopters in the vicinity of DCA in the years before the accident, some of which included airplanes on approach to runway 33.¹⁶ Several of those reports described issues similar to those found in this investigation, including airspace complexity, problems with ATC communications, challenges associated with combining helicopter and local control positions, and helicopters flying above recommended altitudes. An Aviation Safety Information Analysis and Sharing (ASIAS) review of Aviation Safety Action Program (ASAP) reports filed by pilots from February 2020 through October 2024 found 85 reports, or about 18 reports per year, that contained information on close calls between helicopters and airplanes near DCA.¹⁷ Reports of close calls near DCA were also found in other safety occurrence reporting systems, including Air Traffic Safety Action Program (ATSAP), Aviation Safety Reporting System (ASRS), NMACS and mandatory occurrence reports (MORs). Although it is possible that some of the reports in these systems described the same events, it is reasonable to conclude that there were more than 18 close calls per year, or more than 1 close call per month on average, reported in the 4 years before the accident.

Safety occurrence reporting systems rely on subjective self-reports with varying submission criteria and are therefore unlikely to capture all safety events (Dy and Mott, 2024).¹⁸ By comparison, objective aircraft position data, such as TCAS RA data captured by ground-based receivers, indicated that there were about 15 TCAS RAs per month, on average, within 10 nm of DCA between April 2023 and March 2025. Aviation Risk Identification and Assessment (ARIA) data showed that airplanes and helicopters came within 1 nm laterally and 400 feet vertically 390 times per month, on average, between October 2021 and December 2024. PDARS data identified an average of 5.6 instances per month between 2018 and 2025 in which helicopters flying on Routes 1 or 4 came within 500 ft of airplanes arriving or departing DCA.

Some objective measures of aircraft proximity that were examined after the accident were not used for safety assurance before the accident occurred. For example, postaccident review of PDARS radar-based data identified close encounters between aircraft in the vicinity of airports and revealed instances of helicopters flying above maximum route altitudes; however, the FAA had not previously used those data to track such metrics. Additionally, ARIA proximity data and TCAS RA data from ground-based receivers were available to ASIAS, but those data were also not actively monitored by ASIAS or widely available before the accident.¹⁹

The Army and PSA had varied knowledge of and limited access to safety data systems. The Army did not participate in ASIAS, did not request FAA data, and did not routinely use information that the FAA made publicly available. The Army did not have a robust safety occurrence reporting system, nor did it collect and aggregate safety data from their helicopters. PSA had an SMS, as required by 14 *CFR* Part 5, and participated in the ASIAS program. Although PSA reported reviewing safety occurrence reports from its pilots and FOQA-based TCAS data provided by the ASIAS program, PSA did not have access to objective proximity data from PDARS or ARIA. As a result, their safety assurance and safety risk management processes did not identify a heightened risk of midair collision at DCA.

The FAA ATO had access to many sources of data, including ASIAS, PDARS, ARIA, ATSAP, MORs, ASRS, and NMACs, as well as limited access to ASAP and TCAS RA information. Although the ATO reported that they reviewed a large number of data sources as part of their safety assurance process, they also did not iden-

¹⁶These included a NMAC (1070511144 in the NMAC database) for the May 2013 near-miss between an airplane and a military helicopter that was the catalyst for the formation of the HWG at DCA ATCT; an ASRS report from July 2015 that involved a near miss between an airplane on a circling approach to runway 33 and a helicopter (ACN 1283693); and an ASRS report from June 2013 in which an airplane on the River Visual approach to runway 19 received a TCAS RA due to a helicopter passing below (ACN 1095485).

¹⁷The term “close calls” commonly refers to events in which the proximity between two aircraft was perceived as potentially unsafe. See, for example, *Ending Serious Close Calls* (FAA). Other terms, such as near misses, close proximity events, and airborne encounters have been used by different groups to describe similar types of events.

¹⁸Additionally, pilots may not be aware of close proximity events or may have been successfully applying visual separation, which would not result in safety reporting in instances when objective measures indicated close proximities.

¹⁹TCAS TA and RA data were available through an operator’s FOQA and could have provided useful information, but those data are proprietary and only represented information from, and were only available to, operators who participated in ASIAS.

tify the risk of a midair collision between helicopters and fixed-wing traffic at DCA. In the investigative hearing, FAA officials acknowledged that the ATO had missed these indicators of risk.

The ARIA system was designed specifically to use objective criteria to automatically identify air traffic operations that represented potential safety risks and generate reports known as preliminary ARIA reports, or PARs. However, ATO's subsequent reviews of PARs were subjective and largely focused on regulatory compliance rather than potential risk. For example, ARIA generated 874 PARs for the area surrounding DCA between June 2022 and May 2025, but ATO classified none of them as NMACs, even though pilots and controllers made multiple reports of close calls during that period. Additionally, the safety group manager for the FAA's Eastern Service Area noted that their Quality Assurance Office reviewers did not normally search for voluntary reports and acknowledged that, "from one validator to another, or from somebody that's looking at that report, their perception of what is the possibility of collision may be different." As a result of these subjective reviews, potentially valuable objective risk-based safety data were not tracked. The NTSB concludes that *multiple data sources provided evidence of midair collision risk between fixed-wing aircraft and helicopters at DCA, including on approach to runway 33, before this accident; however, the limited access to and use of available objective and subjective proximity data hindered industry and government stakeholders' ability to identify hazards and mitigate risk. [FINDING 63]*

In its Safety Risk Management Policy, the FAA recognized the value of objective data, stating, "While any data is better than no data, when available, analytical data is preferred, followed by empirical, and finally, judgmental. This is due to the margin of error associated with each type of data. Analytical data typically has the lowest margin of error; the margin of error of empirical data can be controlled by sample size; and judgmental data has the largest margin of error due to human biases and subjective experience" (FAA, 2023d).

Since the accident, the FAA ATO has used objective proximity data to identify areas of potential conflict between airplanes and helicopters in the NAS. It conducted a helicopter route analysis using multiple data systems to count "close proximity" events with objective measures based on parameters such as vertical/horizontal proximity, slant range, or time to contact. In addition to identifying near mid-air collisions, analyses of objective proximity data can identify areas of high traffic density and potential routing conflicts, and depict areas with a high concentration of encounters involving distances less than those provided by standard IFR separation, which could have shown evidence of the dependence on visual separation to manage traffic in the DCA airspace before the accident.²⁰

Although there is value in using multiple data sources to understand a problem, the lack of standard proximity metrics or indexes to signify when aircraft are "too close" results in difficulty comparing the risk levels of different locations or tracking the incidence of events over time. The NTSB concludes that *improving stakeholder access to standardized and objective information about aircraft close proximity encounters for use in safety assurance processes would increase the likelihood of detecting and mitigating hazards before accidents occur. [FINDING 64]* Therefore, the NTSB recommends that the FAA *create an objective definition of close proximity encounter and a public database of those encounters and their locations that can be used to monitor their prevalence and identify areas of potential traffic conflict for safety assurance and safety risk management. [RECOMMENDATION 30]*

Safety Information Sharing

Most of the stakeholder groups involved in the investigation described internal processes for evaluating and addressing safety occurrence reports. That the midair collision between PAT25 and flight 5342 occurred despite these reported activities raises the question of why they did not lead to more meaningful risk mitigations at DCA. Some evidence suggests that safety occurrence reports were used at DCA tower to identify hotspots, including a hotspot in the same location as the midair collision, and propose changes to helicopter route charting through the safety risk management panel (SRMP) process; however, these efforts met with resistance from ATO, yielding little success.

The investigation also revealed that, although helicopters routinely triggered TCAS RAs for airplanes on approach to DCA and were the subject of many voluntary pilot reports, helicopter operators were largely unaware of their involvement in these events. Upon learning of its involvement in TCAS RA events involving air-

²⁰ During the investigative hearing, the FAA ATO acting deputy COO cited the dependence on visual separation between helicopters and IFR traffic at DCA as an example of risk that was missed prior to the accident.

planes on approach to DCA, one helicopter operator made changes to its standard operating procedures to help mitigate such events. Additionally, an Army representative stated in the investigative hearing that learning of Army helicopter involvement in TCAS RAs would be valuable for risk mitigation.

FAA regulations (see 14 *CFR* Part 5.57) state that, if a hazard is identified through an operator's SMS, that operator must provide notice to anyone involved that could address the hazard or mitigate the risk. Additional guidance in FAA Order JO 1000.37C states that safety promotion activities include actively sharing safety-related information with other external parties, such as industry stakeholders, air navigation service providers, and other Federal agencies.

Despite this guidance, this investigation revealed that reviews of close proximity events around DCA appeared to have occurred in isolation rather than involving all relevant parties. For example, preliminary ARIA reports were only reviewed by FAA ATO Quality Assurance Office staff and did not incorporate the operators involved in the events. PSA Airlines reported reviewing TCAS RAs involving its aircraft, but noted that there was often a delay of several months between the occurrence and the review. Additionally, PSA relied on the Confidential Information Share Program (CISP) or the FAA to identify other aircraft that triggered TCAS RA activations on PSA aircraft.

When two TCAS-equipped aircraft come into conflict, both aircraft receive RAs that alert the pilots and are captured on flight data recorders. However, when a TCAS RA is triggered by an aircraft without TCAS, the pilot of the unequipped aircraft may never become aware of the event. If timely steps are taken to identify the threat aircraft, the pilots or operators can be notified of their involvement in the event. However, as this investigation showed, it may be difficult to identify aircraft that triggered TCAS RAs if not attempted until months or years after the event, particularly if they are not broadcasting ADS-B Out. The NTSB concludes that *the FAA's lack of an established process to inform parties about their involvement in events such as NMACs or TCAS RAs reduces the likelihood of fully understanding and mitigating future midair collision risk. [FINDING 65]* Therefore, the NTSB recommends that the FAA develop and implement a process that will, in a timely manner, notify involved parties after events such as NMACs or TCAS RA activations, such that notification occurs while relevant data remain available and before meaningful safety analysis, reporting, or corrective action is no longer practicable. [RECOMMENDATION 31]

FAA Air Traffic Organization Safety Management System

Safety Risk Management and Safety Assurance

At the time of the accident, the FAA had an established SMS for several of its organizations, including the ATO and ATO facilities (such as DCA ATCT). FAA policy required that each organization establish and maintain each of the four components of SMS—safety policy, safety risk management, safety assurance, and safety promotion. However, despite the ATO's established and well documented safety policy, this investigation indicated significant gaps in its safety risk management, safety assurance, and safety promotion processes and procedures.

FAA guidance for SMS implementation clearly establishes responsibility and requirements for operators and external service providers to coordinate safety risk management and safety assurance activities with external parties to collect and share safety hazard information and monitor safety risk controls. For example, the FAA stated that airport operators, tenants, and users should coordinate SMS efforts to the fullest extent possible, and that a method of data sharing and reporting among the separate SMSs be included in the safety risk management process. The FAA also required that air traffic managers coordinate with local airport operators to increase awareness and understanding of local operations and safety challenges, including convening conferences to discuss and clarify operations.

By contrast, the FAA ATO Order on identification and mitigation of hazards at the local level does not require external stakeholder involvement. Participation is limited to bargaining unit representatives and management at FAA air traffic facilities (FAA, 2020b). Although the 2021 GAO report called on the FAA to develop a mechanism to exchange information with operators in the DC area, there was no formal process in place at DCA for operators and the FAA to share information about helicopter route traffic, TCAS RAs, or potential traffic conflicts. In the absence of a formal process, formation of helicopter working groups in the Washington, DC, area demonstrated recognition by local controllers and operators of safety risks and attempted coordination of the diverse helicopter operations in the DCA Class B airspace. However, these groups were described as informal, did not include a mission statement or statement of work, and their attempts to recommend changes were met with resistance from, and little action by, the ATO.

As an example of informal collaboration, the DCA ATCT helicopter working group (HWG) identified areas of increased collision risk between airplanes and helicopters, and proposed changes to the charted helicopter route and zone altitudes to mitigate those risks. One of the proposed changes included relocating or eliminating the section of Route 4 adjacent to DCA due to the risk posed by the proximity of that route to fixed-wing approach and departure paths. A near midair collision between a military helicopter and a regional jet in 2013 (which occurred in the same vicinity as this accident) was the catalyst for this initial proposal, and the DCA ATCT HWG made additional recommendations to move Route 4 in the years after; however, members of the group recalled a lack of feedback from management at higher levels within the ATO regarding why their suggestions to move or eliminate Route 4 were not adopted.

The group also proposed the addition of “hotspots” to the Baltimore-Washington Helicopter Route Chart to highlight areas that posed an increased risk of potential conflicts between airplanes and helicopters to increase pilot and controller vigilance in those areas. However, the FAA also rejected the proposal to chart these hotspots because, “hotspots are associated with ground or surface movement and are not within the VFR aeronautical chart specification.” The HWG comprised DCA ATCT controllers—the individuals most familiar with the flow and separation of helicopter and fixed-wing traffic around DCA and with the greatest insight into its vulnerabilities and areas of highest risk; however, the FAA repeatedly failed to act on proposals provided by the group and rejected changes that would have raised pilot awareness of areas of increased midair collision risk and increased separation between Helicopter Route 4 and fixed-wing approach and departure paths.

In addition, the investigation did not identify evidence showing that the ATO conducted annual, documented reviews of helicopter route charts in the Washington, DC, area as required by FAA Order JO 7210.3DD. Further, review of FAA data programs did not indicate that the ATO routinely used available data to evaluate separation risk between fixed-wing traffic and helicopter operations at congested airports, including DCA.

The NTSB concludes that, given their access to a wide range of data sources and information, *the FAA ATO was made aware of, and had multiple opportunities to identify the risk of a midair collision between airplanes and helicopters at DCA; however, their data analysis, safety assurance, and risk assessment processes failed to recognize and mitigate that risk. [FINDING 66]* The NTSB further concludes that *the FAA ATO’s application of its safety management system did not effectively coordinate safety assurance and safety risk management activities with external stakeholders in the DCA Class B airspace. [FINDING 67]*

The FAA established the Air Traffic Safety Oversight Service (AOV) in 2004 as the safety oversight authority to ensure effective and independent safety oversight of ATO and to enforce safety regulations related to air navigation services, including ATO SMS functions (FAA, 2024a). However, in December 2025, the FAA Administrator announced that the FAA was implementing a single, agencywide SMS, stating in testimony before the House Committee on Transportation and Infrastructure’s Subcommittee on Aviation that, “This unified approach will help the FAA detect, analyze, and mitigate risk more consistently and ensure that lessons from accidents, incidents, and near misses are acted upon quickly across the agency” (FAA, 2025f). Additionally, in a document titled, “FAA Flight Plan 2026” the agency stated its intent, as part of creating one FAA SMS, to establish a Safety Integration Office and implement an FAA-wide safety risk management process (FAA, 2026).

Therefore, the NTSB recommends that the U.S. Department of Transportation Office of Inspector General complete *an audit of the FAA ATO SMS functions and data sharing activities at all air traffic control facilities and determine whether these activities are conducted in collaboration with all relevant external stakeholders, ensuring that the audit’s results are documented, reported to the Secretary of Transportation and the FAA Administrator, and made available to the public. [RECOMMENDATION 49]* Additionally, the NTSB recommends that the FAA, *based on results of the audit, ensure that all SMS functions and data sharing activities at all air traffic control facilities are conducted in collaboration with all relevant external stakeholders. [RECOMMENDATION 32]*

At the NTSB’s investigative hearing, the DCA ATCT OM at the time of the accident testified that controllers would routinely compensate for the conditions provided by reduced MIT spacing and compacted demand times by “making it work,” and using “all available tools.” The “make it work” mindset had become normalized and “routine” at DCA ATCT.

Although processes were in place to conduct risk assessments of hazards at the facility level, existing procedures did not provide robust guidance to assist controller and supervisor risk assessment and decision making in real-time, day-to-day oper-

ations. For example, the DCA ATCT SOP contained a list of seven factors that an OS should consider when deciding to combine or de-combine the HC position, but did not provide additional information on how to effectively evaluate the impact of those factors on the control position(s). Changes to the DCA ATCT SOP in 2023 removed the requirement for the OS to document the time and reason for combining or de-combining the HC position in the facility log. Requiring this information to be recorded made it more likely that the OS would consider and evaluate the risks associated with combining or de-combining the position under the existing operational and environmental conditions, and it is likely that the removal of this requirement normalized combining the positions without a thorough evaluation of the associated risk factors. Maintaining this record could also provide background information for safety assurance processes to determine whether the positions were being combined and de-combined appropriately. The NTSB concludes that *changes to DCA ATCT SOPs prior to the accident removing the requirement for the OS to document the time and reason for combining or de-combining the HC position in the facility log made it less likely that the OS would consider and evaluate the risks associated with combining or de-combining the position. [FINDING 68]* Because operational position-combining decisions are made routinely at towers throughout the NAS under time pressure and with similarly limited documentation requirements, establishing a standardized, nationwide requirement to record the time and rationale for combining or de-combining positions would strengthen real-time risk-based decision making and provide consistent safety assurance inputs across facilities. Therefore, the NTSB recommends that the FAA *establish a requirement across all ATCT SOPs that the OS or controller in charge (CIC) document in the daily facility log when any control position is combined with the LC position, or when the OS/CIC position is combined with a control position, along with a rationale for doing so. [RECOMMENDATION 33]*

A number of hazards existed within the DCA ATCT at the time of the accident. Nighttime operations reduced visibility and made identification of aircraft more difficult; traffic volume was increasing with reduced MIT, which increased controller workload and required the use of runway 33 to build additional spacing; helicopter traffic was present; and the HC and LC positions were combined, which increased workload for the LC and ALC controllers. The DCA ATCT SOP stated that the OS was responsible for maintaining situation awareness of the operation, providing assistance to controllers, and deploying available resources for optimal efficiency; however, there was no guidance provided by the ATO or the ATCT SOP that would have assisted the OS in assessing, anticipating, or alleviating controller workload. Because concerns about potential conflicts between airplanes and helicopters had been identified in previous ECVs at the tower facility, the night conditions, helicopter traffic on Route 4, and use of runway 33 at the time of the accident should have raised an additional level of awareness and vigilance, particularly on the part of the OS, as all of those factors increased the likelihood that an airplane and helicopter may come in close proximity. However, the guidance available to the OS was insufficient to help him evaluate these factors and apply operational risk management in a manner that could have more effectively mitigated these hazards.

It is apparent that controllers in the DCA area were under pressure to accommodate more traffic volume, and in response, developed their own methods of traffic management in order to maintain operational efficiency. A functional SMS should have identified and addressed these locally accepted operational practices, the “make it work” mentality described by controllers, and the lack of a robust process for day-to-day risk assessment and mitigation. The NTSB concludes that *safety risk management practices were not fully integrated into DCA ATCT operations and did not identify or mitigate the operational challenges faced by controllers or the lack of guidance regarding operational risk assessments for controllers and supervisors. [FINDING 69]*

Safety Promotion and Positive Safety Culture

According to ICAO, safety promotion is how an organization builds and sustains a positive safety culture and the foundation for an effective SMS. It does this by actively communicating safety information, policies, priorities, and lessons learned. The goal is to ensure that everyone understands their shared responsibility for safety, feels supported by leadership, and has the awareness, tools, and motivation to manage safety risks effectively. During the investigative hearing, the ATO acting deputy COO stated that there was no formal SMS training for controllers, though he believed that facility management would be familiar with the *ATO SMS Manual*. Ensuring that every employee is familiar with their organization’s SMS through training and consistent, transparent communication is essential for building trust and collaboration. FAA AC 120–92D stated that organizations are required to pro-

vide initial safety training for employees so that they can perform their SMS-related duties, and that recurrent training may be necessary to maintain employee competencies. The FAA's previously discussed failure to deliver recurrent TEM training highlights a missed opportunity to reinforce controllers' abilities to recognize and mitigate hazards, which are critical skills that they can apply not only in their day-to-day duties of managing air traffic, but also in providing feedback through established safety reporting systems to foster continuous improvement of the SMS.

At the facility level, ATO utilized and encouraged use of formal safety reporting systems, such as ATSAP, to collect safety concerns from tower personnel without fear of punishment. However, the practice of a just culture was not consistently followed by ATO management. Interviews with some ATO staff indicated that there was a fear of retaliation for raising safety issues, and some individuals would only speak to investigators because they were close to retirement or had retired. An air traffic safety specialist, who would not speak to investigators until after her retirement was finalized, discussed multiple occasions where mandatory reporting events went unreported as well as harassment for pushing back on unsafe practices. Following this accident, DCA ATCT management personnel were reassigned, an action that appeared inconsistent with the characteristics of a positive safety culture defined by the ATO acting deputy COO. During the NTSB's investigative hearing, ATO management witnesses had to be separated from subordinate witnesses due to concern that answers were being influenced due to their close proximity. Organizations involved in the investigative hearing were asked to confirm that there would not be any retaliation against the witnesses participating in the hearing, and all affirmed this commitment. Additionally, interviews with current and former DCA ATCT personnel indicated that morale had been low for years before the accident due to the 2018 facility level downgrade and the FAA's lack of transparency regarding the metrics used to support that decision.

DCA ATCT controllers were familiar with the ATSAP program for reporting safety concerns. As previously discussed, between January 2011 and August 2023, a total of 520 ATSAP reports (approximately 40 reports per year) were filed related to DCA, supporting controller statements that they felt comfortable reporting safety concerns through the system. If a safety concern did not warrant filing an ATSAP report, controllers stated they also felt comfortable expressing their concerns to facility management.

Although there were multiple indicators of the risk of a midair collision in the DCA airspace from numerous objective and subjective data sources, such as ATSAP, ASRS, MORs, ARIA and NMACs, these risks were not identified by ATO safety assurance processes. The FAA also lacked an established process for informing parties about their involvement in NMACs and TCAS RAs. Without adequate awareness that such risks exist, ATO and parties were unable to take adequate mitigations and the DCA airspace remained vulnerable to the risk of a midair collision.

Although traffic flow volume and management issues had been longstanding challenges at DCA, ATO management did not adequately respond to concerns expressed by frontline personnel. For example, suggestions from personnel who were involved in efforts to reduce DCA's AAR were often met with resistance and a lack of communication from ATO management. Instead, controllers were required to adopt a "make it work" mindset and compensated for these conditions by relying on mitigations such as extensive use of pilot-applied visual separation and offloading arrivals to runway 33. Potomac TRACON personnel stated that they also employed workarounds for dealing with the high volume of traffic in the DCA airspace. Proposals from the DCA ATCT HWG to move Route 4 and add "hotspots" to the helicopter route chart were rejected despite their identification of risks in these areas.

Finally, on numerous occasions during the course of this investigation, the FAA failed to provide the NTSB with requested investigative information, even after agreeing to do so, or provided incomplete responses to information requests.

The lack of flexibility in adapting procedures to changes in air traffic, the dismissal of safety improvements suggested by frontline personnel, the fear of retaliation expressed by some former employees, and the ATO's actions following this accident all suggest an organization that does not embrace the principles of open communication, just culture, and continuous improvement inherent to a positive safety culture. The NTSB concludes that *FAA ATO management did not follow the tenets of SMS to support its workforce, encourage open communication, identify and mitigate risks, or foster a just culture, which eroded the overall safety culture within ATO. [FINDING 70]* The NTSB recognizes that the FAA's postaccident initiative to introduce a single, agencywide SMS presents an opportunity to identify and correct inconsistencies between ATO SMS guidance and its other SMS policies and guidance. Therefore, the NTSB recommends that the Secretary of Transportation *work with the FAA Administrator to convene an independent panel to conduct a com-*

prehensive review of the safety culture within the FAA's ATO, and use the findings to enhance the ATO's existing SMS and integrate it into all levels of the organization. [RECOMMENDATION 48]

US Army Safety Assurance

Although helicopters and airplanes had routinely experienced close encounters in the DCA area, the organizations involved appeared to lack awareness of how common such encounters were, or the safety-related implications. Aside from the DCA ATCT controllers who recommended the relocation of Helicopter Route 4 away from the runway 33 approach path, neither FAA or Army was effectively monitoring the risk of a midair collision between military helicopters and civilian fixed-wing aircraft in the area.

The NTSB's review of the Army's safety management processes revealed deficiencies in safety assurance that were not in compliance with DOW requirements and that left the Army unaware of the potential for a midair collision in the DCA area (DOD, 2019b). For example, the Army lacked a flight data monitoring program that could have detected deviations above the published altitudes on Route 4. Flight data monitoring programs have been used by commercial operators, manufacturers, and the FAA to identify, evaluate, and monitor the risks of specific categories of accidents and design and implement safety enhancements to mitigate such risks; however, these programs depend on the collection of relevant operational data, which the Army was not collecting.

Flight data monitoring programs analyze data from a variety of sources, such as flight recorders, dedicated quick access recorders, and ADS-B. If Army safety professionals had been analyzing operational data from its helicopters, it is likely they would have identified altitude exceedances on the helicopter routes adjacent to DCA and would have taken steps to understand why the exceedances were occurring at such a high rate. This may have also raised their awareness about cumulative errors in the UH-60s barometric altimetry system, and the lack of compatibility between the narrow acceptable range of operating altitudes on Route 4 and the acceptable range of error in the barometric altimeters. The NTSB concludes that *the Army did not have a flight safety data monitoring program for helicopters, and as a result, was unaware of routine altitude exceedances and related risks in the DCA terminal area. [FINDING 71]* Given the density of civil air traffic in close proximity to the helicopter routes, this was an unacceptable oversight. Class B airspace surrounds the busiest airports in the country used by passenger-carrying airlines. The Army must take extraordinary care that it does not routinely introduce unacceptable risk to civil aircraft operations in such areas. A 2020 report from the National Commission on Military Aviation Safety found that, if all military services fully employed FOQA, Line Operations Safety Audit (LOSA), and ASAP programs, "the Department of Defense and services would have an invaluable collection of data that would support the development of predictive analysis safety programs" (National Commission on Military Aviation Safety, 2020). Therefore, the NTSB recommends that the Secretary of the Army *establish a flight data monitoring program for rotary-wing aircraft the U.S. Army operates in the NAS. [RECOMMENDATION 38]*

Another limitation in the Army's safety assurance capability was the absence of a mature, front-line incident reporting program capable of capturing first-hand accounts of close encounters between aircraft. The Army's framework for hazard identification, reporting, and analysis consisted of operational hazard reports (OHRs) and the Army Safety Management Information System (ASMIS) "mishap and near miss reporting" module; however, participation in these programs was limited, and they had not yet matured into full operational use.

The TAAB safety manager stated that ASMIS 2.0 was being used to record monthly inspection results, mishaps, and near-misses, but described these as company-level safety inputs rather than individual pilot submissions. TAAB pilots similarly described company safety officers as responsible for most safety paperwork and data entry. Pilot interviews gave no indication of flight crew-initiated OHRs, and no interviewee described pilots directly logging events in ASMIS.

According to the brigade safety manager, no ASMIS near-miss reports or OHRs related to near mid-air collisions between aircraft had been filed, and no OHRs had been filed about near midair collisions in the DCA area. The brigade safety manager stated that no OHRs had been submitted by brigade pilots for any reason in the year preceding the accident. This low utilization could explain, in part, the Army's lack of awareness about the prevalence of close proximity events in the DCA area. The NTSB concludes that *the Army's safety reporting systems for pilots were not well utilized and did not provide the organization with information about close encounters between Army helicopters and other aircraft that were later found to have occurred frequently. [FINDING 72]*

Given the number of close encounters between helicopters and fixed-wing aircraft in the DCA area revealed by postaccident analysis of safety data, the NTSB believes that it is important for the Army to improve its capability in this area. Interviewed pilots did not offer reasons for their lack of utilization of the safety reporting systems. Research literature suggests that common reasons for underreporting cited by pilots include the effort required to file a safety report, concern over negative consequences, and disbelief that safety reporting will lead to safety improvements (Haslbeck, Schmidt-Moll, and Schubert, 2015, 596–601). Such barriers might be addressed by reducing the effort required to file a report, cultivating a supportive (“just”) culture, or providing feedback to pilots about changes resulting from safety reports. The first step in addressing this issue would be for the Army to identify the specific reasons for the low utilization of safety reporting systems among its pilots. Therefore, the NTSB recommends that the Secretary of the Army *survey U.S. Army helicopter pilots to identify barriers to the utilization of flight safety reporting systems, develop a plan to address the identified barriers, and implement that plan across Army aviation units. [RECOMMENDATION 39]*

The deficiencies noted above likely existed because the Army had yet to fully implement best practices for safety management. Based on testimony from the TAAB commander during the investigative hearing, TAAB was in the beginning stages of implementing the Army’s SMS (Army Safety and Occupational Health Management System, or ASOHMS) and had not yet reached the point where it was focused on the development of effective safety assurance capabilities.

The Army’s slow progress in implementing ASOHMS could stem from several causes. First, responsibility for different aspects of safety management was widely distributed across various Army organizations. Second, the program was designed to address the full range of safety issues that a commander might seek to manage, both on-and off-duty, not only safety of flight operations. Third, the Army encountered resource issues, as evidenced by comments made at the NTSB’s investigative hearing by the director of the Data Analysis and Prevention Directorate that the military flight operations quality assurance (MFOQA) mandate was unfunded. Fourth, TAAB safety personnel indicated that staffing was an issue. Until shortly before this accident, TAAB had only one full-time safety manager, who was responsible for five battalions and a variety of different functions. Due to his broad range of responsibilities, only half of his time was available for working on flight safety issues, and only a portion of that time was spent specifically on helicopter safety. The 12th Aviation Battalion safety officer, who was also a pilot, spent about 75 percent of his time on ground safety and occupational health matters and 25 percent on aviation safety. B Company’s safety officer, also a pilot, estimated that 80 percent of his time was spent on occupational health and safety matters. By comparison, a Part 121 airline typically employs several individuals working full-time on flight safety management-related functions.

A 2023 GAO study of Army National Guard helicopter units found that workload and staffing imbalances hindered the scope of safety officer efforts in the Guard’s aviation units. Safety officers interviewed by the GAO described struggling to address the broad scope of their ground and flight safety responsibilities and their roles as pilots. This impeded their ability to do such things as “coordinating with other safety organizations; using data systems to perform hazard analysis; communicating with unit personnel for aircraft-specific insights; and overseeing the quality of hazard and accident reporting processes.” Evidence from this investigation suggests that TAAB and the 12th Aviation Battalion faced similar challenges with safety-related staffing and workload allocations.

At the NTSB’s investigative hearing, the director of safety and occupational health for the U.S. Army Secretariat acknowledged the existence of these challenges and said that the Army was updating its “manpower evaluation” model to address the issue. Although updating the manpower evaluation model was an annual requirement, past updates did not result in adequate safety staffing. The NTSB concludes that *the Army’s process for allocating resources to aviation safety management did not ensure the development of a robust SMS for helicopter operations in the Washington, DC, area. [FINDING 73]* This accident demonstrates the importance of having the capability for, at a minimum, implementing safety assurance processes to monitor the safety of Army aviation operations in densely utilized airspace with a high concentration of commercial air traffic. Therefore, the NTSB recommends that the Secretary of the Army *revise the method for allocating resources to ensure the development of a robust SMS that will, at a minimum, identify and monitor the potential for midair collisions between Army aircraft and civil air traffic operating in the NAS. [RECOMMENDATION 40]*

US Army Safety Culture

Our investigation identified several characteristics of the Army's safety culture relevant to this accident.

Just culture: At the operational unit level (brigade and battalion), investigators found evidence of a generally non-punitive and non-repressive safety climate. Front-line personnel reported feeling comfortable expressing safety-related concerns to safety officers and to their chain of command. The absence of a repressive climate did not appear to be a limiting factor in safety information flow.

Reporting culture: Although formal safety reporting systems existed, including OHRs and ASMIS near-miss reports, their utilization by flight crews was low. As a result, the organization had limited visibility into emerging operational risks, including the frequent close proximity of helicopters to jet aircraft arriving at DCA. This gap reflects a reporting culture that was formally established but not functionally embedded in routine operations.

Informed culture: The Army's ability to maintain an informed understanding of operational risk was constrained by organizational structure and priorities. Safety professionals who might otherwise analyze safety reports and operational data were largely consumed by ground safety and occupational health responsibilities mandated at the Army level. In combination with the low volume of flight safety reports and the absence of flight data monitoring capability, these constraints limited the organization's capacity to synthesize available information and maintain awareness of hazards, such as routine altitude exceedances on Washington, DC, helicopter routes.

Flexible culture: The Army's safety system lacked the structural flexibility and analytical capability necessary to adapt its safety focus in response to changes in the operational environment. Consequently, safety oversight did not adjust to the increasing density of aircraft arrivals at DCA, the reliance on visual separation to maintain traffic flow, or the infrequent use of runway 33, which made encounters between helicopters on Route 4 and low-flying airplanes approaching from the southeast atypical and less anticipated.

Learning culture: Organizational learning within the Army was primarily reactive, occurring in response to mishaps rather than through anticipatory identification of weak signals and emerging trends. The Secretary of the Army had mandated adoption of the ASOHMS in 2024, and the Army Combat Readiness Center had developed tools to support hazard tracking and analysis; however, these capabilities were not effectively utilized due to the structural and cultural limitations described above.

Although Army leadership had recently initiated policy changes intended to shift aviation safety management in a more proactive direction, these efforts were constrained by limitations in organizational capacity and safety culture. Specifically, Army aviation exhibited an underdeveloped reporting culture, limited informed awareness of operational hazards, insufficient flexibility to adapt safety oversight to changing risk, and a learning culture oriented toward reactive rather than anticipatory risk management.

The NTSB concludes that *the Army's aviation safety system failed to consistently detect, interpret, and act on signals of latent hazards, resulting in degraded safety assurance, organizational learning, and safety culture. [FINDING 74]*

The NTSB believes that addressing the identified safety culture limitations described above would require the Army to take several interrelated, system-level steps. First, the Army would need to ensure that flight safety management functions are adequately staffed and resourced, including the assignment of competent safety professionals with the expertise and time necessary to cultivate a robust reporting culture and to identify weak signals of risk through effective analysis.

Second, the Army would need to structurally protect these personnel from collateral duties unrelated to aviation safety that dilute their capacity to perform proactive safety oversight.

Third, the Army would need to provide flight safety personnel with objective data collection and analysis tools, such as a funded and institutionalized MFOQA capability, to support the detection of emerging risk trends during normal operations.

Finally, the Army would need to ensure that flight safety personnel are empowered, through organizational authority and access to leadership, to effectively advocate for safety-related changes based on the risks they identify.

As a result, the NTSB recommends that *the U.S. Army develop and maintain a flight safety management capability that is independently resourced and functionally separate from its occupational and environmental health management system, and ensure that this capability is both culturally and functionally integrated with units conducting sustained flight operations in the NAS. [RECOMMENDATION 41]*

ATTACHMENT:

NTSB FINDINGS, PROBABLE CAUSE, AND RECOMMENDATIONS LIST

Findings

1. The pilots of flight 5342 were certificated and qualified in accordance with Federal regulations.
2. The pilots of flight 5342 were medically qualified for duty, and available evidence does not indicate that they were impaired by effects of medical conditions or substances at the time of the accident.
3. Review of the flight 5342 pilots' time since waking and sleep opportunities in the days before the accident indicated that the pilots were unlikely to have been experiencing fatigue.
4. The pilot, instructor pilot, and crew chief onboard PAT25 were qualified and current in their positions as designated by the unit commander in accordance with Army regulations.
5. The pilot, instructor pilot, and crew chief of PAT25 were medically qualified for duty, and available evidence does not indicate that they were impaired by effects of medical conditions or substances at the time of the accident.
6. Review of the three PAT25 crewmembers' time since waking and sleep opportunities in the days before the accident indicated that the crew were unlikely to have been experiencing fatigue.
7. The airplane was properly certificated, equipped, and maintained in accordance with 14 CFR Part 121. The airplane was operated within its weight and balance limitations throughout the flight. Examination of the airplane revealed damage consistent with an in-flight collision and subsequent impact with water, and there was no evidence of any structural, system, or powerplant failures or anomalies. Review of surveillance videos indicated that the airplane's wing navigation, landing/taxi, and anti-collision strobe lights were operating at the time of the collision.
8. The helicopter was properly certificated, equipped, and maintained in accordance with U.S. Army regulations. Review of helicopter maintenance records did not reveal any open discrepancies or anomalous trends that contributed to the accident. The helicopter was operated within its weight and balance limitations throughout the flight. Examination of the helicopter revealed damage consistent with an in-flight collision and subsequent impact with water, and there was no evidence of any structural, main or tail rotor system, flight control system, or powerplant failures or anomalies. Review of surveillance videos indicated that the helicopter's right and tail position lights, the landing light, as well as both upper and lower anti-collision lights, were operating at the time of the collision.
9. The operations supervisor and four controllers who were working in the Ronald Reagan Washington National Airport air traffic control tower cab at the time of the accident were properly certified, qualified in accordance with Federal regulations and facility directives, and current.
10. Although the Ronald Reagan Washington National Airport air traffic control tower facility was not staffed to its target level at the time of the accident, the number of staff in the tower at the time of the accident was adequate and in accordance with Federal Aviation Administration directives.
11. The decision to combine the helicopter control and local control positions was not the result of insufficient staffing, and personnel were available to staff the helicopter control and local control positions separately had the operations supervisor chosen to do so.
12. The local control controller, assistant local controller, and operations supervisor were medically qualified for duty, and available evidence does not indicate they were impaired by effects of medical conditions at the time of the accident.
13. Review of the local control and assistant local control controllers' and operations supervisor's (OS) time since waking and sleep opportunities in the days before the accident indicated that the controllers, including the OS, were unlikely to have been experiencing fatigue.
14. Visual meteorological conditions prevailed in the area at the time of the accident. A review of observations recorded throughout the night of the accident revealed no evidence of any local atmospheric pressure anomalies that would have impacted barometric altimeter readings.

15. The Metropolitan Washington Airports Authority Airport Rescue and Fire-fighting and airport operations staff responded immediately and in accordance with applicable emergency plans and regulatory requirements, deploying land-and water-based resources, and coordinating mutual aid under complex nighttime and on-water conditions.
16. Keeping the helicopter control and local control positions continuously combined on the night of the accident increased the local control controller's workload and negatively impacted his performance and situation awareness.
17. The local control and helicopter control positions should have been separated at the time of the accident given present traffic volume and complexity.
18. In the two minutes before the accident when traffic volume was increasing, the assistant local controller should have prioritized surveillance of aircraft in the air in order to assist the local controller, rather than diverting her attention to the lower priority task of documenting helicopter information, which could have been completed when traffic volume and complexity had subsided.
19. Had the helicopter and local control positions been staffed separately, PAT25 might have received a more timely and effective traffic advisory.
20. Due to extended time on position at the time of the collision and his complacency, the operations supervisor was likely experiencing reduced alertness and vigilance, which decreased his awareness of the operational environment and reduced his ability to proactively assess the risks posed by the traffic and environmental conditions at the time of the accident.
21. The lack of mandatory relief periods for supervisory air traffic control personnel is contrary to human factors research that shows clear performance deterioration in situations of prolonged time on task.
22. Although the local control controller provided an initial traffic advisory to the crew of PAT25 in accordance with Federal Aviation Administration Order Job Order 7110.65, he did not provide a corresponding advisory to the crew of flight 5342 regarding PAT25's location and intention, which could have increased situation awareness for the crew of flight 5342.
23. If the local control controller had issued a standard safety alert to the flight crews of either aircraft as prescribed in FAA Order Job Order 7110.65, providing the conflicting aircraft's position and positive control instructions, the crew of either aircraft could have taken immediate action to avert the impending collision.
24. Initial and recurrent scenario-based training in threat and error management would help controllers identify and mitigate risks and strengthen situation awareness.
25. A risk assessment or decision making tool would likely have benefited the accident OS in identifying and mitigating the operational risk factors that were present on the night of the accident.
26. Due to degraded radio reception, the crew of PAT25 did not receive salient information regarding flight 5342's circling approach to runway 33.
27. The PAT25 instructor pilot did not positively identify flight 5342 at the time of the initial traffic advisory despite his statement that he had the traffic in sight and his request for visual separation.
28. With several other targets located directly in front of the helicopter represented by points of light with no other features by which to identify aircraft type, and without additional position information from the controller, the instructor pilot likely identified the wrong target.
29. Interference that obscured the controller's "circling to" call, the microphone keying that blocked the PAT25 crew from receiving the instruction to "pass behind," ambiguous visual cues, and the lack of an integrated traffic awareness and alerting system likely reinforced the PAT25 crew's expectation bias that the airplane was among the traffic approaching runway 1 and did not pose a conflict.
30. The absence of documented training on Ronald Reagan Washington National Airport's fixed-wing procedures and the mixed-traffic operating environment represented a safety vulnerability for Army flight crews operating in the Ronald Reagan Washington National Airport Class B airspace.
31. Due to additive allowable tolerances of the helicopter's pitot-static/altimeter system, it is likely that the crew of PAT25 observed a barometric altimeter altitude about 100 ft lower than the helicopter's true altitude, resulting in the

crew erroneously believing that they were under the published maximum altitude for Route 4.

32. A recurrent task to verify the continued accuracy of recorded flight data for U.S. Army aircraft would help ensure the data integrity needed to support quality assurance and safety programs and accident investigations.
33. The Federal Aviation Administration and the Army failed to identify the incompatibility between the helicopter routes' low maximum altitudes and the error tolerances of barometric altimeters, which contributed to helicopters regularly flying higher than published maximum altitudes and potentially crossing into the runway 33 glidepath.
34. Pilots need all available information on the potential total error, allowed by design, that could occur in flight on an airworthy barometric altimeter.
35. The Army's post-installation functional check of the transponder on the accident helicopter was insufficient to detect that it was not broadcasting Automatic Dependent Surveillance–Broadcast Out.
36. The Army's lack of a recurrent transponder inspection procedure resulted in the incorrect aircraft address being transmitted by the accident helicopter's transponder, and the incorrect automatic dependent surveillance–broadcast settings on several other helicopters being undetected.
37. Because the APX–123A transponder is designed for use on multiple aircraft platforms, it is possible that incorrect settings may be present on other aircraft used throughout the Department of War armed services.
38. The crew of flight 5342 did not see the helicopter until it was too late to avoid a collision because of the high workload imposed during the final phase of their approach, and due to the helicopter's low conspicuity and lack of apparent motion.
39. Times of compacted demand as a result of air carrier scheduling practices increased operational complexity and required mitigations by controllers to maintain spacing and surface movement.
40. Ronald Reagan Washington National Airport air traffic control tower routinely received less than the requested miles in trail spacing from Potomac Consolidated Terminal Radar Approach Control, which increased controller workload by requiring them to generate additional spacing to prevent delays or gridlock.
41. The practice of "offloading" arrival traffic on approach to runway 1 by asking pilots if they could accept a circling approach to runway 33 was a routine mitigation strategy for Ronald Reagan Washington National Airport controllers to generate spacing that was not provided by Potomac Consolidated Terminal Radar Approach Control.
42. Time-based flow management, or metering, would provide Potomac Consolidated Terminal Radar Approach Control and Ronald Reagan Washington National Airport air traffic control tower with a consistent flow of traffic with more accurate spacing and greater predictability, thereby reducing controller workload.
43. Ronald Reagan Washington National Airport air traffic control tower has significant airspace, airfield, mixed fleet, and operations complexities that appear to be inconsistent with its current facility level classification.
44. The Federal Aviation Administration Air Traffic Organization failed to recognize external compliance verification results as indicators of systemic traffic management, volume, and flow issues at Ronald Reagan Washington National Airport for which controllers were required to compensate.
45. The longstanding practice of relying on pilot-applied visual separation (see-and-avoid) as the principal means of separating helicopter and fixed wing traffic in the Washington, DC, area by Ronald Reagan Washington National Airport air traffic control tower, the Army, and other helicopter operators led to a drift in operating practices among controllers and helicopter crews that increased the likelihood of a midair collision.
46. Reliance on pilot-applied visual separation (see-and-avoid) as a primary means of separating mixed traffic introduced unacceptable risk to the Ronald Reagan Washington National Airport Class B airspace.
47. Ronald Reagan Washington National Airport air traffic control tower's procedure of maintaining a discrete helicopter frequency when the local and helicopter control positions were combined decreased overall situation awareness for pilots operating in the area.

48. Providing controllers with additional salient cues regarding the perceived severity of a potential conflict would reduce controller cognitive load and would likely improve reaction time to the most critical conflict alerts.
49. There was no evidence that the local control controller, assistant local control controller, or operations supervisor were under the influence of alcohol or prohibited drugs at the time of the accident; however, evidence was substantially limited by the lack of postaccident alcohol testing, and evidence was of somewhat lower quality than it would have been if drug testing had been conducted sooner following the accident.
50. The Federal Aviation Administration Air Traffic Organization's (ATO) drug and alcohol testing determination did not meet Department of Transportation (DOT) timeliness requirements; furthermore, the ATO's decision to not conduct drug testing as soon as possible after the testing determination, and to not conduct alcohol testing at all, violated DOT requirements.
51. The delayed and inappropriate drug and alcohol testing determination was due in part to the Air Traffic Organization's (ATO) determination process being inadequately designed to routinely meet Department of Transportation requirements for timely testing, and in part to ATO staff's incomplete understanding of those requirements.
52. Annual reviews of helicopter route charts as required by Federal Aviation Administration Order 7210.3DD would have provided an opportunity to identify the risk posed by the proximity of Route 4 to the runway 33 approach path, but there is no evidence to support that these reviews were being performed at Ronald Reagan Washington National Airport.
53. The information published by the Federal Aviation Administration regarding Washington, DC, area helicopter routes was insufficient to provide helicopter and fixed-wing operators with a complete understanding of the helicopter route structure and its lack of procedural separation from fixed-wing traffic.
54. Current aeronautical charting does not provide information on visual flight rules helicopter routes that may conflict or come in close proximity to approach and departure corridors, which reduces pilot situation awareness.
55. The lack of Automatic Dependent Surveillance–Broadcast (ADS–B) Out from the accident helicopter did not contribute to this accident, as the helicopter was still being tracked by radar, and ADS–B Out would not have provided improved traffic alerting for the Ronald Reagan Washington National Airport controller or the crew of flight 5342, because the airplane was not equipped with ADS–B In.
56. The Army's standard operating procedures that prevent flight crews from enabling Automatic Dependent Surveillance–Broadcast (ADS–B) Out while in flight, when not performing sensitive missions that require ADS–B to be disabled, limit the visibility of military aircraft on collision avoidance technologies that leverage ADS–B information.
57. Although the airplane's traffic alert and collision avoidance system operated as designed, it was ineffective in preventing the collision because of current activation criteria and resolution advisory inhibit altitudes.
58. Traffic advisory aural alerts that include additional information about the location of traffic could reduce the time pilots need to visually acquire target aircraft.
59. Had the airplane been equipped with an airborne collision avoidance system that used Automatic Dependent Surveillance–Broadcast In information to show directional traffic symbols, the crew of flight 5342 would have received enhanced information about the risk posed by the helicopter, which could have enabled them to take earlier action to avert the collision.
60. Although the pilot and instructor pilot onboard PAT25 were equipped with tablets that had the ability to display traffic transmitting Automatic Dependent Surveillance–Broadcast Out, it is unlikely that the pilots were using the tablets to monitor or identify traffic at the time of the accident due to the workload associated with low-altitude flight.
61. Technological advances since the development of traffic alert and collision avoidance system II operating standards may allow airborne collision avoidance system Xa with reduced inhibit altitudes to have an expanded alerting envelope while reducing nuisance alerts.
62. Although not yet commercially available, had the helicopter been equipped with airborne collision avoidance system Xr with integrated aural alerting,

the crew could have received an alert regarding flight 5342 and could have taken action to avert the collision.

63. Multiple data sources provided evidence of midair collision risk between fixed-wing aircraft and helicopters at Ronald Reagan Washington National Airport, including on approach to runway 33, before this accident; however, the limited access to and use of available objective and subjective proximity data hindered industry and government stakeholders' ability to identify hazards and mitigate risk.
64. Improving stakeholder access to standardized and objective information about aircraft close proximity encounters for use in safety assurance processes would increase the likelihood of detecting and mitigating hazards before accidents occur.
65. The Federal Aviation Administration's lack of an established process to inform parties about their involvement in events such as near midair collisions or traffic alert and collision avoidance system resolution advisories reduces the likelihood of fully understanding and mitigating future midair collision risk.
66. The Federal Aviation Administration Air Traffic Organization was made aware of, and had multiple opportunities to identify the risk of a midair collision between airplanes and helicopters at Ronald Reagan Washington National Airport; however, their data analysis, safety assurance, and risk assessment processes failed to recognize and mitigate that risk.
67. The Federal Aviation Administration Air Traffic Organization's application of its safety management system did not effectively coordinate safety assurance and safety risk management activities with external stakeholders in the Ronald Reagan Washington National Airport Class B airspace.
68. Changes to Ronald Reagan Washington National Airport air traffic control tower's standard operating procedures to the accident removing the requirement for the operations supervisor (OS) to document the time and reason for combining or de-combining the helicopter control position in the facility log made it less likely that the OS would consider and evaluate the risks associated with combining or de-combining the position.
69. Safety risk management practices were not fully integrated into Ronald Reagan Washington National Airport air traffic control tower operations and did not identify or mitigate the operational challenges faced by controllers or the lack of guidance regarding operational risk assessments for controllers and supervisors.
70. Federal Aviation Administration Air Traffic Organization (ATO) management did not follow the tenets of safety management systems to support its workforce, encourage open communication, identify and mitigate risks, or foster a just culture, which eroded the overall safety culture within ATO.
71. The Army did not have a flight safety data monitoring program for helicopters, and as a result, was unaware of routine altitude exceedances and related risks in the Ronald Reagan Washington National Airport terminal area.
72. The Army's safety reporting systems for pilots were not well utilized and did not provide the organization with information about close encounters between Army helicopters and other aircraft that were later found to have occurred frequently.
73. The Army's process for allocating resources to aviation safety management did not ensure the development of a robust safety management system for helicopter operations in the Washington, DC, area.
74. The Army's safety system failed to consistently detect, interpret, and act on signals of latent hazards, resulting in degraded safety assurance, organizational learning, and safety culture.

Probable Cause

We determined that the probable cause of this accident was the FAA's placement of a helicopter route in close proximity to a runway approach path; their failure to regularly review and evaluate helicopter routes and available data; and their failure to act on recommendations to mitigate the risk of a midair collision near Ronald Reagan Washington National Airport; as well as the air traffic system's overreliance on visual separation in order to promote efficient traffic flow without consideration for the limitations of the see-and-avoid concept.

Also causal was the lack of effective pilot-applied visual separation by the helicopter crew, which resulted in a midair collision. Additional causal factors were the

tower team's loss of situation awareness and degraded performance due to the high workload of the combined helicopter and local control positions and the absence of a risk assessment process to identify and mitigate real-time operational risk factors, which resulted in misprioritization of duties, inadequate traffic advisories, and the lack of safety alerts to both flight crews. Also causal was the Army's failure to ensure pilots were aware of the effects of error tolerances on barometric altimeters in their helicopters, which resulted in the crew flying above the maximum published helicopter route altitude.

Contributing factors include:

- The limitations of the traffic awareness and collision alerting systems on both aircraft, which precluded effective alerting of the impending collision to the flight crews;
- An unsustainable airport arrival rate, increasing traffic volume with a changing fleet mix, and airline scheduling practices at DCA, which regularly strained the DCA ATCT workforce and degraded safety over time;
- The Army's lack of a fully implemented safety management system, which should have identified and addressed hazards associated with altitude exceedances on the Washington, DC, helicopter routes;
- The FAA's failure across multiple organizations to implement previous NTSB recommendations, including ADS-B In, and to follow and fully integrate its established safety management system, which should have led to several organizational and operational changes based on previously identified risks that were known to management; and
- The absence of effective data sharing and analysis among the FAA, aircraft operators, and other relevant organizations.

What We Recommended

On Mar. 7, 2025 we issued an urgent recommendation report (AIR-25-01) with two urgent recommendations on mitigating the risk of midair collisions at DCA.

To the Federal Aviation Administration:

- Prohibit operations on Helicopter Route 4 between Hains Point and the Wilson Bridge when runways 15 and 33 are being used for departures and arrivals, respectively, at Ronald Reagan Washington National Airport (DCA). (Urgent)
- Designate an alternative helicopter route that can be used to facilitate travel between Hains Point and the Wilson Bridge when that segment of Route 4 is closed. (Urgent)

As a result of this investigation, we made the following new safety recommendations.

To the Federal Aviation Administration:

1. Develop and implement time-on-position limitations for supervisory air traffic control personnel, including guidance for district and facility level management to adapt these limitations to account for their own staffing and local standard operating procedures.
2. Develop instructor-led, scenario-based training on threat and error management that trains controllers to continuously monitor their environment to more quickly and accurately identify threats; promote team communication to ensure that communications are clear, timely, and assertive; emphasize effective scanning habits; recognize patterns in the development of adverse events; and enhance decision-making under stress by developing habits that balance procedural compliance with problem solving to mitigate the risks of threats and errors, and provide this training to all air traffic controllers annually.
3. Develop and implement a risk assessment tool for supervisors that incorporates the principles of threat and error management to assist in risk identification, mitigation, and operational decision making.
4. Initiate rulemaking in 14 Code of Federal Regulations Part 93 Subpart K, High Density Traffic Airports, that prescribes air carrier operation limitations at DCA in 30-minute periods, similar to those imposed at LaGuardia Airport, to ensure that the airport does not exceed capacity and to mitigate inconsistent air carrier scheduling practices.
5. Fully implement operational use of the time-based flow management system at Potomac Consolidated Terminal Radar Approach Control and its associated air traffic control towers.

6. Reassess the Ronald Reagan Washington National Airport's airport arrival rate with special consideration to its airspace complexity, airfield limitations, mixed-fleet operations, and traffic volume.
7. Define objective criteria for the determination of air traffic facility levels considering traffic and airspace volume, operational factors unique to each facility, and cost of living.
8. Using the criteria established by Safety Recommendation [7], determine whether the classification of the Ronald Reagan Washington National Airport's air traffic control tower as a level 9 facility appropriately reflects the complexity of its operations.
9. Conduct a comprehensive evaluation, in conjunction with local operators, to determine the overall safety benefits and risks to requiring all aircraft to use the same frequency when the helicopter and local positions are combined in the Ronald Reagan Washington National Airport air traffic control tower.
10. Implement anti-blocking technology that will alert controllers and/or flight crews to potentially blocked transmissions when simultaneous broadcasting occurs.
11. Develop and implement improvements to the conflict alert system to provide more salient and meaningful alerts to controllers based on the severity of the conflict triggering the alert.
12. Once the improvements to the conflict alert system discussed in Safety Recommendation [11] are implemented, provide training to controllers on its use.
13. Revise the Air Traffic Organization's initial event response procedures so that an appropriate on-site supervisor makes each postaccident and postincident drug and alcohol testing determination, based on their assessment of whether the event meets testing criteria and which controllers had duties pertaining to the involved aircraft, without needing to wait for investigation or approval.
14. At least annually, provide training on the revised postaccident and postincident drug and alcohol testing determination procedure discussed in Safety Recommendation [13] to all staff who have responsibilities under that procedure; this training should include a post-learning knowledge assessment.
15. Ensure that annual reviews of helicopter route charts are being conducted throughout the National Airspace System as required by Federal Aviation Administration Order.
16. Conduct a safety risk management process to evaluate whether modifications to the remaining helicopter route structure in the vicinity of Ronald Reagan Washington National Airport are necessary to safely deconflict helicopter and fixed-wing traffic and provide the results to the National Transportation Safety Board.
17. Amend your helicopter route design criteria and approval process to ensure that current and future route designs or design changes provide vertical separation from airport approach and departure paths.
18. Based on the criteria and approval process established by Safety Recommendation [17], review all existing helicopter routes to ensure alignment with these updated criteria.
19. Incorporate the lateral location and published altitudes of helicopter routes onto all instrument and visual approach and departure procedures to provide necessary situation awareness to fixed-wing operators of the risk of helicopter traffic operating in their vicinity.
20. Modify airborne collision avoidance system traffic advisory aural alerts to include clock position, relative altitude, range, and vertical tendency.
21. Require existing and new traffic alerting and collision avoidance system (TCAS) I, TCAS II, and airborne collision avoidance system X installations to integrate directional traffic symbols.
22. Require all aircraft operating in airspace where Automatic Dependent Surveillance–Broadcast (ADS–B) Out is required to also be equipped with ADS B In with a cockpit display of traffic information that is configured to provide alerting audible to the pilot and/or flight crew.
23. Require the use of the appropriate variant of airborne collision avoidance system X on new production aircraft that are subject to traffic alert and collision avoidance system equipage regulations.

24. Require existing aircraft that are subject to traffic alert and collision avoidance system equipage regulations be retrofitted with the appropriate variant of airborne collision avoidance system X.
25. Evaluate the feasibility of decreasing the traffic advisory and resolution advisory inhibit altitudes in airborne collision avoidance system Xa to enable improved alerting throughout more of the flight envelope.
26. If the evaluation resulting from Safety Recommendation [25] finds that the inhibit altitudes can be safely decreased, require retrofitting of the applicable airborne collision avoidance system X variant incorporating the reduced traffic advisory and resolution advisory inhibit altitudes on all aircraft that are subject to traffic alert and collision avoidance system and equipage regulations.
27. Require that all rotorcraft operating in Class B airspace be equipped with airborne collision avoidance system (ACAS) Xr technology once the ACAS Xr standard has been published.
28. Create an objective definition of close proximity encounter and a public database of those encounters and their locations that can be used to monitor their prevalence and identify areas of potential traffic conflict for safety assurance and safety risk management.
29. Develop and implement a process that will, in a timely manner, notify involved parties after events such as near midair collisions or traffic alert and collision avoidance system resolution advisory activations, such that notification occurs while relevant data remain available and before meaningful safety analysis, reporting, or corrective action is no longer practicable.
30. Based on the results of the audit completed in accordance with Safety Recommendation [49], ensure that all safety management system functions and data sharing activities at all air traffic control facilities are conducted in collaboration with all relevant external stakeholders.
31. Establish a requirement across all air traffic control tower standard operating procedures that the operations supervisor (OS) or controller-in-charge (CIC) document in the daily facility log when any control position is combined with the local control position, or when the OS/CIC position is combined with a control position, along with a rationale for doing so.
32. Develop a new and comprehensive instructor-led, scenario-based training on the proper use of visual separation, both tower-and pilot-applied. This training should include information on the inherent limitations of see and avoid, responsibilities when applying visual separation, and guidance for controllers on factors, such as current traffic volume, workload, weather or environmental factors, experience, and staffing, that should be considered when applying visual separation. Require this training for all controllers and include on a recurrent basis thereafter in annual simulator refresher training.
33. Require each Class B or Class C air traffic control tower facility to evaluate its existing miles-in-trail procedures or agreements to ensure that the spacing provided is appropriate for operational safety, and make the results publicly available.

To the U.S. Army:

34. Revise training procedures for flight crews assigned to operate in the Washington, DC, area to ensure that they receive initial and recurrent training on fixed-wing operations at Ronald Reagan Washington National Airport, including approach and departure paths, runway configurations, and the interaction of those traffic flows with published helicopter routes.
35. Develop and implement a recurring procedure, at an interval not to exceed 18 months, to verify the continued accuracy of recorded flight data.
36. Incorporate information within the appropriate operator's manual for all applicable aircraft on the potential total error allowed by design that could occur in flight on an otherwise airworthy barometric altimeter, including the increased position error associated with the external stores support system configuration.
37. Develop and implement a transponder inspection procedure on all aircraft with transponders capable of transmitting Mode S and automatic dependent surveillance—broadcast (ADS-B) and operated in the National Airspace System (NAS), at least annually and upon each aircraft's entry into service in the NAS, that ensures 1) the transponder ADS-B settings are correct, 2) the

transponder is transmitting ADS-B, and 3) the transponder is transmitting the correctly assigned address.

38. Establish a flight data monitoring program for rotary-wing aircraft the U.S. Army operates in the National Airspace System.
39. Survey U.S. Army helicopter pilots to identify barriers to the utilization of flight safety reporting systems, develop a plan to address the identified barriers, and implement that plan across Army aviation units.
40. Revise the method for allocating resources to ensure the development of a robust safety management system that will, at a minimum, identify and monitor the potential for midair collisions between Army aircraft and civil air traffic operating in the National Airspace System.
41. Develop and maintain a flight safety management capability that is independently resourced and functionally separate from its occupational and environmental health management system, and ensure that this capability is both culturally and functionally integrated with units conducting sustained flight operations in the National Airspace System.

To the Department of War Policy Board on Federal Aviation:

42. Conduct a study to evaluate the quality of radio transmissions and reception for those aircraft operated within the National Airspace System to identify factors that degrade communications equipment performance and adversely affect the safety of civilian and military flight operations.
43. Implement appropriate enhancements, based on the findings of the study recommended in Safety Recommendation [41], to remediate identified deficiencies in air-ground radio communications performance.
44. Require the Department of War to verify on all aircraft with transponders capable of transmitting Mode S and automatic dependent surveillance—broadcast (ADS-B) and operated in the National Airspace System (NAS), at least annually and upon each aircraft's entry into service in the NAS, that 1) the transponder ADS-B settings are correct, 2) the transponder is transmitting ADS-B, and 3) the transponder is transmitting the correctly assigned address.
45. Require armed services to amend their operational procedures to allow flight crews to enable Automatic Dependent Surveillance—Broadcast Out while in flight.
46. Require all military aircraft operating in the National Airspace System (NAS) be equipped with Automatic Dependent Surveillance-Broadcast (ADS-B) In with a cockpit display of traffic information that is configured to provide alerting audible to the pilot and/or flight crew, and that such requirement apply wherever in the NAS the Federal Aviation Administration requires any aircraft to operate with ADS-B Out.

To the Department of Transportation:

47. Require the Federal Aviation Administration to demonstrate at least annually that each air traffic control facility it operates has the routine capability to accomplish required postaccident and postincident drug and alcohol testing within the U.S. Department of Transportation's specified timeframes of 2 hours for alcohol and 4 hours for drugs, and implement a process to ensure that any facility without such capability will demonstrate timely remediation.
48. Work with the Federal Aviation Administration (FAA) Administrator to convene an independent panel to conduct a comprehensive review of the safety culture within the FAA's Air Traffic Organization (ATO), and use the findings to enhance the ATO's existing safety management system and integrate it into all levels of the organization.

To the Department of Transportation Office of Inspector General:

49. Complete an audit of the Federal Aviation Administration (FAA) Air Traffic Organization safety management system functions and data sharing activities at all air traffic control facilities and determine whether these activities are conducted in collaboration with all relevant external stakeholders, ensuring that the audit's results are documented, reported to the Secretary of Transportation and the FAA Administrator, and made available to the public.

To the RTCA Program Management Committee:

50. Finalize and publish the minimum operational performance standards for airborne collision avoidance system Xr for rotorcraft.

The CHAIRMAN. Thank you, Madam Chair. In just a moment, Chairwoman Homendy is going to play a short video simulation that the NTSB produced that includes the transcript of the cockpit voice recordings along with air traffic control transmission. And I will say right before this hearing began, the Chairwoman played for the members of this committee, in the back conference room, the video along with the audio of the cockpit voice transmissions.

Under Federal law, we're not allowed to play the actual voice transmissions publicly. But I will tell you, watching and listening, and for any members that did not see that, I'm certain that Chairwoman would be happy to give you the opportunity to see it and listen to it. It is positively horrifying. And watching it and listening to the voices of the pilots makes you sick to your stomach.

After watching, it is indisputable that ADS-B In and Out could have prevented, and likely would have prevented, this accident, and we have an obligation to prevent the next accident. I do want to give a moment if any of the family members wish to step out and not watch the video. We certainly understand that, and so, I want to give you an opportunity if you would prefer not to watch it.

And, Madam Chair, you can play the video now.

[Video shown.]

Ms. HOMENDY. So, it I think it stopped here because that—it says 47 seconds, but at 48 seconds, the helicopter crew had—they did have ADS-B In on an iPad that was strapped to their thigh, but they also had NVGs on, and it was a high night vision goggles on, and it was a high workload environment.

And so, they didn't look down. You don't look down constantly in this airspace with NVGs on to—it would be very difficult. Had—the problem is that they would have received an oral alert from their iPad at 48 seconds had that been connected into their headsets, but their headsets aren't able to receive those oral alerts.

And so, an oral alert, had that been connected and integrated into their headset, which was one of our recommendations to do that so that they can get those alerts, it would have been 40—they would have been at 280 feet. The aircraft would have been at 640 feet. They would have been miles apart and could have taken evasive action because, at this point, they're at Hains Point, in plenty of time to take action. But that was the first time they would have received an alert, but didn't because they couldn't hear. It doesn't come across their headset.

[Video shown.]

Ms. HOMENDY. At 59 seconds, this is where Flight 5342, had they had ADS-B In, would have gotten their first alert. That would have been their first alert had there been ADS-B In, and I know there has been statements made, but the helicopter wasn't transmitting ADS-B Out. Even if this aircraft had ADS-B In, it wouldn't have mattered because at DCA you have something called TIS-B, it's Traffic Information Service-Broadcast. They have ground radar stations that take information from transponders and other aircraft in the air that have ADS-B, and relay it back up to aircraft that have ADS-B In.

So, they would have gotten their first alert and it would have sounded something like, "Traffic 12 o'clock, 2 nautical miles, 500

feet below,” or, “low altitude.” What you’re going to hear in a minute—in just a few seconds, at 19 and a half seconds, is what they actually did here, and that’s—we’ll go ahead and play.

[Video shown.]

Ms. HOMENDY. Yes, sorry, you didn’t hear, “Traffic, traffic,” at 19 and a half seconds because the CVR audio isn’t on there, but that would have been 19 and a half seconds. And then at that point at, “Traffic, traffic,” you’re looking out, trying to figure out where the traffic is. Helicopters down in the lights. Pilots are told when it’s a traffic advisory, you’re not to take any sort of evasive action because you need to be looking at and acquiring that traffic.

Resolution advisories, which is part of TCAS that you can get, resolution advisories would have provided them with a climb/descend. Except, below 900 feet, across our entire airspace, resolution advisories are inhibited, meaning they are quiet, all you get is, “Traffic, traffic.” What we’re talking about is timely information for pilots.

The CHAIRMAN. Thank you, Madam Chair. The NTSB conducted a thorough investigation into this accident. What did the NTSB investigation show about what would have happened if both aircraft had been equipped with ADS-B In?

Ms. HOMENDY. The accident wouldn’t have happened. At 48 seconds, the helicopter crew would have gotten an oral alert, they could have taken evasive action, and the flight crew of 5342, at 59 seconds, could have had an alert that allowed them to take evasive action. So, we have recommended ADS-B In everywhere there is ADS-B Out for all aircraft.

The CHAIRMAN. As you know, the bipartisan ROTOR Act, which passed out of this committee and which is passed to the Senate unanimously, every Republican, every Democrat has voted for it, mandates ADS-B In and Out on aircraft flying into congested airspace. In your professional judgment, if the ROTOR Act had been the law at the time of this accident, would the accident have occurred?

Ms. HOMENDY. No, it wouldn’t have occurred. Though, this helicopter route shouldn’t have existed, but that’s another story. No, I don’t believe it would have occurred.

The CHAIRMAN. Well, and as you know, that’s another component of the ROTOR Act is mandating a reassessment of helicopter—

Ms. HOMENDY. Absolutely.

The CHAIRMAN.—routes as well. ADS-B Out and In is not new technology. Today, the FAA only requires ADS-B Out, which sends signals directly to air traffic control. In 2010, the Agency chose not to require ADS-B In, which would have given pilots those same signals. Nonetheless, some aviators voluntarily use ADS-B In, receiving weather, traffic, and other information in the cockpit. American Airlines, for example, has equipped nearly 30 percent of its fleet with ADS-B In. More than 80 percent of private pilots use some form of ADS-B In. It is clearly a popular technology.

I’ve heard a handful of special interest groups, however, want carve outs from the ADS-B In requirement. I don’t think a private jet or a charter flight flying into DCA, or Dulles, or DFW, should be able to adhere to a lower safety standard than a passenger airline. Special treatment for them would put everyone else’s lives at

a risk. Others have said that all of general aviation should be exempt, even though pilots in rural areas are already exempted, and the ROTOR Act protects general aviation's ability to use portable transponders. In your judgment, should different aircraft be flying into congested area using different ADS-B safety rules?

Ms. HOMENDY. No, absolutely not. It's a shared airspace.

The CHAIRMAN. Those same skeptics like to claim that ADS-B In is too costly. Major airlines like American Airlines have figured out how to install ADS-B In. Every new Gulf Stream has ADS-B In, and, of course, the ROTOR Act only requires ADS-B In for planes flying into busy airspace. A crop duster flying in Arkansas isn't going to need it and won't be affected, but if that crop duster decides to land at DCA Reagan, then it should have the technology and not be endangering the lives of passengers flying into and out of Reagan every day. In your judgment, is it too expensive for planes to install ADS-B In?

Ms. HOMENDY. Four hundred dollars. Everybody's got a phone. Everybody's got a headset. Four hundred dollars. Maybe you get an iPad, it's a little more expensive, but that isn't costly. American Airlines, less than \$50,000 a plane to retrofit. The plane was out of service. They told me one or two days when they retrofitted it—each plane.

The CHAIRMAN. So, I want you to repeat that because one of the concerns people are raising is this is some onerous government mandate. A private pilot can get the equipment necessary, A, to keep himself or herself safer, B, to keep everyone else flying into that congested airspace safer. They can get that equipment for \$400.

Ms. HOMENDY. You already have a headset. Everybody has a phone. Some people have iPads. Four hundred dollars. This is the receiver.

The CHAIRMAN. Another objection that has been raised is the claim that somehow the military should be exempt, that the military should be able to fly in congested airspace and not be subject to the rules everyone else is. Does that make any sense?

Ms. HOMENDY. No, it does not.

The CHAIRMAN. Well, 100 members of the U.S. Senate agree with you. The Secretary of War agrees with you. The Secretary of Transportation agrees with you, and I am hopeful that within the next two weeks, the House of Representatives will put the ROTOR Act on the floor, will pass it, and will put it on President Trump's desk for signature. We owe it to the families of those who lost their lives, the 67 souls who should be with us today if only Congress had listened to the first 16 times the NTSB recommended ADS-B In. Thank you.

Ms. HOMENDY. I know you don't have any more time, but can I—

The CHAIRMAN. Sure.

Senator CANTWELL. He's the Chair.

Ms. HOMENDY. I know you—yes. Can I have one thing to point out?

The CHAIRMAN. You could have two.

Ms. HOMENDY. OK. Thank you. In 2001, the FAA had a rule-making on fractional ownership, and they stated in there that pas-

sengers who are transported under Parts 121 and Part 135, “Exercise no control over and bear no responsibility for the airworthiness or operation of the aircraft aboard which they are flown.”

I would also say that applies to Part 91, Revenue Generating Passenger Operations. The FAA concluded that, “The appropriate level of public safety is provided by very stringent regulations and oversight under Part 121 and Part 135.” In Ketchikan in 2019, we stated that, “Aircraft without ADS-B do not demonstrate the appropriate level of safety for passenger-carrying operations conducted under Part 135 Regulations,” and we also stated that there’s shared airspace between 121, 135, and GA.

We’ve conducted numerous investigations between Part 121 airlines and GA aircraft, or GA aircraft carrying passengers who paid for a service with other GA aircraft, or between 135s and 121s, or 135 and GA. The fact is everyone should be under the same rules, one level of safety, because it doesn’t matter if you’re in a private plane, a commercial jet is also operating in your airspace.

The CHAIRMAN. Thank you. Ranking Member Cantwell.

Senator CANTWELL. Thank you, Mr. Chairman. Chair Homendy, you, in my opinion, have become a sentry for aviation safety. And that means that you’re standing guard over our system, which, I believe, should be standing guard over by the FAA, and you should play a role on the details that then, jointly, this works together.

But somehow, the industry has too much influence over this process, and I don’t know if the FAA just thinks that it can’t keep up technologically. I don’t know, but these recommendations have been on the table for a long time, and they’ve never been implemented. And so, I want to ask several questions about your 14 key recommendations.

But, first, on this issue of ADS-B In, you just talked about the issue of what it would take to implement. But isn’t there a cost? General aviation is saying this is too expensive and you just refuted that, but isn’t there a cost for not doing it? NTSB data showed that between 2006 and 2025, they investigated 153 mid-air collisions involving general aviation operators compared to one mid-air collision and four near mid-air collisions involving commercial jets. So, these general aviation accidents have cost 198 lives. So, there is a huge cost to general aviation for not doing this. Isn’t that correct?

Ms. HOMENDY. That’s correct. Unfortunately, when you do rule-making, the DOT puts the price of a life at \$11.6 million. The NTSB considers all life priceless. You can’t put a price tag on a life.

Senator CANTWELL. How many times did you or your individuals listen to the audio tapes here?

Ms. HOMENDY. Quite a number of times.

Senator CANTWELL. Hundreds?

Ms. HOMENDY. If I combined everyone. Yes.

Senator CANTWELL. So, I think that’s the difference. You’re listening to this, analyzing this, and you are steadfast in your recommendations, and somehow, these guys are listening to other voices and saying we don’t have to do it because there’s a cost. And I got news for the FAA: in the digital age that’s not going to stand because we all can see this information, and we need an FAA that

basically is on top of this, and will push through the regulations to implement.

So, on this issue, a safety management system, which is basically part of the requirements, you're basically saying that they didn't integrate a system. Would a safety management system with the number of near misses that you said were alarm bells going off in the cockpit, demanded that this run—this route no longer exist?

Ms. HOMENDY. A safety management system—a properly implemented safety management system should have identified the risk. But it is pretty clear from our investigation—

Senator CANTWELL. Well, would have—

Ms. HOMENDY.—that did not occur.

Senator CANTWELL.—not only identified it, but would have required, once identified, to fix it.

Ms. HOMENDY. Yes, once you identify, then you look at your mitigations, and then you implement those mitigations, and monitor those mitigations, and reevaluate for change. But in this case, there were numerous warning signs from people within the FAA saying we have a problem here. Then, there was their own data that they weren't even looking at: 15,214 close proximity events.

I can tell you this much, the FAA requires a lot of data. They've got 10 different systems just for mid-air collisions, but they don't actually have a definition for what they consider is a mid-air collision, a near miss, not one single definition. So, then, you have people who aren't looking at the data. Then, you have the tower who is trying to raise concerns over and over again, year after year, and not being heard, told to go away. And I have to tell you, this same scenario that occurred on January 29, also occurred in 2013 between a military aircraft and a private commercial jet. It was averted. Same thing happened.

Senator CANTWELL. So, we need an aggressive FAA in this air traffic control office and safety office on aviation safety to actually collect data, report on data. And my guess is we're going to have to get some of this data, and review it, and require hearings because, otherwise, this job isn't getting done. It appears to be.

Ms. HOMENDY. Yes.

Senator CANTWELL. So, if you would just comment on San Antonio—I mean El Paso, for us about this newest event.

Ms. HOMENDY. I don't know a lot. I don't know anything about El Paso other than what I read. It's not something that we handle. However, you know, from the—what little I know, I will say there has been miscommunication or no communication between—at least, the Army and FAA for years. Now, the Army participated—the 12th Battalion participated in the Helicopter Working Group, but in general, they weren't having conversations.

Senator CANTWELL. Which this—is in this accident, the key issue as well. The conversation should have been happening, and we, obviously, had a rule that somehow got changed that allowed this to happen, and it wasn't an accurate assessment even after the rule was changed, so.

Ms. HOMENDY. Yes. And if you don't mind me mentioning, the—listen, the reason why the NTSB has the party system, when we do an investigation, we invite entities who are technical experts into our investigation, like FAA, like the Army, like, you know, a

number of others, PSA, you name it, in order for us to get the evidence we need to conduct our investigation. They're not part of the analysis, right? But during that time—it has been a year—during that time, parties get that information in real time and can make change immediately. They don't need to wait for our final investigation to come out with 50 recommendations.

You know what the best result of an investigative report is? It's the best thing that has happened in years at the NTSB, in Missouri, actually. I wish Mr. Schmitt was here to hear it. We had at the end of a terrible train derailment, I was on scene, went to meet with a farmer in his barn who said he had been talking about, you know, this terrible accident that could occur for years on Facebook, doing videos. I met with him in his barn and said, "What's going on," for, like, 2 hours, and he said to me—I said, "I'm going to fix this before we leave," and he's like, "Sure you are." I don't blame him. You know, he had been facing a government bureaucracy for years. So, I got everybody together before we left. I said, you name it, and I said, "We are fixing this crossing." And you know what happened? A year later, we issued our final report on a deadly train collision at this terribly designed grade crossing. And Governor Parson not only fixed that crossing, he fixed 49 others, and we issued no recommendations.

The failure in this report is that we had to issue recommendations. Now, I'm going to get a briefing from FAA on the reorganization, but we can't be just shifting around the deck chairs. ATC didn't contribute to this. We need reform.

Senator CANTWELL. Well, other people here need to listen. Thank you, Mr. Chairman.

The CHAIRMAN. Thank you. Senator Wicker.

**STATEMENT OF HON. ROGER WICKER,
U.S. SENATOR FROM MISSISSIPPI**

Senator WICKER. Thank you, Mr. Chairman. And also, thank you, Ranking Member Cantwell, and former Chairman Cantwell, for asking that question about El Paso.

Senator Cantwell and I were leading this committee during the time when we were investigating the 737 MAX 8 tragedies, and this is the most heartrending and gut-wrenching issue that we could possibly ever investigate. And I just don't have the words to tell the families how awful this is, and how terrible I realize they must feel. Thank you, Chairwoman Homendy, for your leadership in this.

Since the accident in January of last year, what has changed at Reagan National Airport between the FAA, the towers, and the National Guard, in the interim, before our Act can be passed by the House?

Ms. HOMENDY. Well, one thing that did change is that within—we issued two urgent safety recommendations for immediate action in March of this past year, just a couple of months after the accident occurred, calling on the Secretary of Transportation to take action about the helicopter route itself, Route 4.

And within two hours—it's the fastest we have ever had an entity implement our recommendation. Within two hours, he did so. He prohibited mixed traffic between Hains Point and Wilson Bridge,

which is now in an interim final rule before him. But he's continued that prohibition on mixed traffic, and has required ADS-B Out in the airspace. He has authorized additional personnel in the tower. However, the tower is facing some challenges. The numbers are lower because a lot of people are going through training, but a number of other measures need to be—need to take place.

Senator WICKER. Sure——

Ms. HOMENDY. But he's done a great job.

Senator WICKER. I understand that, but things have been done within weeks of this accident based on your recommendations.

Ms. HOMENDY. Yes. And I have to say, this was his first day on the job.

Senator WICKER. Right. Yes.

Ms. HOMENDY. It was his first day on the job. He did—this will forever stay with him, which is why he is so committed to aviation safety, and he has been an excellent partner on this with us.

Senator WICKER. When you speak to skeptical members of the other body, is it the cost to general aviation that they mention as the only reason they're skeptical about the bill? What other reasons do they give for not readily passing what has been passed unanimously over here?

Ms. HOMENDY. I've heard a number of things. I've heard cost. I've heard aircraft——

Senator WICKER. That would be the cost to the general aviation owners?

Ms. HOMENDY. I've heard for everybody. Cost for general aviation, 135, 121 regional airlines, major airlines. I've heard difficulty in retrofitting, planes being out of service. I've heard privacy concerns. I've heard—and I'm sure Senator Budd is going to raise this, I've heard concerns about tracking aircraft with ADS-B Out where some airports and third-party entities are tracking aircraft, especially GA aircraft, to charge them landing and ramp fees, which is something you-all can address. Those are the main issues I've heard about.

Senator WICKER. Let me ask you—let me ask you this. On the headsets, it just strikes me as so inconceivable that this helicopter had the ADS-B, but the two pilots could not hear it on their headsets. Why was that, and how readily could that be fixed?

Ms. HOMENDY. So it can be fixed. We have issued a recommendation for them to have an integrated headset so that they can hear any sort of alerting, but we've also recommended better technology on the helicopters so they're not relying on iPads on their legs while they're in a night vision goggle, high workload environment.

I will say the Army has been very responsive. They have completely replaced their helicopters at the 12th Battalion, from the old Lima models to the new MIC models, and they have stated they're going to implement that technology. They're still working on the headset issue and haven't quite committed to that, but implement better technology for ADS-B In and Out by the third quarter of 2027, though, they're asking for \$500 million. So, since you're in charge of that, I will ask for \$500 million.

Senator WICKER. And if the Chair will indulge me, should the House pass this bill that has now passed unanimously in the Sen-

ate, should they pass it next week, how soon could it be implemented?

Ms. HOMENDY. I think certain measures can be implemented immediately. Some measures will take a little bit of time. I don't know how much time, but it would take a little bit of time, and FAA would have to sort some of it out through a rulemaking in that amount of time, like ADS-B In. But in that amount of time, the risk still is in our airspace. So, every day that goes by, we face the potential for another catastrophe to occur.

Senator WICKER. Well, thank you for your stewardship of this issue.

Ms. HOMENDY. Thank you.

The CHAIRMAN. Senator Duckworth.

Senator DUCKWORTH. Thank you, Mr. Chairman. As our committee conducted oversight and aftermath of the tragic DCA crash, I've noticed that the stories from FAA and the Army have gradually evolved over time. Specifically, my sense is that the information provided have come to resemble more of a telling of what should have happened rather than what actually happened, and I fear this pattern is yet another symptom of a complacent culture.

For example, NTSB is now officially recommending that FAA and the Army engage in proactive data sharing. The lack of coordination between the FAA and the Army was on full display in May of last year when it was reported that the dedicated direct access line connecting the Pentagon tower with the DCA tower had not worked since 2022, meaning that for more than 1,000 days—1,000 days—not a single soul ever used the hotline directly connecting the DCA tower and the Pentagon's Army heliport. Now, in the aftermath of this scandal, which itself occurred only months after the preventable deadly DCA crash, FAA issued statements downplaying the impact, implying that the inoperable hotline was really no big deal because, look, controllers could just “call each other on the telephone.”

But FAA cannot hand-wave away the scandal because FAA's Deputy Chief Operating Officer publicly admitted that FAA had no idea that the dedicated hotline was not working for 3 years. FAA had no idea until another Army helicopter incident less than 4 months after the DCA crash forced two commercial flights to abort landings at DCA. Meaning, that after the tragedy of Flight 5342 civil military collision, not one FAA employee thought, “Hmm, maybe we should test our direct communications line to the Army heliport from the DCA Tower?”

Chair Homendy, does the fact that the FAA's dedicated direct access line to the Pentagon was literally inoperable for years without anyone noticing, serve as an apt metaphor for the sheer amount of work that must be done to improve communications between DOD and FAA?

Ms. HOMENDY. That one's still under investigation by NTSB, but, yes, I would agree with that.

Senator DUCKWORTH. Just yesterday, the FAA announced a 10-day temporary flight restriction in El Paso, then abruptly reversed it hours later. The conflicting reports that emerged do not inspire confidence that the FAA and DOD have improved their communications either with each other or within their own organizations.

In fact, the FAA Administrator yesterday in response to the Chairman Cruz's question about what happened in El Paso said that Secretary Duffy's tweet about drug cartel drones was absolutely correct, that they knew about the impending—the request for closure of the airspace, but he did not know why FAA actually closed the airspace for 10 days.

Chair Homendy, the DCA collision, and now we're hearing it's a party balloon that they shot down. So, I'm still waiting to hear what's happening. But Chair Homendy, the DCA collision, the May Pentagon go rounds, the B52 incident in South Dakota, and now, El Paso, showcases a severe lack of coordination.

What must change at the FAA, DOD to prevent future coordination failures? What is at risk if there is no improvement, and has NTSB been included in some of these meetings with—and coordination between FAA and DOD because they were keeping you out for a while there?

Ms. HOMENDY. No, we are not part of that, but we would not necessarily be part of that. But FAA, we can talk about separately because I do have some concerns there. Army actually worked really well with us. What we investigated was between the Army and the FAA, and there was no communication. I mean, the Army participated, the 12th Battalion participated in a helicopter working group that was formed by the tower because the tower was saying, hey, we've got a serious safety issue here and nobody's doing anything about it. Let's try to coordinate. But Army wasn't asking for data. They had their own safety management system problems and there was lack of coordination.

Look, I'm going to tell you, I worked 15 years on Capitol Hill, and we talk about this all the time. When you go to an agency, the lack of communication, even within a large agency and between agencies is terrible. I don't understand it. People can't talk. It's astounding to me, but it's not surprising from what we've seen from the investigation.

Senator DUCKWORTH. Would it be safe to presume that you would support Congress elevating the NTSB recommendations following the DCA mid-air collision into a statutory requirement?

Ms. HOMENDY. Yes. And you can do that simply by requiring the entities to adopt the recommendations, and reference our report without actually having to do language everywhere. What I will say, though, is we shouldn't wait to move the provisions in the ROTOR Act. This isn't a wait on ROTOR move, this legislation. This is a yes, and. Congress can move many pieces of legislation every day, so it's a yes/and.

Senator DUCKWORTH. Thank you.

The CHAIRMAN. Thank you. Senator Moran.

Senator MORAN. Senator Cruz, thank you. I intended in my line of questioning to reemphasize the importance of ROTOR Act, but perhaps that has been accomplished in this hearing, although one would have thought that 17 other times it may have been accomplished. So, maybe it can't be said enough, but I reaffirm my commitment to seeing the passage of the ROTOR Act a bit along the lines of Senator Duckworth about—and you talked about communication.

One of the things, and I don't have any of the details in front of me, so you'll have to refresh my memory. But the number of near misses you mentioned in your opening statement that were reported at DCA in regard to potential collisions, but you also, in an earlier testimony or in our conversations, talked about the number of times that somebody at DCA reported a problem that they thought needed to be fixed, but it never worked its way up the chain of command. And I think, as I recall, like nothing ever made it to the folks who actually could implement changes recommended by air traffic controllers or others involved in air traffic safety. Am I saying enough to refresh your memory about what I'm talking about?

Ms. HOMENDY. Yes. First of all, the data which we actually obtained from the FAA, in coordination with them, showed 15,214 close proximity events over about 10 years, 85 of which were near misses, and——

Senator MORAN. But you also indicated today something I didn't realize. There's no real definition because those have been dismissed as unimportant, but to me or to Kansans and Americans, you hear a near miss, that means something. But apparently there's no definition that would awake somebody within the FAA.

Ms. HOMENDY. Yes. They need a common definition because you all—you brought together FAA, NTSB, and the Army at one point behind closed doors, and I talked about the near miss numbers that we had received from FAA. And all of a sudden FAA spoke up and said, no, it's five. And I looked over, where'd you get five? You somehow whittled down 15,214 to five because there's no common definition. Ten different data sources, and it's whatever you choose it to be that day, a definition. And, you know—so, you know, from my standpoint, that is just one of many areas that they could have fixed before we even got to a recommendation.

Senator MORAN. You fill in spaces on my other aspect of my question——

Ms. HOMENDY. Yes.

Senator MORAN.—about that, where things were reported time and time again, but never did anyone in the hierarchy ever hear of the complaints because there was timidity in complaining.

Ms. HOMENDY. Well, one, I would probably—I would say the hierarchy at the air traffic organization did understand——

Senator MORAN. Yes.

Ms. HOMENDY.—what was going on, which was a problem. I mean it was push it down, make it go away, not an issue. Too political. Too political was from one of the interviews, not my phrasing. The leadership of the FAA probably were totally unaware. So, you have the tower—that's the ultimate bureaucracy, by the way. I think at one point, we counted the steps from the tower to get something all the way up to leadership. It was like 10 or 12 steps. It's ridiculous.

Senator MORAN. Almost nothing made it the 10 or 12 steps——

Ms. HOMENDY. No.

Senator MORAN.—if you recall what you——

Ms. HOMENDY. No. It made it to the district level and made it nowhere else. So, what happened was the air traffic control tower said, you know what, we're going to have to take things into our

own hands. So, we're going to create this Helicopter Working Group. So, they did, not just with the military, but all the private operators, police, you name it, law enforcement, and they pulled together the working group. They did some work. They proposed to their hierarchy, hey, you know, we should move helicopter Route 4. Another time they said, we think we should put some hotspots, you know, on the helicopter charts, including at the end of Runway 33, which we've seen is an area where we have a great concern for risk if there's a mid-air collision. And FAA's response—

And then, they had numerous reports just coming from the tower, written reports. They also had a report saying, we're getting too many requests from Potomac TRACON to reduce spacing between aircraft landing. There were so many reports, and each time it was nope, or no—and this is the ultimate in bureaucracy when the response to the hotspot was, yes, we don't put hotspots on maps. Oh, the only hotspots we do on maps is for ground movement. Come on.

At our hearing, we raised this issue. Why didn't you do anything? The person who showed up from FAA said, well, they could have raised it at a symposium. Really? They were raising it so many times in writing, verbally. If that happens at DCA, you know it's happening everywhere else in our airspace.

Senator MORAN. Thank you for refreshing my memory and putting that on the record today. Let me ask you, if there's any indication or what are the indications that the FAA, the Department of Transportation are taking aggressive action to implement recommendations, past and present? Has anything changed since January 29 of last year? I think you made a really important point that you don't—I think there's a tendency, I can see myself thinking the same thing: we'll wait for the recommendations, and then we'll know what to do when we know there are things to be done today.

Ms. HOMENDY. And that's perfectly reasonable for you-all, but for those that were parties to our investigation, the reason why you are parties is because you're privy to factual information so you can take early action. None of that occurred. In fact, the entire time—we work for FAA, and I'm going to be honest with you, I met with the DOT IG at one point to talk about whether we should write a letter about obstruction to our investigation, because we weren't—we were repeatedly denied data we requested. What we kept hearing from FAA was, well, you're not asking for it properly. We did. I audited it, but here's what I'll say on the changes. I don't know of any other than what the Secretary did, and that isn't right.

Senator MORAN. Message received. I wrote on my notes today that our subcommittee, this committee, we ought to rely—I guess, request GAO Inspector General, constant oversight on the Department of Transportation, and the FAA in particular.

Ms. HOMENDY. Yes.

Senator MORAN. Thank you, again.

Ms. HOMENDY. And on DOT IG, one thing I will say, sometimes they don't get access to their data systems. That's something you should chat with them about, because they aren't getting the data. They're relying on people giving them the data.

Senator MORAN. Thank you.

The CHAIRMAN. Thank you. Senator Klobuchar.

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

Senator KLOBUCHAR. Thank you very much, Senator Cruz. And, thank you, Chairwoman. Not only do you bring this incredible expertise—you know I've always been a supporter of yours, but you also bring the passion and the anger that I know so many of the families and the loved ones in this room are feeling over what happened. I want to thank your dedicated NTSB staff for all of their hard work. And I want to acknowledge the 67 people who lost their lives, including Wendy Jo Schaffer, a mom of two from Mahtomedi, Minnesota.

So, this committee, as you noted, has worked in a bipartisan fashion to advance the ROTOR Act, and I thank the Chairman and the Ranking Member for their work on this, as well as Senator Moran and Senator Duckworth. So, my questions are, first of all, on air traffic control staffing, we have a shortage of air traffic controllers. Former Senator Braun and I pushed to address staffing shortages by requiring the FAA to conduct maximum hiring of air traffic controllers.

While the number of the staff at the time in the tower, as you've noted in the report, was adequate, and in accordance with FAA directives, the facility was staffed below its target level. How can lower staffing levels impact controller performance and awareness? Has the FAA increased staffing at DCA to mitigate some of the issues raised today?

Ms. HOMENDY. So, it impacts staff—we didn't find a concern with staffing on that day, as you noted, but it does impact safety because it impacts their workload. In this case, you can see two people should have been on position, one on helicopter control, one on local control. And what happened was the local controller was doing two jobs. People were at the—in the tower and on staff, and available, but he was forced to do two jobs and taking—and handling between seven and 12 aircraft.

What I will say, as far as staffing today, there are staffing challenges, and that is a significant impact on safety. They are authorized at DCA to have pretty high numbers, but they're not at those numbers. On January 6, right before our board meeting, I checked—we checked the numbers at DCA. There's authorized numbers, but then you have to ask any day, what's operational, who's out, who's on medical leave, who's on military leave? It was lower than it was on January 29.

Senator KLOBUCHAR. OK. Thank you. The NTSB report showed that the flight path for helicopter Route 4 comes within 75 feet of the approach to Runway 33, and that video was chilling to watch. Are there any circumstances in which 75 feet of vertical separation is safe?

Ms. HOMENDY. Absolutely not. Not safe, anywhere in our airspace.

Senator KLOBUCHAR. The FAA is required to annually review these helicopter flight routes. Who was tasked with reviewing helicopter routes, and why hadn't this risk been identified previously?

Ms. HOMENDY. I'm only laughing a little bit because it's so sad, because DCA has existed since 1940s. Runway 33, 1940s, traffic certainly has changed, but helicopter Route 4 has been there since 1986. FAA is required to do an annual review of those routes. Not a single annual review was done. Not a single one. In fact, they couldn't—at first, when we asked who was responsible for doing those annual reviews—

Senator KLOBUCHAR. I think we asked NTSB or FAA. Have they been able to identify who has that role?

Ms. HOMENDY. They finally—they did finally tell us who it was. It was like a terminal operations director, but nobody knows who specifically that is.

Senator KLOBUCHAR. And do you know if they've changed this now?

Ms. HOMENDY. No, I do not.

Senator KLOBUCHAR. OK. Well, that's a good question for us to ask. Could you talk about how you did this report and got this thorough analysis, through all the grief? And as I was watching the video, I was thinking about the hard work of your staff, and I was thinking about the grief of the families. And I was thinking about how every single day they had to come to work, your staff, feeling that weight of what had happened to these families and then still do their jobs. How many staff contributed to this investigation? How many hours? And what is the funding status for NTSB? And you can put it in writing later if you don't have it. Exactly.

Ms. HOMENDY. It's probably about 50 or 60 staff. I mean, we're only about 415 right now. It's significant. How were we able to do this? The people behind me. I can only advocate like I do, and know the facts that I do, and do a good job because of them. We are a team, and they put together—they gathered 19,000 pages of evidence. It's my duty to read every single word of that evidence because that's their hard work. I mean, it's a lot—a lot of work, while they also have about 15 to 20 other cases. Mr. Chin here, who's behind me, did all the helicopter work: helicopter systems, barometric altimeters, you'll name it, on this investigation. He's also leading the UPS crash as the investigator in charge.

Senator KLOBUCHAR. Thank you, Mr. Chin.

Ms. HOMENDY. So, the personnel, it has been difficult. I mean, it's a difficult year for them, and the shutdown was difficult. It's a strain on all of them, but I have never been more proud of the team than I was on January 27, and every day since I came to the NTSB. Thank you.

Senator KLOBUCHAR. Thank you. I just think this—the findings and the fact that on a bipartisan basis, the Chairman and Ranking Member have worked on this, as you noted, focused on this, along with Senator Moran, Senator Duckworth. I just don't detect partisanship here when it comes to this, and it is such an example of why we're never going to be able to make things better if we don't get to the bottom of what went wrong. And as I understand already, some changes have been made that you've recommended, and must continue to be made, every single one of them. Thank you.

Ms. HOMENDY. Thank you. And I'll also add for the Chairman, this is the same team behind me that helped us—helped me evalu-

ate NDAA before we even did anything. We got to—we get together as a group and make decisions as a team.

Senator KLOBUCHAR. Thanks.

The CHAIRMAN. Senator Sullivan.

**STATEMENT OF HON. DAN SULLIVAN,
U.S. SENATOR FROM ALASKA**

Senator SULLIVAN. Thank you, Mr. Chairman, and, Madam Chair, it's good to see you again, and I want to thank you as well. You're doing an exceptional job, and you're—your whole team. I want to begin by, of course, expressing my deepest condolences to the families and loved ones of those we lost in the American Airlines Flight 5342 tragedy at DCA.

As you know, Madam Chair, also around the same time, we had another airplane crash in Alaska, the Bering Air crash over Norton Sound. One year later, these losses remain deeply felt throughout our country with witnesses here, in my state in Alaska, where, as you know, aviation is not a luxury, it's a lifeline. And I want to thank the NTSB for its thorough work, and I appreciate the work you've done on the latest Bering Air crash—or not, or that latest crash in Alaska. We are grateful for your commitment. We're grateful for you going up to Alaska so soon after that crash, and aviation safety is particularly important in my state, where communities depend on reliable air service, for healthcare, for commerce. We have over 230 communities in my state that are not connected by roads, and so, it really, really matters.

So, I want to broaden the aperture here. It has been 6 years since the February 2020 NTSB report that found over a 10-year period, Alaska's aviation crash rate was almost two and a half times higher than the national average, and the fatality rate was 1.3, almost 1.4 times higher. That led me and the FAA Administrator at the time, Steve Dixon, and you, to push for what we now refer to as the Alaska Aviation Safety Initiative, the FAASI Initiative.

I was able to get that initiative codified in the FAA Reauthorization Act of 2024, ensuring that it would be in law with the goal that we would reduce fatal aviation accidents in Alaska by 90 percent by 2033, require the FAA to improve maintenance and reliability of weather equipment, and to reauthorize \$25 million, at a minimum, annually, through 2028, to carry out this work.

We've made significant progress on that. As you know, the Working Families Tax Cuts Act had a huge investment in aviation safety, ATC reform. A lot of that, about \$180 million so far, is going to Alaska. So, given the substantial work and funding we've had since 2020 in the NTSB report, would you agree with me that it's time to take a more comprehensive look at where we are with the state of aviation safety in Alaska? And can I get your commitment to work with me on this?

Ms. HOMENDY. Yes. In fact, I will offer, if you'd like, we'll come back to Alaska, and would certainly welcome having a robust conversation with you and others about aviation safety and your needs, which are very unique.

Senator SULLIVAN. Good. Well, I appreciate that. Mr. Chair, one of the things I'm going to be working on, and hopefully with the Chair's—you know, and the Committee's help, is possibly a field

hearing with the Chairman of the NTSB, who again, I think is doing a great job with the FAA on the state of where we are in the FAASI Initiative. Because what we're trying to do——

The CHAIRMAN. Can the field hearing coincide with salmon fishing season?

Senator SULLIVAN. If you come, it can. But what we're trying to do is preempt, you know, what Senator Duckworth actually said, which is see our challenges. You know, I did notice, Madam Chair, in your opening statement, you mentioned Alaska with regard to 15 potential near collisions. We did have a collision in 2019 in Ketchikan. Six people died, you know, in that collision.

So, yes, I'd like to get to have you up and have my constituents see, because I think there's progress, but there are still gaps. And would you agree with that? And you know, the President, Secretary Duffy, did announce a huge investment in AWA systems in Alaska. I think the President actually announced 170 for my state, which would be fantastic, but we need to work on all elements of that. Can I get your commitment again on that? And are there any things that, from the preliminary look at the Bering Air investigation, or your other areas of expertise that relate to Alaska, that you could kind of lay out right now here?

Ms. HOMENDY. Well, we're still collecting—well, first of all, yes, you have my commitment on that.

Senator SULLIVAN. Great. Thank you.

Ms. HOMENDY. I was the Board Member on scene for Ketchikan. It was really devastating.

Senator SULLIVAN. Yes.

Ms. HOMENDY. And Brice Banning was also on that investigation. He's our investigator in charge for DCA. Yes, so we're still conducting the investigation on Nome. We hope—I need to check in with the team on what the—when that will be completed.

But you have a lot of needs in Alaska, infrastructure for one of them, resources. I mean, just to see how different aviation is, that you're relying on aviation from everything from mail, to prescriptions, lifesaving medicine, to food.

Senator SULLIVAN. Yes.

Ms. HOMENDY. And you need to have that infrastructure there so you can get all of that in, whether it's weather, whether it's runway lights, or anything else.

Senator SULLIVAN. Good. Well, I look forward to that. And Mr. Chairman, I look forward to maybe getting you up there and your team, but that'll be an important hearing. And again, thank you for your work. Thank you for your work on the FAASI Initiative. I want to thank the Committee on that. We made some really good progress on the Alaska Safety Initiative here in the last FAA reauthorization, and the Working Families Tax Cuts Act, which we passed in July. And your work on this, I know it's difficult. And again, to the families who have lost loved ones, we are very focused on making sure this doesn't happen again, either in D.C. or in Alaska. Thank you.

The CHAIRMAN. Thank you. Senator Luján.

**STATEMENT OF HON. BEN RAY LUJÁN,
U.S. SENATOR FROM NEW MEXICO**

Senator LUJÁN. Thank you. Mr. Chairman. To all the families that are here, thank you for being here. Not just lifting the memories and names of those that you lost personally, but of all 64 that we lost, for reminding us that behind policy, behind these decisions, that there are people. And I want to thank you all for being here.

Chair Homendy, one of the many findings and recommendations in this report, one that stood out to me, is how the lack of communication and coordination between the FAA and the Army contributed to this crash. What's even more concerning is that this lack of coordination apparently has not been resolved.

Just yesterday, we saw how the lack of coordination between the FAA and the Department of Defense can lead to widespread confusion. Flights were delayed, canceled for many of my constituents, Senator Cruz's constituents, and others throughout the United States. But it's more than those flights being canceled. It's the worry and the uncertainty that also came from this.

There has still been no answer from the President, from the U.S. Government, from the Department of Transportation, from the Department of Defense. And now, we're learning the Department of Homeland Security, they've all been quiet and they stand behind what Secretary Duffy said, that it was about a drone incursion. Well, what's being reported now is that it was a laser that was on loan from the Department of Defense to the Department of Homeland Security, Border Patrol, and that they were—that they shot a party balloon.

I thought that was a technical term for some craft. A party balloon is a balloon any one of you would buy for someone's birthday party, and they shut down—they said they were going to shut down air traffic for 10 days without calling the White House, without calling the Department of Defense. Do you all know how long the airspace was shut down over Venezuela when the full force of the United States military went down there? Twenty-four hours.

Further, what's being reported is that the FAA and DOD have said that this technology was safe for air travel. It also says that there are accounts that there were DOD personnel on the ground there with Border Patrol. I appreciate Senator Cruz and Senator Cornyn making it abundantly clear that there needs to be a briefing in a SCIF. I don't know why there needs to be a briefing in a SCIF shooting a party balloon.

But it's not just the Department of Defense that needs to be there. The Department of Transportation, the FAA, as part of the Department of Transportation, the Department of Homeland Security, and the Border Patrol, and the people that were on the ground that did this, and I want to know why they're not communicating.

So, my question to you is, are you going to investigate this?

Ms. HOMENDY. Our mandate is to investigate after a tragedy occurs.

Senator LUJÁN. I appreciate that. Let me ask you a different question. Yes or no, is a lack of Federal coordination harmful to the safety of our airspace?

Ms. HOMENDY. Yes.

Senator LUJÁN. Will the—well, I just asked that as well. My other questions around this, Ms. Homendy, is with—what Congress needs to do to make sure that the crash that you are here to share information about does not happen again. The question that Senator Moran asked about how many communications have there been throughout the years, whether it's under a Republican or a Democratic President, it doesn't matter, from air traffic controllers or from anyone else, have been silenced?

I certainly hope that we're able to demand that that information be shared to this committee to oversight, and that we have a real conversation about what it takes to implement those changes, because no administration has been willing to do this by rule. Clearly, from the point that Senator Duckworth made, that even a phone that should be used to communicate is not even being utilized.

A few years ago, I was in New Mexico at a site for aircraft that was used to put out forest fires at one of the command centers that is under, I believe, the jurisdiction of the United States Department of Agriculture. When I was in there looking at this particular tower, they told me the Internet didn't work inside the tower, and they were hesitant to tell me.

Well, I started calling everyone that I could, and we got a bunch of folks on board. Chairman, I think your office might have even helped with this one. Well, now that tower has access to the Internet, and the people in that air traffic tower are a little more safe than they were before it was out. If it's little things like that that are getting in the way of this because someone's being told you have to stay quiet, shame on all of us.

And so, as I close here, I know I didn't ask many questions in this area. I just certainly hope that we can get to the bottom of this, and that, Chairman, we truly can make things safer, and that we don't forget the names of those that have been lost. Not just on this horrific crash, but on the others as well, and that we do something significant in this space, and I look forward to working with you and doing my part. You let me know how we can make this better.

But in the case of what's happened in El Paso, Southern New Mexico, it's not just a briefing in a SCIF. I don't want to hear the spin. I don't want to hear the cover up. I want to hear the facts. I want to hear the truth. I certainly hope that that briefing doesn't have to take place in a SCIF. There should be information that's shared with the American people as to what happened there, because that can't happen anywhere else. We need people coordinating. I'm not suggesting we don't go after bad people or bad things. It's not what I'm saying, but we need to make sure that we're keeping people safe as we're also going after bad things throughout the United States that are endangering all of our constituents as well. Thank you for the time, Mr. Chairman.

The CHAIRMAN. Thank you.

Ms. HOMENDY. May I have 10 seconds?

The CHAIRMAN. Sure.

Ms. HOMENDY. Just—and I don't know, we're not involved in El Paso, but what I will say is we did note the poor safety culture within the Air Traffic Organization, and throughout our investigation, we found numerous people were afraid to talk to us. They

didn't want to be formally interviewed. Some people actually came directly to me and that would not be appropriate for me to talk to them in an investigation.

So, I—over time, with—our investigators were able to gain trust, their trust, to then interview them, but some people wouldn't provide their names. They were scared. I can't tell you the number of people who were just scared to speak up because they were worried about retaliation. At our own hearing, I had to get everyone to commit to not to retaliate. Still, that occurred, but it's not a good culture right now.

Senator LUJÁN. I appreciate that. Thank you, Chairman.

The CHAIRMAN. Senator Budd.

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

Senator BUDD. Thank you, Chairman. You know, Flight 5342 was a Charlotte-based flight crew. A North Carolina pilot was in the Blackhawk. But wherever folks were from, even outside North Carolina, we never want this to happen again. Thanks for your work on this and that of your team behind you. Chair Homendy, I think you had this in your written testimony, but would you agree that ADS-B In information is most effective when all aircraft are broadcasting ADS-B Out?

Ms. HOMENDY. Yes, sir.

Senator BUDD. Should policymakers address incentive structures that discourage the installation and use of ADS-B Out?

Ms. HOMENDY. We don't have a formal position on that, but I will say yes.

Senator BUDD. You know, as you mentioned a few moments ago, a couple questioners ago, some airports are now contracting with third-party companies to use ADS-B Out data to assess landing fees on operators. Would you say that this aligns with the intent of ADS-B?

Ms. HOMENDY. Absolutely not. ADS-B is a safety tool, and it should be used for safety, not to—not as a revenue generator to charge, certainly, general aviation pilots and others, ramp fees, or landing fees. That's not how it should be used. It's a safety technology.

Senator BUDD. Do you think using it in a manner that you just described, like to generate fees, would encourage pilots, aircraft owners to have them turned off?

Ms. HOMENDY. Yes. They turn them off, or just not install it at all, or use it. That would be—that would discourage their use. So, I would—and I believe you have legislation on this. I hope it moves because I think it should be prohibited.

Senator BUDD. Well, to address the issue, I introduced the Pilot and Aircraft Privacy Act, which would prevent airports from using ADS-B to assess fees on aircraft operators for that very reason that you just mentioned. I think it harms safety.

You know, you noticed—as you noted in your testimony, if both the helicopter Flight PAT25 and Flight 5342 had been using ADS-B, a collision avoidance system, the crew of 5342 would have had nearly a minute more, advanced warning than they received from the TCAS. Now, it may not have prevented the tragedy, but it

would have been another layer in this so-called Swiss cheese model.

Chair Homendy, I do appreciate the time today, time you gave today. I appreciate your team, and I look forward to working with you and with this committee to ensure as many aircraft as possible use the ADS-B system and other critical safety technologies. Thank you so much.

Ms. HOMENDY. Thank you.

The CHAIRMAN. Thank you. Senator Markey.

**STATEMENT OF HON. EDWARD MARKEY,
U.S. SENATOR FROM MASSACHUSETTS**

Senator MARKEY. Thank you, Mr. Chairman. First of all, Madam Chair, I just want to say that you are one of America's great public servants. You're fearless, and you're very smart, and very needed at this time. So, I just wanted to tell you that publicly.

Ms. HOMENDY. I'm only as good—I'm only that good because of them behind me.

Senator MARKEY. But we need people like you to make them good, because there are other people who have positions in our government who, as you're saying, they put even their own personnel in a code of omerta where they're afraid to speak the truth, afraid to say the right thing, and you create the right culture to protect the American people. I just want to tell you how grateful I am, and I think our Nation is whenever they hear you speak because they know you're speaking the truth.

And I want to begin just by taking a moment to honor the 67 individuals who lost their lives when American Eagle Flight 5342 crashed into the Potomac River. In Massachusetts, this tragic crash hit us especially hard. Six individuals associated with the Skating Club of Boston, as well as Massachusetts native, Chris Collins, were on board Flight 5342. Chris's brother, Matt Collins, is in the audience at today's hearing. To Matt and all of the families here, and watching, we are committed to honoring your loved ones with more than just words, with actions that we are going to take.

And it is because of you, the families, who have turned unimaginable grief into determined advocacy, that the Senate unanimously passed the bipartisan ROTOR Act in December. Change does not happen without your bravery, without your perseverance, without the families standing up and demanding that something be done.

And even as we speak, Maxim Naumov, the son of two of the members of the Skating Club of Boston, and a Norwood, Massachusetts resident, is honoring his parents' memory right now on the world stage at the Winter Olympics, skating with extraordinary strength, extraordinary grace, which is what all the families are showing right now. So, it's time for Congress that it takes inspiration from Max's courageous performance and enacts the ROTOR Act into law in our Nation. This legislation is the action needed to honor the crash victims and prevent future tragedies so hearings like this are not necessary in the future.

Now, I'd like to talk about airline accountability. The NTSB's final report concludes that it is vital that all commercial aircraft are equipped with crash avoidance technology called ADS-B In. Despite the importance of this technology, the airline industry has re-

peatedly said that it would be too costly to implement. So, Chair Homendy, is it true that this technology is too costly to implement?

Ms. HOMENDY. Not by the evidence. American Airlines outfitted—retrofitted over 300 Airbus A321s for less than \$50,000 an airplane, and only had them out of service for 1 or 2 days.

Senator MARKEY. Yes. It reminds me when the auto industry used to say it's too expensive to have airbags, it's too expensive to have seat belts, we just can't afford it makes the car too unaffordable. You know what the American public said? Build in the safety. And it turns out, the more you do it, is the lower the cost is. We have to get it done for our airline industry as well.

Ms. HOMENDY. And that's the cost.

Senator MARKEY. Without question. It's just an unacceptable price that we have to pay because the industry wants to cheap out in terms of building in the protections that the families of our country deserve. So, I believe that an industry that rakes in billions in profits every year, can afford lifesaving technology for a very small cost.

And I want to turn to one final issue: FAA staffing. Soon after the crash, the NTSB examined flight data and identified over 15,000 close proximity events between airplanes and helicopters here at the Washington airport. If an FAA employee had been analyzing this data, they may have identified the risk in this DCA airspace before the tragic crash.

Rather than bolstering FAA staffing capacity, the Trump administration responded by cutting the very FAA staff needed to conduct this life-saving analysis, and that's why last July, I sent a letter to the FAA demanding answers about its staffing levels and capacity to identify similar risk at other airports in our country. And it's also why I fought for and won an amendment in the ROTOR Act to ensure the FAA Administrator maintains the necessary staffing levels to analyze safety trends before a disaster happens.

Unfortunately, over a year later, according to NTSB's report, the FAA is still not analyzing these trends to catch close calls before they occur. It's a year later. This is unacceptable. Chair Homendy, do you agree that the FAA is still not proactively acting to identify these risks at U.S. airports?

Ms. HOMENDY. They are not doing what we have recommended, and we have been urging them to do the entire time, which is to not only evaluate their data, which they're starting to do now, but to develop a simple definition of what a close call is. They have 10 different types of data sources coming in for a near miss and not one single definition that everyone can get around on what is a near miss. And then, even the information and data they collect, isn't shared with the airlines until about 3 to 6 months later.

Senator MARKEY. Yes. You recommend that there be the creation of an office to collect the data and then to disseminate the information. And that still has not happened.

Ms. HOMENDY. We had recommended that they develop a standard definition for what a close proximity event is, and to improve their data analysis, and to share that data with external stakeholders, including Federal agencies and the airlines in a timely manner.

Senator MARKEY. You recommended the creation of an office in order to track and publicly report this data, and that has not happened.

Ms. HOMENDY. I don't think we recommended an office, but—

Senator MARKEY. That was in the NTSB report, so I'll double-check on that, but that's how I read the report.

Ms. HOMENDY. We did mention an office about doing a safety management system review of Air Traffic Organization. That is one area that we did mention that we needed some work done.

Senator MARKEY. Thank you, Mr. Chairman, and we must pass this legislation. It's absolutely critical.

Ms. HOMENDY. Thank you.

The CHAIRMAN. Thank you, Chairwoman Homendy, for your testimony here today, and thank you for the hard work of your team who does a consistently excellent job.

Senators will have until the close of business on February 19 to submit questions for the record. The witnesses will have until close of business on March 5, to respond to those questions.

That concludes today's hearing. The Committee stands adjourned.

[Whereupon, at 12:19 p.m., the Committee was adjourned.]

A P P E N D I X

RESPONSE TO WRITTEN QUESTIONS SUBMITTED BY HON. JERRY MORAN TO
HON. JENNIFER HOMENDY

Question 1. As part of its investigation, the NTSB simulated the flight paths of American Airlines Flight 5342 and Priority Air Transport 25 with and without the most advanced position broadcast and traffic collision avoidance technologies, including ADS-B In-enabled Cockpit Display of Traffic Information—or “CDTI”—and Airborne Collision Avoidance System X—or “ACAS-X”—respectively. The investigation concluded that installation and use of ADS-B In—and the suite of more advanced cockpit alerting technologies it enables—would have provided the commercial jet with its first indication of the potential hazard posed by the helicopter nearly one minute before the collision, rather than just 19 seconds before the collision using older traffic collision avoidance technology. Similarly, the investigation concluded that the installation and use of ADS-B In and ADS-B In-enabled technologies would have provided the helicopter with its first indication of the hazard posed by the commercial jet 48 seconds before the collision. The NTSB’s investigation attested to the difference that ADS-B In and ADS-B In-enabled technologies could have made in this circumstance. Would you elaborate on how installation and use of ADS-B and comparable technologies would impact air safety?

Answer. The NTSB has previously advocated for the FAA to require ADS-B In technology on the basis that equipping aircraft with ADS-B In capability would provide an immediate and substantial contribution to safety by enhancing pilot and flight crew situation awareness of surrounding traffic, especially near airports. Simulations using the circumstances of this accident reaffirm this conclusion and demonstrate the value of ADS-B In-derived traffic information in improving pilots’ situation awareness and supporting earlier identification of potential traffic conflicts.

In this accident, the traffic alert (TA) that the flight 5342 crew received with the installed traffic alert and collision avoidance system (TCAS) consisted of the aural annunciation, “Traffic, traffic,” with the TCAS display simply depicting a yellow circle in front of the airplane. Information about the specific location of the traffic threat relative to the airplane was not announced, and the crew would have had to watch the TCAS display to determine the threat’s relative position and direction of motion before visually scanning the appropriate area. Given the crew’s high workload during final approach to land on runway 33 at the time they received the TCAS TA, they would have had limited capacity to look for and acquire the conflicting traffic. Notably, the crew of flight 5342 had not received any traffic information from the DCA local controller of the presence of PAT25 and were likely unaware of the presence and proximity of PAT25 until a few seconds before the collision.

The NTSB performed simulations using an ADS-B In application and a cockpit display of traffic information (CDTI) to determine how an ADS-B-based system would have performed in the accident scenario. The simulation indicated that the crew of flight 5342 would have received two alerts concerning PAT25 had it been equipped with such a system. The first aural and visual alert would have occurred 59 seconds before the collision, annunciating “Traffic, 12 o’clock, low, 3 miles, descending.” A second aural alert would have occurred 35 seconds before the collision, annunciating “Traffic, 12 o’clock, low, 2 miles.” These two alerts would have occurred 40 and 16 seconds, respectively, before the TCAS TA that the crew received before the collision, providing the crew with early awareness of proximate traffic, enhancing their situation awareness of the presence of PAT25. This enhanced situation awareness could have afforded an opportunity for the crew of flight 5342 to query the air traffic control local controller regarding the presence of PAT25.

Although TCAS TAs provide a verbal annunciation that a potential traffic conflict exists, the annunciations do not include the position and range of the target, requiring the pilot to first refer to the TCAS display inside the cockpit to determine the direction in which they need to direct their visual search. A TA indicating the clock position, relative altitude, range, and vertical tendency of nearby traffic would allow pilots to immediately direct their visual search in the proper direction outside the

aircraft. The NTSB concludes that TA aural alerts that include additional information about the location of traffic could reduce the time pilots need to visually acquire target aircraft. Consequently, the NTSB recommended that the FAA modify airborne collision avoidance system (ACAS) aural alerts to include clock position, relative altitude, range, and vertical tendency (Safety Recommendation A-26-29 from the DCA investigation). The NTSB also recommended that the FAA require existing and new TCAS I, TCAS II, and ACAS X installations to integrate directional traffic symbols (A-26-30).

We have investigated numerous midair collisions that occurred within controlled airspace or in which air traffic control was in contact with at least one of the involved aircraft. In many of these investigations, we noted that a CDTI—which may be part of the aircraft’s installed avionics, such as on a dedicated navigation display or multifunction display, or that could be hosted on a portable device, such as a smartphone or tablet computer—with ADS-B In information would enhance pilots’ situation awareness by providing information regarding traffic conflicts that may otherwise go undetected due to the numerous documented limitations of pilot-applied visual separation (the see-and-avoid concept). The circumstances of this accident illustrate that the additional information provided by an ACAS system supplemented with ADS-B In information, including alerts indicating the clock position, relative altitude, range, and vertical tendency of the other identified aircraft as well as directional traffic displays, further enhances the safety benefit provided by ACAS. For all pilots, ADS-B In information provided on a CDTI with alerting that is visible and audible to the pilot would provide critical situation awareness to help mitigate the risk of midair collisions. To take full advantage of the safety benefits provided by ADS-B, the NTSB recommends that the FAA require all aircraft operating in airspace where ADS-B Out is required to also be equipped with ADS-B In with a cockpit display of traffic information that is configured to provide alerting audible to the pilot or flight crew (Safety Recommendation A-26-31). Additionally, to fully realize the benefit of ADS-B In, the NTSB recommended the following to FAA in our DCA investigation report:

- Require the use of the appropriate variant of airborne collision avoidance system X on new production aircraft that are subject to traffic alert and collision avoidance system equipage regulations. (A-26-32)
- Require existing aircraft that are subject to traffic alert and collision avoidance system equipage regulations be retrofitted with the appropriate variant of airborne collision avoidance system X. (A-26-33)
- Evaluate the feasibility of decreasing the traffic advisory and resolution advisory inhibit altitudes in airborne collision avoidance system Xa to enable improved alerting throughout more of the flight envelope. (A-26-34)
- If the evaluation resulting from Safety Recommendation A-26-34 finds that the inhibit altitudes can be safely decreased, require retrofitting of the applicable airborne collision avoidance system X variant incorporating the reduced traffic advisory and resolution advisory inhibit altitudes on all aircraft that are subject to traffic alert and collision avoidance system and equipage regulations. (A-26-35)
- Require that all rotorcraft operating in Class B airspace be equipped with airborne collision avoidance system (ACAS) Xr technology once the ACAS Xr standard has been published. (A-26-36)

Question 2. Several of the NTSB’s recommendations involve the installation and use of ADS-B In technology. Last year, the Senate unanimously passed the ROTOR Act, which Chairman Cruz and I and other members of this Committee introduced to address the precise gaps in air safety that the NTSB’s identified. I believe that the ROTOR Act aligns precisely with many of the NTSB’s recommendations, particularly as it relates to installation and use of ADS-B technology. Would you agree that the ROTOR Act represents a targeted and precise approach to improving the safety of the National Airspace System?

Answer. If enacted, FAA implementation of the requirements in the ROTOR Act would directly address 1 of 50 NTSB safety recommendations from the DCA midair collision investigation: Safety Recommendation A-26-31, which recommends that the FAA require all aircraft operating in airspace where ADS-B Out is required to also be equipped with ADS-B In with a cockpit display of traffic information that is configured to provide alerting audible to the pilot and/or flight crew. The NTSB has long believed such equipage would immediately and substantially contribute to the safety of the National Airspace System (NAS), especially near airports. The ROTOR Act was introduced prior to the completion of our investigation, and does address long-standing NTSB-identified safety issues, but recipients must implement

all 50 NTSB recommendations made in the final investigation report to address all the safety deficiencies identified in this investigation.

Question 3. The NTSB concluded that one of the chief causes of this accident was a helicopter route that would have placed rotorcraft traversing it within 75 vertical feet, at most, of commercial traffic on approach to DCA's runway 33. Describe how the NTSB determined that this route presented such a problem to the safety of the airspace around DCA? Did the NTSB's investigation reveal why this route—and the problems it presented—was not addressed long before this collision?

Answer. Preliminary investigative findings of this accident revealed that, when flown at the recommended maximum altitude of 200 ft, a helicopter operating over the eastern shoreline of the Potomac River on Helicopter Route 4 would have about 75 ft of vertical separation at maximum from an airplane approaching runway 33. This vertical separation decreases the farther west of the shoreline the helicopter is flown, or if the airplane is operating below the 3° visual glidepath provided by the runway 33 precision approach path indicator (PAPI).

In an urgent safety recommendation report published on March 11, 2025, we concluded that the separation distances between helicopter traffic operating on Route 4 and aircraft landing on runway 33 that existed at the time of the accident were insufficient and posed an intolerable risk to aviation safety by increasing the chances of a midair collision.

As a result of our findings, we issued an urgent safety recommendation to the FAA (Safety Recommendation A-25-1) asking the FAA to prohibit operations on Helicopter Route 4 between Hains Point and the Wilson Bridge when runways 15 and 33 were being used for departures and arrivals, respectively, at DCA. That recommendation has since been classified Closed—Exceeds Recommended Action.

Our investigation identified multiple factors resulting in the risk of midair collision between airplanes and helicopters at DCA remaining unmitigated. One factor was that the FAA Air Traffic Organization's data analysis, safety assurance, and risk assessment processes failed to recognize and mitigate the risk of collision, particularly when DCA air traffic controllers had previously voiced concern about near midair collision occurrences near DCA. We also found that multiple data sources provided evidence of midair collision risk between fixed-wing aircraft and helicopters at DCA, including on approach to runway 33, before this accident; however, the limited access to and use of available objective and subjective proximity data hindered industry and government stakeholders' ability to identify hazards and mitigate risk. Additionally, the FAA Air Traffic Organization's application of its safety management system (SMS) did not effectively coordinate safety assurance and safety risk management activities with external stakeholders in the airspace around DCA. As a result, we recommended that the Department of Transportation Office of Inspector General complete an audit of the FAA Air Traffic Organization's SMS functions and data-sharing activities at all air traffic control facilities and determine whether these activities are conducted in collaboration with all relevant external stakeholders (A-26-56). We also recommended the following to the FAA:

- Based on the results of the audit completed in accordance with Safety Recommendation A-26-56, ensure that all SMS functions and data-sharing activities at all air traffic control facilities are conducted in collaboration with all relevant external stakeholders. (A-26-39)
- Create an objective definition of close proximity encounter and a public database of those encounters and their locations that can be used to monitor their prevalence and identify areas of potential traffic conflict for safety assurance and safety risk management. (A-26-37)
- Develop and implement a process that will, in a timely manner, notify involved parties after events such as near midair collisions or traffic alert and collision avoidance system resolution advisory activations, such that notification occurs while relevant data remain available and before meaningful safety analysis, reporting, or corrective action is no longer practicable. (A-26-38)

FAA Order JO 7210.3DD listed criteria and procedures for developing and modifying helicopter route charts. One of the listed criteria was that "care should be exercised to avoid recommending altitudes or flight ceilings/floors which would cause helicopters operating on a designated route to encounter inflight wake turbulence generated by large, fixed-wing traffic." The order stated that Terminal Operations Service Area Directors were responsible for reviewing and approving new or revised helicopter route chart proposals and assuring that they complied with all prescribed criteria. These directors were also responsible for annually reviewing existing visual flight rule helicopter route charts to determine their accuracy and continued utility; however, the FAA was unable to provide documentation of the required annual re-

views for the Baltimore-Washington Helicopter Route Chart, nor was the FAA able to identify who was responsible for conducting such annual reviews. As of the date of our final investigative report, no information has been provided regarding whether annual reviews have been conducted and, if so, what criteria were used in the review.

The NTSB concludes that annual reviews of helicopter route charts as required by FAA Order 7210.3DD would have provided an opportunity to identify the risk posed by the proximity of Route 4 to the runway 33 approach path, but there is no evidence to support that these reviews were being performed at DCA. The NTSB is concerned that the lack of documentation of annual reviews for the Baltimore-Washington Helicopter Route Chart may be an indication that these annual reviews are not occurring at other locations throughout the NAS. Therefore, the NTSB recommends that the FAA do the following:

- Ensure that annual reviews of helicopter route charts are being conducted throughout the National Airspace System as required by FAA Order. (A-26-24)
- Conduct a safety risk management process to evaluate whether modifications to the remaining helicopter route structure in the vicinity of Ronald Reagan Washington National Airport are necessary to safely deconflict helicopter and fixed-wing traffic and provide the results to the National Transportation Safety Board. (A-26-25)
- Amend your helicopter route design criteria and approval process to ensure that current and future route designs or design changes provide vertical separation from airport approach and departure paths. (A-26-26)
- Once the criteria and approval process referenced in Safety Recommendation A-26-26, review all existing helicopter routes to ensure alignment with these updated criteria. (A-26-27)
- Incorporate the lateral location and published altitudes of helicopter routes onto all instrument and visual approach and departure procedures to provide necessary situation awareness to fixed-wing operators of the risk of helicopter traffic operating in their vicinity. (A-26-28)

Question 4. The NTSB faulted deficient data sharing practices across the FAA, Department of Defense, and aircraft operators, citing this breakdown as a contributing factor to the midair collision of January 29th, 2025. The ROTOR Act would require the Army Inspector General, as part of an audit of Army aviation, to assess the Army's coordination with the FAA. The bill would also establish or designate an office within the FAA called the Office of FAA-DOD Coordination. This Office would coordinate the military's airspace usage with relevant verticals within the FAA—including the Air Traffic Organization—make certain that employees are empowered to provide feedback—such as that raised about the dangerous airspace design near DCA—pursue improved aviation safety data sharing practices between civil and military airspace users and execute certain safety reviews. How would a dedicated FAA-DOD coordination apparatus like the one proposed in the ROTOR Act support improved aviation safety data sharing? Describe the significance of data sharing among all airspace users to aviation safety.

Answer. The NTSB investigation found that the FAA's lack of an established process to inform parties about their involvement in events such as near midair collisions or TCAS resolution advisories reduces the likelihood of fully understanding and mitigating future midair collision risk. While multiple data sources provided evidence of midair collision risk between airplanes and helicopters at DCA before this accident, limited access to this data hindered both industry and government stakeholders' ability to identify hazards and mitigate risk. The likelihood of detecting and mitigating these hazards and risks before accidents occur would be increased by improving stakeholder access to information about close proximity encounters for use in safety assurance processes. To collaborate effectively regarding these risks, the NTSB recommends that the FAA create an objective definition of close-proximity encounter and a public database of those encounters and their locations that can be used to monitor their prevalence and identify areas of potential traffic conflict for safety assurance and safety risk management (Safety Recommendation A-26-37). The NTSB also recommends that the FAA develop and implement a process that will, in a timely manner, notify involved parties after events such as near midair collisions or TCAS resolution advisories such that notification occurs while relevant data remain available and before meaningful safety analysis, reporting, or corrective action is no longer practicable (Safety Recommendation A-26-38). Additionally, we recommend that the FAA ensure that all SMS functions and data-sharing activities at all air traffic control facilities are conducted in col-

laboration with all relevant external stakeholders (including military NAS users; Safety Recommendation A-26-39).

The NTSB investigation found that the Army's safety reporting systems for pilots were not well utilized and did not provide the organization with information about close encounters between Army helicopters and other aircraft that were later found to have occurred frequently. As a result, the NTSB recommends that the Army survey its helicopter pilots to identify barriers to the utilization of flight safety reporting systems, to develop a plan to address the identified barriers, and to implement that plan across Army aviation units (Safety Recommendation A-26-46).

Question 5. The NTSB, and this Committee, have attested to the importance of widespread adoption of ADS-B In technology and its importance to improving safety. How does the NTSB view comparable and complementary technologies—including, for example, ACAS-X or hybrid TCAS—that can also utilize ADS-B data to the benefit of aviation safety?

Answer. Many technologies contribute to aviation safety, and the NTSB's analysis and recommendations in response to the catastrophe at DCA address multiple collision avoidance technologies, including TCAS I, TCAS II, ACAS-X, and ADS-B In and Out. The NTSB's overarching concern in relation to each of these technologies is to ensure that, on all aircraft operating in high traffic airspace, they are equipped; operating properly; configured in such a way as to provide alerts audible to the pilot and flight crew in their operating environment; that such alerts to the pilot and flight crew include the clock position, relative altitude, range, and vertical tendency of the other identified aircraft; and that cockpit displays of traffic information integrate directional traffic symbols. In short, we believe pilots and flight crews should have ready access to the fullest possible dataset when identifying other traffic in their airspace.

Our recommendations from the DCA investigation to the FAA on these technologies include the following:

- Modify airborne collision avoidance system traffic advisory aural alerts to include clock position, relative altitude, range, and vertical tendency. (A-26-29)
- Require existing and new traffic alerting and collision avoidance system (TCAS) I, TCAS II, and airborne collision avoidance system X installations to integrate directional traffic symbols. (A-26-30)
- Require all aircraft operating in airspace where Automatic Dependent Surveillance—Broadcast (ADS-B) Out is required to also be equipped with ADS B In with a cockpit display of traffic information that is configured to provide alerting audible to the pilot and/or flight crew. (A-26-31)
- Require the use of the appropriate variant of airborne collision avoidance system X on new production aircraft that are subject to traffic alert and collision avoidance system equipage regulations. (A-26-32)
- Require existing aircraft that are subject to traffic alert and collision avoidance system equipage regulations be retrofitted with the appropriate variant of airborne collision avoidance system X. (A-26-33)
- Evaluate the feasibility of decreasing the traffic advisory and resolution advisory inhibit altitudes in airborne collision avoidance system Xa to enable improved alerting throughout more of the flight envelope. (A-26-34)
- If the evaluation resulting from Safety Recommendation A-26-34 finds that the inhibit altitudes can be safely decreased, require retrofitting of the applicable airborne collision avoidance system X variant incorporating the reduced traffic advisory and resolution advisory inhibit altitudes on all aircraft that are subject to traffic alert and collision avoidance system and equipage regulations. (A-26-35)
- Require that all rotorcraft operating in Class B airspace be equipped with airborne collision avoidance system (ACAS) Xr technology once the ACAS Xr standard has been published. (A-26-36)

NTSB recommendations to the Department of War Policy Board on Federal Aviation include:

- Require the Department of War to verify on all aircraft with transponders capable of transmitting Mode S and Automatic Dependent Surveillance—Broadcast (ADS-B) and operated in the NAS, at least annually and upon each aircraft's entry into service in the NAS, that 1) the transponder ADS-B settings are correct, 2) the transponder is transmitting ADS-B, and 3) the transponder is transmitting the correctly assigned address. (A-26-51)

- Require armed services to amend their operational procedures to allow flight crews to enable Automatic Dependent Surveillance—Broadcast Out while in flight. (A-26-52)
- Require all military aircraft operating in the National Airspace System (NAS) be equipped with Automatic Dependent Surveillance—Broadcast (ADS-B) In with a cockpit display of traffic information that is configured to provide alerting audible to the pilot and/or flight crew, and that such requirement apply wherever in the NAS the Federal Aviation Administration requires any aircraft to operate with ADS-B Out. (A-26-53)

The NTSB also issued one related recommendation to the RTCA Program Management Committee, as follows:

- Finalize and publish the minimum operational performance standards for airborne collision avoidance system Xr for rotorcraft. (A-26-57)

Question 6. Last year, I introduced the Aviation Funding Stability Act, which would allow the FAA to draw from the Airport and Airway Trust Fund to continue operating when appropriations lapse. Importantly, my legislation would also make certain that controllers get paid in the event of a shutdown. Many experts have emphasized that consistent and uninterrupted funding for the FAA is essential for maintaining and promoting a safe and efficient National Airspace System. Would you agree that stable funding for the FAA would enhance the safety and reliability of our National Airspace System?

Answer. Stable funding for the FAA and the NTSB would enhance the safety and reliability of our national airspace. The NTSB needs authorization to operate when appropriations lapse, and the NTSB urges you to consider that. When an accident occurs, it is incumbent upon the NTSB to take action immediately to prevent further tragedies in our airspace; that action can't wait for appropriations and continuing resolutions.

RESPONSE TO WRITTEN QUESTIONS SUBMITTED BY HON. MARIA CANTWELL TO
HON. JENNIFER HOMEMDY

NTSB Recommendations for Air Traffic Control. It's clear Congress should swiftly pass the ROTOR Act so that the FAA must begin implementing many of the key requirements we discussed during the hearing. However, that does not mean our work stops there. Several of the NTSB's findings and recommendations related to the FAA providing air traffic controllers with proper training and support should be considered in additional legislation.

Question 1. One of these recommendations says the FAA should develop new annual training for controllers on how to better manage scenario-based threats and decision-making in high stress situations. How would this annual training improve controllers' ability to identify and mitigate safety risks?

Answer. In November 2016, the NTSB issued Safety Recommendation A-16-51, asking the FAA to provide initial and recurrent training for air traffic controllers on controller judgment, vigilance, and/or safety awareness with specific reference to two midair collisions that occurred in 2015 to be used as case studies. The FAA responded that, in July 2017, it instructed controllers on threat and error management (or TEM, which the FAA described as the practice of applying controller judgment, vigilance, and safety awareness) as part of instructor-led recurrent training and stated that the training would also be required for future controllers. The FAA stated that it delivered a web-based "Emergencies" training in July 2017 to high-light accidents similar to the two midair collisions cited in the recommendation. After reviewing this training, the NTSB determined that the materials did not highlight the safety issues identified in the 2015 midair accidents, nor did the training discuss those or similar accidents, as recommended. When the FAA indicated that it did not plan to take further action, Safety Recommendation A-16-51 was classified Closed—Unacceptable Action in 2023.

A vast majority of the time, controllers perform very effectively and reliably; however, human vulnerabilities such as fatigue, increased workload, time pressure, and biases can increase errors. A controller's ability to anticipate, detect, and mitigate risks is essential. TEM provides a strategy to combat these vulnerabilities. TEM is a process for identifying safety risks—threats, errors, and undesired states—in the environment and mitigating those risks.

The controllers involved in this accident stated they were not familiar with the term "threat and error management" during postaccident interviews, nor were they familiar with the concepts that would be included in such training, suggesting that

they did not receive training on this method of safety management. The NTSB requested, and received, controller training materials related to identifying and mitigating risk. This material did not reveal any formal TEM training other than the 2017 workshop, and there was no evidence to indicate that the workshop or the subject matter it contained had been offered in any training since 2017.

Adequate TEM training can strengthen situation awareness by teaching controllers to continuously monitor their environment to more quickly identify threats; promote team communication to ensure that communications are clear, timely, and assertive; emphasize effective scanning habits; recognize patterns in the development of adverse events; and enhance decision-making under stress by developing habits that balance procedural compliance with problem solving to mitigate the risks of threats and errors. TEM would have likely improved all controllers' situation awareness in this event, which may have allowed for earlier conflict recognition or encouraged the operations supervisor (OS) to conduct a risk assessment of the steady helicopter traffic and its resulting workload on the local control (LC) and assistant local control (ALC) controllers.

The NTSB continues to believe that including case studies in initial and annual air traffic controller training and highlighting situations in which controller judgment, vigilance, and safety awareness could be improved would enhance controllers' ability to identify and manage threats and errors. FAA guidance on the use of good judgment is vague, and case studies provide the opportunity to examine a real chain of events that had resulted in an accident, imparting valuable lessons without exposing participants to the potential risk of adverse outcomes inherent to on-the-job training, which the FAA often relies upon for controller training. The NTSB also believes that providing controllers the opportunity to discuss and practice applying TEM using scenario-based training is critical, as repeating skills through training leads to behavioral automaticity, thus freeing up working memory. Automaticity has been demonstrated to improve speed and accuracy, situation awareness, and decision-making. The NTSB investigation found that initial and recurrent scenario-based training in threat and error management would help controllers identify and mitigate risks and strengthen situation awareness. Accordingly, the NTSB recommends that the FAA develop instructor-led, scenario-based training on threat and error management that trains controllers to continuously monitor their environment to more quickly and accurately identify threats; promote team communication to ensure that communications are clear, timely, and assertive; emphasize effective scanning habits; recognize patterns in the development of adverse events; and enhance decision-making under stress by developing habits that balance procedural compliance with problem solving to mitigate the risks of threats and errors, and provide this training to all air traffic controllers annually (Safety Recommendation A-26-9).

Question 2. In the FAA Reauthorization law, we required FAA to deploy advanced tower simulation systems nationwide to help train controllers to prevent near misses. Should FAA use these systems for this new annual training?

Answer. Yes.

Question 3. Other key recommendations call for FAA to implement more useful alerts for controllers that better flag the severity of issues triggering the alert, and to install technology in towers to alert controllers when their transmissions have been blocked. If implemented, how would these safety recommendations have mitigated risks and prevented the strained conditions at DCA Tower that contributed to the accident?

Answer. The current conflict alerts (CA) system operates in the same manner regardless of the algorithm that triggered the alert. In the absence of any salient information conveying the severity of the conflict, controllers must determine on their own if the conflict alert requires immediate action, thus increasing the controller's cognitive load. Available improvements to the CA software could provide color coding or various aural alerts, depending on which conflict alert algorithms were activated. Providing controllers with additional salient cues regarding the perceived severity of a potential conflict would reduce controller cognitive load and would likely improve reaction time to the most critical conflict alerts.

Regarding blocked radio transmissions, the very high frequency (VHF) radio communications used by air traffic control do not allow for simultaneous transmissions. If a pilot or controller attempts to broadcast on the same frequency at the same time as another pilot, one or both transmissions may be garbled, incomplete, or blocked from reception entirely. This leads to missed control instructions, lack of clarity, loss of situation awareness, or readback errors; however, there is currently no system in use that allows controllers to know when a simultaneous broadcast has occurred.

Antiblocking technology would alert controllers and/or flight crews to potentially blocked transmissions when simultaneous broadcasting occurs.

Strong ADS-B In Performance Standard. It's crucial for the safety of the flying public that aviation operators, especially the commercial passenger fleet—which moves over 2 million passengers each day, are equipped with ADS-B In technology, and not alternatives that don't deliver on safety.

Importantly, not every type of ADS-B In performs the same way and delivers the same benefits. That's why our bipartisan DCA safety legislation requires ADS-B In that boosts situational awareness for pilots and delivers real-time traffic advisories and alerts to ensure a robust additional layer of safety on the flight deck.

Question 1. What are the benefits of pilots having ADS-B In that is integrated with avionics on the flight deck?

Answer. The NTSB has previously advocated for the FAA to require ADS-B In technology because equipping aircraft with ADS-B In capability would immediately and substantially contribute to safety, especially near airports. Simulations using the circumstances of this accident reaffirm this conclusion and demonstrate the value of ADS-B In-derived traffic information in improving pilots' situation awareness and supporting earlier identification of potential traffic conflicts. Pilots and flight crews (not the airplane) need to receive the rich alerting information, including cockpit displays of traffic information with directional traffic symbols and audible traffic and resolution advisories.

In this accident, the TA that the flight 5342 crew received consisted simply of the annunciation, "Traffic, traffic." No information about the location of the traffic threat relative to the airplane was annunciated, and the crew would have had to refer to the TCAS display to determine the relative position of the threat before visually scanning in the appropriate area. Given the crew's high workload at the time they received the TA, it is unlikely that they performed a focused visual search for the helicopter at this time.

The NTSB performed a simulation to determine how an ADS-B-based system capable of providing alerts would have performed in the accident scenario. The simulation indicated that the crew of flight 5342 would have received two alerts concerning PAT25 had it been equipped with such a system. The first aural and visual alert would have occurred 59 seconds before the collision, annunciating "Traffic, 12 o'clock, low, 3 miles, descending." A second aural alert would have occurred 35 seconds before the collision, annunciating "Traffic, 12 o'clock, low, 2 miles." These two alerts would have occurred 40 and 16 seconds, respectively, before the TCAS TA that the crew received before the collision, providing the crew with additional awareness of the helicopter.

Although TCAS TAs provide a verbal annunciation that a potential traffic conflict exists, these annunciations do not include the target's position and range, requiring the pilot to first refer to the TCAS display inside the cockpit to determine the direction in which they need to direct their visual search. A TA indicating the clock position, relative altitude, range, and vertical tendency of nearby traffic would allow pilots to immediately direct their visual search in the proper direction outside the aircraft. The NTSB concludes that TA aural alerts that include additional information about the location of traffic could reduce the time pilots need to visually acquire target aircraft. Consequently, the NTSB has also recommended that the FAA modify airborne collision avoidance system (ACAS) TA aural alerts to include clock position, relative altitude, range, and vertical tendency (Safety Recommendation A-26-29).

The circumstances of this accident illustrate that the additional information provided by an ACAS system supplemented with ADS-B In information, including alerts and directional traffic displays, further enhances the safety benefit provided by ACAS. For all pilots, ADS-B In information on a CDTI with alerting that is audible to the pilot would provide critical situation awareness to help mitigate the risk of midair collisions, even if an aircraft is not equipped with an ACAS. To take full advantage of the safety benefits provided by ADS-B, the NTSB recommends that the FAA require all aircraft operating in airspace where ADS-B Out is required to also be equipped with ADS-B In with a cockpit display of traffic information that is configured to provide alerting audible to the pilot and/or flight crew (Safety Recommendation A-26-31).

Question 2. Do you agree that ADS-B In that is integrated with an aircraft's avionics on the flight deck would provide the strongest safety benefit for commercial passenger flights?

Answer. Improving pilots' situation awareness of surrounding traffic and potential traffic conflicts in busy airspace, such as near airports, is important for preventing midair collisions. Ensuring pilots receive effective aural and visual alerts to potential traffic conflicts enhances safety. Having a CDTI that uses ADS-B data to show

surrounding traffic, and its directionality increases pilots' awareness of the movements of nearby traffic. The information provided to the pilot is equally, if not more important than the method of display. Therefore, the NTSB recommended that the FAA require all aircraft operating in airspace where ADS-B Out is required to also be equipped with ADS-B In with a CDTI that is configured to provide alerting audible to the pilot and/or flight crew.

For currently installed airborne collision avoidance systems on commercial passenger aircraft, the traffic display may only show a nondirectional target, requiring pilots to watch the display to infer the direction of movement of the traffic target relative to their own aircraft. Using ADS-B data to show the directionality of surrounding traffic provides more timely information to help pilots determine if certain targets may become collision threats. The NTSB recommended that the FAA require existing and new airborne collision avoidance system installations to integrate directional traffic symbols (Safety Recommendation A-26-30). Additionally, ensuring that aural alerts to potential traffic conflicts can be both heard by the pilots and contain additional information about the location of traffic, such as clock position and distance, could reduce the time pilots need to visually acquire these targets before they become a collision threat. Therefore, NTSB recommended that the FAA modify aural alerts in airborne collision avoidance systems (ACAS) to include clock position, relative altitude, range, and vertical tendency (Safety Recommendation A-26-29).

By adding directional traffic symbols and information-rich aural alerting into an installed ACAS, information would be immediately available to pilots in their normal visual scan of cockpit instruments and flight displays, pilot situation awareness of surrounding traffic would be enhanced, and the time for pilots to visually acquire a potential traffic conflict would be reduced, providing a strong safety benefit by preventing midair collisions.

Question 3. Do you agree that ADS-B In technology and ACAS-X technology are two separate technologies with different capabilities?

Answer. ACAS-X (including ACAS-Xa and ACAS-Xr) is a family of technologies intended to serve as a successor to TCAS technologies. ACAS-X technology is intended to include, and have the capabilities to utilize, ADS-B data (referred to as "ADS-B In") as an integrated feature of the ACAS-X system. ACAS-X also receives information about nearby aircraft by interrogating their transponders. ACAS-X uses these data to provide both traffic advisories and resolution advisories. However, ADS-B In may also be utilized on aircraft *without* ACAS-X systems via other technologies. For example, a general aviation airplane may be equipped with a portable ADS-B receiver and a tablet that receives ADS-B data from the receiver to display information about surrounding traffic and alert the pilot of potential traffic conflicts.

Question 4. If so, do you agree that ACAS-X is not an alternative means of compliance to NTSB's recommendations on ADS-B In issued in response to the Board's investigation of the January 29, 2025 mid-air collision near DCA?

Answer. ACAS-X uses ADS-B and interrogator data. If Congress is concerned, it should charge the FAA with mandating the use of that data and ACAS-X and ACAS-Xr.

Limitations of Collision Avoidance Technologies.

Question 1. Do you agree that collision avoidance technologies like TCAS and ACAS-X depend on ADS-B In data for maximum performance and safety benefits?

Answer. Yes.

Older generation ACAS technologies typically do not leverage ADS-B data; however, newer technologies, such as ACAS-X, do use ADS-B In data for optimal performance.

In addition, although a TCAS display does depict traffic targets, a pilot must monitor the display over time to determine in what direction the target is moving. By leveraging ADS-B In traffic information, an ACAS display can depict the ground track of traffic targets, increasing pilots' awareness of the movements of nearby traffic and providing more timely information to help a pilot determine if a target may become a collision threat.

Question 2. Do you agree that ADS-B In provides pilots with better situational awareness at lower altitudes where Traffic Alert and Collision Avoidance System (TCAS) does not activate?

Answer. Pilots using ADS-B In have improved situation awareness, especially when integrated with ACAS. Currently, TCAS I or II is only required for about 4 percent of aircraft registered in the United States. For the other 96 percent, there is a gap in regulations that ADS-B In would fill.

The circumstances of this accident illustrate that the additional information provided by an ACAS supplemented with ADS-B In information, including ADS-B

alerts and directional traffic displays, further enhance the safety benefit provided by ACAS. For all pilots, ADS-B In information provided on a CDTI with alerting that is audible and visible to the pilot would provide critical situation awareness to help mitigate the risk of midair collisions, even if their aircraft are not equipped with an ACAS.

To take full advantage of the safety benefits provided by ADS-B, the NTSB recommends that the FAA require all aircraft operating in airspace where ADS-B Out is required to also be equipped with ADS-B In with a CDTI that is configured to provide alerting audible to the pilot and/or flight crew. To provide the same situation awareness advantages to military flight crews, the NTSB recommends that the Department of War require all military aircraft operating in the NAS be equipped with ADS-B In with a CDTI that is configured to provide alerting audible to the pilot and/or flight crew, and that such requirement apply wherever in the NAS the FAA requires any aircraft to operate with ADS-B Out.

Question 3. In NTSB's view, why should FAA require aircraft operating in busy airspace to fly with *both* safety enhancing ADS-B In and ACAS-X? What is the safety benefit to pilots by having both of these technologies while flying in busier airspace?

Answer. ADS-B In is required as an input of surveillance data to ACAS-X systems for TSO certification; however, if ADS-B In data are invalid, ACAS-X systems can still alert by using the other surveillance input, which is transponder interrogations and replies. Per the minimum operational performance standards, ACAS-X uses ADS-B information for optimal performance.

Clear Timeline for ADS-B In Requirement.

Question 1. Do you agree with how the ROTOR Act sets a clear compliance date for aviation operators to equip with safety enhancing ADS-B In? How will this help ensure aviation safety benefits can be delivered in a timely manner to pilots across the National Airspace System?

Answer. The Board's longstanding position is that the FAA should require ADS-B In as soon as possible. A clear, definitive deadline for compliance would provide certainty and accountability for the FAA and industry to move forward to implementation as soon as possible. We are concerned that negotiating rulemaking could water down the final rule.

Question 2. How would a clear compliance date for operators to equip with ADS-B In help foster regulatory certainty for the aviation industry?

Answer. As noted above, a clear, definitive deadline for compliance would provide certainty and accountability for the FAA and industry to move forward to implementation as soon as possible.

Aircraft Separation and Pilot Workload.

Question 1. In your estimation is ADSB-In primarily a safety technology to improve pilot situational awareness?

Answer. ADS-B is a data source that can be used by numerous technologies. The NTSB has previously advocated for the FAA to require ADS-B In technology because equipping aircraft with ADS-B In capability would immediately and substantially contribute to safety, especially near airports. The NTSB has investigated numerous midair collisions that occurred within controlled airspace or in which air traffic control was in contact with at least one of the aircraft involved. In many of these investigations, the NTSB noted that a cockpit display of traffic information with ADS-B In information would enhance pilots' situation awareness by providing information on surrounding traffic as well as alerting to traffic conflicts that augment the pilots' see-and-avoid task. In these accidents, the investigation found that these conflicts went undetected, which confirms the numerous documented limitations of see-and-avoid.

Question 2. Would you have concerns with efforts to use ADSB-In to transfer primary responsibility for separation and traffic flow throughput from air traffic controllers to pilots?

Answer. This is beyond the scope of our investigation.

Question 3. Would transferring primary responsibility for separation to pilots create higher pilot workloads and human factors issues for pilots in en route and terminal areas? Do you see this posing any issue for air traffic controllers who are exercising positive control of separation?

Answer. This is beyond the scope of our investigation.

Army Safety Management System. The investigative record indicates the Army's aviation safety system failed to consistently detect and act on altimeter alti-

tude exceedances and other operational factors concerning Army aviation flights in the National Capitol Region environment.

Question 1. On top of ensuring an effective safety management system at the Army, what structural safety management changes should Congress require from the military to prevent future mismanagement of safety risks?

Answer. The NTSB issued eight safety recommendations to the U.S. Army as part of our DCA investigation.

- Revise training procedures for flight crews assigned to operate in the Washington, DC, area to ensure that they receive initial and recurrent training on fixed-wing operations at Ronald Reagan Washington National Airport, including approach and departure paths, runway configurations, and the interaction of those traffic flows with published helicopter routes. (A-26-41)
- Develop and implement a recurring procedure, at an interval not to exceed 18 months, to verify the continued accuracy of recorded flight data. (A-26-42)
- Incorporate information within the appropriate operator's manual for all applicable aircraft on the potential total error allowed by design that could occur in flight on an otherwise airworthy barometric altimeter, including the increased position error associated with the external stores support system configuration. (A-26-43)
- Develop and implement a transponder inspection procedure on all aircraft with transponders capable of transmitting Mode S and Automatic Dependent Surveillance—Broadcast (ADS-B) and operated in the National Airspace System (NAS), at least annually and upon each aircraft's entry into service in the NAS, that ensures 1) the transponder ADS-B settings are correct, 2) the transponder is transmitting ADS-B, and 3) the transponder is transmitting the correctly assigned address. (A-26-44)
- Establish a flight data monitoring program for rotary-wing aircraft the U.S. Army operates in the National Airspace System. (A-26-45)
- Survey U.S. Army helicopter pilots to identify barriers to the utilization of flight safety reporting systems, develop a plan to address the identified barriers, and implement that plan across Army aviation units. (A-26-46)
- Revise the method for allocating resources to ensure the development of a robust safety management system that will, at a minimum, identify and monitor the potential for midair collisions between Army aircraft and civil air traffic operating in the National Airspace System. (A-26-47)
- Develop and maintain a flight safety management capability that is independently resourced and functionally separate from its occupational and environmental health management system, and ensure that this capability is both culturally and functionally integrated with units conducting sustained flight operations in the National Airspace System. (A-26-48)

RESPONSE TO WRITTEN QUESTIONS SUBMITTED BY HON. TAMMY DUCKWORTH TO
HON. JENNIFER HOMEMDY

Question Topic: Improving Aviation Safety Across the National Airspace System

Question 1. The National Transportation Safety Board (NTSB) report on the DCA Midair Collision issued dozens of recommendations. Which of the recommendations from the report would make the most significant impact on aviation safety if implemented across the entire National Airspace System?

Answer. Every one of the NTSB's 50 recommendations in response to the DCA tragedy is crucial and, if implemented, will help save lives.

Question 2. The Federal Aviation Administration (FAA) is in the process of a \$32.5 billion overhaul of the air traffic control (ATC) system.

A. To date, the FAA has focused on upgrading equipment as a key pillar in the Brand New Air Traffic Control System (BNATCS). However, as the NTSB report showed, Terminal Radar Approach Control controllers repeatedly overrode DCA tower controllers, increasing the strain on the system. Management failed to appropriately address the issue. An overhaul of the ATC system does not only require new equipment, but significant change to the safety culture. What recommendations does the NTSB have to ensure the BNATCS addresses deeper cultural issues that contribute to strain on the system?

Answer. Numerous recommendations from the DCA final report call for ATC reforms related to operational practices, safety culture, and technology, including

those listed below. Broadly, the FAA must ensure controllers are properly trained and supported by effective management practices, effective procedures, *and* the best available technology.

- To the FAA: Develop and implement time-on-position limitations for supervisory air traffic control personnel, including guidance for district and facility level management to adapt these limitations to account for their own staffing and local standard operating procedures. (A-26-08)
- To the FAA: Develop instructor-led, scenario-based training on threat and error management that trains controllers to continuously monitor their environment to more quickly and accurately identify threats; promote team communication to ensure that communications are clear, timely, and assertive; emphasize effective scanning habits; recognize patterns in the development of adverse events; and enhance decision-making under stress by developing habits that balance procedural compliance with problem solving to mitigate the risks of threats and errors, and provide this training to all air traffic controllers annually. (A-26-09)
- To the FAA: Develop and implement a risk assessment tool for supervisors that incorporates the principles of threat and error management to assist in risk identification, mitigation, and operational decision making. (A-26-10)
- To the FAA: Define objective criteria for the determination of air traffic facility levels considering traffic and airspace volume, operational factors unique to each facility, and cost of living. (A-25-15)
- To the FAA: Using the criteria established by Safety Recommendation A-26-15, determine whether the classification of the Ronald Reagan Washington National Airport's air traffic control tower as a level 9 facility appropriately reflects the complexity of its operations. (A-26-16)
- To the FAA: Develop a new and comprehensive instructor-led, scenario-based training on the proper use of visual separation, both tower-and pilot-applied. This training should include information on the inherent limitations of see and avoid, responsibilities when applying visual separation, and guidance for controllers on factors, such as current traffic volume, workload, weather or environmental factors, experience, and staffing, that should be considered when applying visual separation. Require this training for all controllers and include on a recurrent basis thereafter in annual simulator refresher training. (A-26-17)
- To the FAA: Conduct a comprehensive evaluation, in conjunction with local operators, to determine the overall safety benefits and risks to requiring all aircraft to use the same frequency when the helicopter and local positions are combined in the Ronald Reagan Washington National Airport air traffic control tower. (A-26-18)
- To the FAA: Implement anti-blocking technology that will alert controllers and/or flight crews to potentially blocked transmissions when simultaneous broadcasting occurs. (A-26-19)
- To the FAA: Develop and implement improvements to the conflict alert system to provide more salient and meaningful alerts to controllers based on the severity of the conflict triggering the alert. (A-26-20)
- To the FAA: Once the improvements to the conflict alert system discussed in Safety Recommendation A-26-20 are implemented, provide training to controllers on its use. (A-26-21)
- To the FAA: Revise the Air Traffic Organization's initial event response procedures so that an appropriate on-site supervisor makes each postaccident and postincident drug and alcohol testing determination, based on their assessment of whether the event meets testing criteria and which controllers had duties pertaining to the involved aircraft, without needing to wait for investigation or approval. (A-26-22)
- To the FAA: At least annually, provide training on the revised postaccident and postincident drug and alcohol testing determination procedure discussed in Safety Recommendation A-26-22 to all staff who have responsibilities under that procedure; this training should include a post-learning knowledge assessment. (A-26-23)
- To the FAA: Establish a requirement across all air traffic control tower standard operating procedures that the operations supervisor (OS) or controller-in-charge (CIC) document in the daily facility log when any control position is combined with the local control position, or when the OS/CIC position is combined with a control position, along with a rationale for doing so. (A-26-40)

- To the Department of Transportation (DOT): Require the Federal Aviation Administration to demonstrate at least annually that each air traffic control facility it operates has the routine capability to accomplish required postaccident and postincident drug and alcohol testing within the U.S. Department of Transportation's specified timeframes of 2 hours for alcohol and 4 hours for drugs, and implement a process to ensure that any facility without such capability will demonstrate timely remediation. (A-26-54)
- To the DOT: Work with the Federal Aviation Administration (FAA) Administrator to convene an independent panel to conduct a comprehensive review of the safety culture within the FAA's Air Traffic Organization (ATO), and use the findings to enhance the ATO's existing safety management system and integrate it into all levels of the organization. (A-26-55)
- To the DOT Office of the Inspector General: Complete an audit of the Federal Aviation Administration (FAA) Air Traffic Organization's safety management system functions and data sharing activities at all air traffic control facilities and determine whether these activities are conducted in collaboration with all relevant external stakeholders, ensuring that the audit's results are documented, reported to the Secretary of Transportation and the FAA Administrator, and made available to the public. (A-26-56)

B. How can the FAA more broadly implement the recommendations in the report to improve the ATC system through its ongoing effort to modernize?

Answer. The FAA needs to implement every recommendation resulting from this investigation. Safety recommendations from this investigation regarding the ATC system would work together with our other recommendations to the FAA to ensure the FAA is building safeguards at multiple levels of operations to prevent future tragedies.

C. What would be an appropriate timeline for the implementation of recommendations that address ATC?

Answer. Many NTSB recommendations on ATC from the DCA report could be acted upon immediately by the FAA. The NTSB designates parties to an investigation so they can take early action to improve safety, and the FAA is mandated to be a party to all our aviation investigations. The agency has access to all the factual information we do, and it should have taken action even before we issued our final recommendations in this report.

Question 3. If passed into law, the *ROTOR Act* would codify many of the NTSB recommendations from the NTSB's report. However, there is work to be done beyond the *ROTOR Act*.

A. What key issues are not addressed by the *ROTOR Act*?

Answer. The *ROTOR Act* would address 1 of 50 NTSB safety recommendations from our DCA investigation—Safety Recommendation A-26-31, which calls on the FAA to require all aircraft operating in airspace where Automatic Dependent Surveillance—Broadcast (ADS-B) Out is required to also be equipped with ADS-B In with a cockpit display of traffic information that is configured to provide alerting audible to the pilot and/or flight crew. The *ROTOR Act* does not address many other safety recommendations from the NTSB's DCA investigation, nor was it originally intended to. All 50 safety recommendations made in response to the DCA tragedy are key to improving safety in the NAS and must be implemented.

B. What are the top ten NTSB recommendations beyond the *ROTOR Act* to improve aviation safety and create more redundancy in the system?

Answer. Every one of the NTSB's 50 safety recommendations in response to the DCA tragedy would improve safety and should be acted on immediately.

Question Topic: FAA and Department of Defense (DoD) Coordination

Question 1. The NTSB recommendations include multiple areas for improved information sharing between the FAA and DoD. After the DCA Collision, there were still several close calls and loss of separation events between military and civilian aircraft in the National Airspace System.

A. Please provide a list of events that the NTSB has investigated or is currently investigating that involve both the FAA and the DoD.

Answer. The following Aviation Safety Investigations in the NAS since 2001 have also included a branch of the U.S. Armed Services as a party:

- MIA01GA070—Marathon, FL—Coast Guard airplane collision with water
- LAX02FA110—Marana, AZ—Midair collision between U.S. Army Pilatus UV-20A and Cessna 182C
- CHI03IA066—Wichita, KS—Experimental airplane with in-flight inverter fire

- CHI05FA055—Hollister, OK—Midair collision between USAF military trainer (Cessna T-37B) and Air Tractor AT-502B
- DFW05FA244—Pleasanton, TX—Unmarked power line strike during training flight
- DEN06LA004—Truth or Consequences, NM—Failure to maintain terrain clearance
- DEN06GA017—Alpine, WY—Low-level flight maneuver, cable strike
- LAX06GA254—Happy Camp, CA—Tail rotor separation during fire suppression operation
- DEN07FA140—Dayton, WY—Loss of control during in-flight weather
- SEA08FA023—Las Vegas, NV—In-flight collision with terrain
- DFW08TA225—Pueblo, CO—Wake turbulence encounter and impact with terrain
- CEN11IA114—Colorado Springs, CO—Parts separation from aircraft
- WPR12FA058—Coupeville, WA—Loss of engine power
- CEN14TA126—Fort Carson, CO—Wake encounter and loss of control in flight
- WPR15MA243—San Diego, CA—Midair collisions between Cessna 172 and experimental North American Rockwell Sabreliner
- CEN16FA172—North Little Rock, AR—Loss of engine power
- CEN16FA278—Fairmont, OK—Loss of control in flight
- WPR17LA186—Pacific Ocean, San Diego, CA—Wake turbulence and loss of control
- DCA19MA143—Jacksonville, FL—Runway excursion
- WPR21LA070—Heber City, UT—Loss of control in flight
- WPR23LA045—San Diego, CA—Midair collision between Sikorsky UH-60A and Sikorsky MH-60R
- ERA23FA256—Montebello, VA—Unknown circumstances leading to terrain impact
- DCA25MA108—Washington, DC—DCA midair collision
- OPS25LA034—Washington, DC—Loss of separation between Army Sikorsky UH60 and Republic Airways Embraer ERJ 170
- MIA02LA057—River Ranch, FL—Loss of engine power and forced landing
- LAX04GA051—Big Bear City, CA—Encounter with weather and collision with terrain
- LAX06FA099—Buckeye, AZ—Near collision, loss of control, and collision with terrain
- CEN14FA468—Abilene, TX—Unknown emergency and impact with trees and terrain
- ERA15MA259—Moncks Corner, SC—Midair collision between an F-16 and Cessna 150M
- WPR16FA166—Las Vegas, NV—Loss of engine power
- ERA18FA120—Daytona Beach, FL—Aircraft structural failure
- WPR22FA094—Glendale, AZ—Fuel exhaustion
- OPS25LA052—Minot, ND—Loss of separation between USAF B-52H and SkyWest Airlines ERJ-170-200; subsequent loss of separation between same USAF B-52H and Piper PA

B. Please provide a list of any previous recommendations made by the NTSB involving improved coordination between the FAA and DoD and the status of those recommendations.

Answer.

- To the Department of Defense (DoD; Closed—Acceptable Action): Coordinate with the Federal Aviation Administration to ensure oversight, including periodic en route inspections, is provided at all contractor bases of operation for civilian contractors that provide aviation transportation to the U.S. military overseas under 14 Code of Federal Regulations Part 121 or Part 135. (A-06-78)
- To the Air Force Rescue Coordination Center (Closed—Acceptable Action): Work with the Federal Aviation Administration to develop specific phraseology for communicating about the location, time, and nature of emergency locator trans-

mitter signals and emergency beacon codes and revise your procedures to reflect that phraseology. (A-10-35)

- To the DoD (Closed—Acceptable Alternate Action): Develop, in cooperation with the FAA, a formal document that clearly defines the roles & responsibilities of each agency regarding the activation of the special use areas (warning areas), & that provides for the timely activation of special use areas to accommodate the users; prior to implementation, these agencies should also ensure that air traffic control personnel in all facilities are provided adequate training & formal briefing on the procedures responsibilities. (A-97-114)
- To the DoD (Closed—Acceptable Action): Conduct, in cooperation with FAA, a formal review of special use airspace (warning area) procedures to ensure that they are current, safe, understood, & adhered to by all those involved. Personnel involved in this review should include air force, navy, FAA representatives; pilots, controllers & other persons deemed appropriate. Info generated by the review should be disseminated to every unit involved in the scheduling, control, &/or use of special use airspace. (A-97-115)
- To the DoD (Closed—Unacceptable Action): Require that controllers solicit pilot reports of cloud & visibility conditions from military flights that are operating in special use areas (warning areas). During periods when the special use areas have been released to the FAA, the DOD should require that military controllers confer with the FAA controllers so that they can maintain an awareness of flight conditions prior to the start of a scheduled mission. (A-97-116)
- To the DoD (Closed—Acceptable Action): Vigorously pursue upgrading all air traffic control equipment that directly interfaces with FAA air traffic control facilities to provide the same level of safety as that provided to civil aircraft by the FAA & ensure compatibility with automated systems is [*sic*] FAA facilities. (A-97-120)
- To the DoD (Closed—Acceptable Action): Participate in a task force, to be convened by the Federal Aviation Administration, to establish a permanent bird strike working group to facilitate conflict resolution and improve communication between aviation safety agencies and wildlife conservation interests. (A-99-97)

Question 2. The DCA midair collision resulted, in part, from a lack of coordination between the FAA and the Army. Less than a year later, an Air Force B-52 aircraft forced a Delta plane to take evasive action over Minot, South Dakota. Miscommunications between the FAA and DoD occur across the Department.

A. Should the Senate Commerce, Science and Technology Committee coordinate with the Senate Armed Services Committee to ensure that the best practices outlined in the NTSB report are instituted across the Department, and importantly, that the data gained from the systems is proactively shared with FAA safety experts?

Answer. Yes.

a. What specific forms of data and information would be the most critical for DoD and FAA to share? What is the optimal periodicity for each type of data or information (*e.g.*, instantly, daily, weekly, bi-weekly, monthly, annually)?

Answer. We only looked at the Army; we would need to look more broadly at the DoD.

B. In your investigation, what (if any) existing technical systems did you find currently share relevant data between DoD and FAA? What was your assessment of the usefulness and functioning of each system and what recommendations did you have for improvement?

Answer. We only looked at the Army; we would need to look more broadly at the DoD.

C. Which existing Army or DoD systems could connect easily to or be compatible with FAA systems or data, or is the NTSB's position that DoD and/or FAA's systems need to be overhauled in order to speak to each other?

Answer. We only looked at the Army; we would need to look more broadly at the DoD.

Question 3. Has the NTSB faced any resistance or obstacles to observing Safety Reviews conducted by the DoD or FAA? Were there any barriers to obtaining the information needed to complete the NTSB investigation of the DCA Midair Collision?

Answer. The FAA refused to give us investigative information in numerous instances; the DoD provided us with all investigative information requested.

Question 4. Following the DCA midair collision, FAA announced it is using artificial intelligence and machine learning to scan incident reports and mine data

sources to identify similar hotspots with high volumes of mixed helicopter and airplane traffic. Has FAA shared any of these analyses with NTSB and DoD?

Answer. We have not received this analysis; however, we would like to, as our Chief Data Officer has concerns about how this practice is being implemented and that safety concerns identified in our investigations may be missed.

Question 5. What is the NTSB's assessment of the U.S. Army's aviation platforms' ability to communicate in real-time with non-military aircraft or air traffic controllers? Are there any gaps in communications systems onboard U.S. Army aircraft that prevent real-time communication?

Answer. Our investigation of the DCA midair collision found that several of the Army 12th Aviation Battalion's helicopters were not transmitting ADS-B Out. The battalion did not know this was occurring. The NTSB determined that the Army's lack of recurrent inspections to verify the transponder ADS-B settings were correct and transmitting ADS-B was a factor in this issue remaining undetected by the battalion. Accordingly, the NTSB recommended the Army and the Department of War Policy Board on Federal Aviation develop and implement a transponder inspection procedure on all aircraft with transponders capable of transmitting Mode S and ADS-B and operated in the National Airspace System (NAS), at least annually and upon each aircraft's entry into service in the NAS, that ensures 1) the transponder ADS-B settings are correct, 2) the transponder is transmitting ADS-B, and 3) the transponder is transmitting the correctly assigned address (Safety Recommendations A-26-44 and A-26-51). Verifying functionality of aircraft transponders will ensure these systems that interface with TCASs and ground radar stations work properly while flying in the NAS.

Our investigation also found that degraded radio reception resulted in the crew of PAT25 not receiving salient information regarding flight 5342's circling approach to runway 33. Clear and effective communication is essential for safe ATC operations and pilot situation awareness. When radio quality is degraded, pilots and controllers can miss important information, and having to repeat control instructions can result in time lost for other safety-critical tasks. Therefore, we recommended that the Department of War Policy Board on Federal Aviation conduct a study to evaluate the quality of radio transmissions and reception for those aircraft operated within the NAS to identify factors that degrade communications equipment performance and adversely affect the safety of civilian and military flight operations (Safety Recommendation A-26-49). We further recommended the DOW implement the appropriate enhancements based on the findings of this study (Safety Recommendation A-26-50).

Question Topic: DoD Safety Improvements

Question 1. Should Congress statutorily require the development of a robust Safety Management System for all Military Services, including a flight data monitoring system for all aircraft and frontline incident reporting system, similar to the NTSB recommendations to the Army?

Answer. Yes.

Question 2. What would be a reasonable deadline for the Army to close out the three recommendations related to development of a Safety Management System?

- Establish a flight data monitoring program for rotary-wing aircraft the U.S. Army operates in the National Airspace System (A-26-45)
- Revise the method for allocating resources to ensure the development of a robust safety management system that will, at a minimum, identify and monitor the potential for midair collisions between Army aircraft and civil air traffic operating in the National Airspace System (A-26-47)
- Develop and maintain a flight safety management capability that is independently resourced and functionally separate from its occupational and environment health management system, and ensure that this capability is both culturally and functionally integrated with units conducting flight operations in the National Airspace System (A-26-48)

Answer. As soon as possible. The team is having ongoing and productive discussions with the Army.

Question 3. There has been an increase in military-on-military aircraft collisions. Would the NTSB recommend expanding its recommendation to identify and monitor potential for midair collisions between Army aircraft and civil air traffic (A-26-47) to include aircraft and all other traffic operating in the National Airspace System?

Answer. Our recommendations have already been made.

Question Topic: Enhance Transparency of NTSB Proceedings

Question 1. Does the NTSB have ex-parte rules prohibiting communication between entities that would be impacted by an ongoing NTSB investigation while a given draft is before the board?

Answer. No; however, I have asked our General Counsel to draft a Board order prohibiting such communications. It would be helpful to have congressional support for this action because NTSB Board orders can be changed at will by the Board.

Question 2. To protect NTSB independence, and to enhance public transparency, would you support Congress passing legislation to codify such a prohibition on lobbying NTSB members while considering a draft, and a requirement that amendments proposed by NTSB members be publicly disclosed?

Answer. Yes, I strongly support this. One of our core values is transparency, and that should apply to our Board. The Board will work the Committee on any legislation under consideration.

Question Topic: Air Traffic Controller Training

While the NTSB final report does not explicitly state why the trend over the previous decade went from always manning the Helicopter Control (HC) and Local Control (LC) positions separately to both positions be normally combined, this period coincided with declining recruitment of air traffic controllers.

Question 1. Does NTSB recommend that the FAA invest in additional pathways to increase the recruitment and training of air traffic controllers to minimize towers, resorting to implementing staffing modifications like combining the HC and LC positions?

Answer. This is beyond the scope of our investigation.

Question Topic: ADS-B In/Out Recommendations

Question 1. Please provide a list of all previous NTSB recommendations issued on Automatic Dependent Surveillance—Broadcast (ADS-B) In and ADS-B Out, and the status of these recommendations.

Answer. ADS-B was first discussed in NTSB correspondence related to *Safety Recommendation A-00-66* (Closed—Unacceptable Action), which resulted from our investigations of four runway incursions that occurred in 1999, and asked the FAA to require a ground movement safety system that prevents runway incursions and provides a direct warning to flight crews.

Safety Recommendation A-00-66 superseded Safety Recommendation A-91-29, which asked the FAA to develop and implement a system to alert controllers to pending runway incursion.

ADS-B is not specified in the text of A-00-66; however, it is discussed in our correspondence. In a 2011 letter, we discussed the FAA's ADS-B rulemaking and told the FAA that ADS-B might have been a viable response to A-00-66, but only if ADS-B In were required.

In 2024, as a result of our investigation of a 2023 runway incursion at JFK airport, we issued Safety Recommendations A-24-4 through -6 to the FAA (all three are classified Open—Unacceptable Response), which collectively superseded A-00-66.

- Collaborate with aircraft and avionics manufacturers and software designers to develop the technology for a flight deck system that would provide visual and aural alerts to flight crews of traffic on a runway or taxiway and traffic on approach to land. (A-24-4)
- Require that the technology developed in response to Safety Recommendation A-24-4 be installed in all newly certificated transport-category airplanes. (A-24-5)
- Require that existing transport-category airplanes be retrofitted with the technology developed in response to Safety Recommendation A-24-4. (A-24-6)

Between 2006 and 2007, we recommended that the FAA require equipment that could provide increased aircraft identification, location, and communication capabilities for aircraft operations in the Gulf of America and remote areas of Hawaii. The following recommendations have been classified Closed—Acceptable Action:

- Ensure that the infrastructure for the National ADS-B Program in the Gulf of America is operational by Fiscal Year 2010. (A-06-21)
- Until the infrastructure for the National ADS-B Program in the Gulf of America is fully operational, direct POIs to inform operators in that region about the benefits of commercial flight-tracking systems and encourage the operators to acquire such systems. (A-06-22)

- Accelerate the implementation of ADS-B infrastructure in Hawaii to include high-quality ADS-B services to low-flying aircraft along heavily traveled commercial air tour routes. (A-07-25)
- Require that Hawaii air tour operators equip tour aircraft with compatible ADS-B technology within 1 year of the installation of a functional National ADS-B Program infrastructure in Hawaii. (A-07-26)

FAA Rulemaking on ADS-B

In 2007, the FAA published a notice of advance rulemaking (NPRM) that only proposed requiring ADS-B Out. The FAA determined ADS-B In was not needed to maintain the safety and efficiency of the NAS.

In our 2008 NPRM comments, we pointed out that for ADS-B to provide maximum safety benefits, the system should support both ADS-B Out and ADS-B In. ADS-B Out provides basic aircraft information, such as location and altitude, to air traffic controllers to provide traffic separation. ADS-B In would permit users access to additional services, such as data-linked weather and traffic information, and would also provide a means of transmitting conflict warnings directly to pilots via the ADS-B In communications link.

In 2010, the FAA published a final rule, “ADS-B Out Performance Requirements,” which required, as of 2020, that aircraft flying in controlled airspace be equipped with ADS-B Out.

The FAA Reauthorization Act of 2018 repealed earlier legislation that had directed the FAA to initiate rulemaking to issue guidelines and regulations relating to ADS-B In technology. The repeal language appears as section 522 of the FAA Reauthorization Act of 2018.

In 2021, because of our investigation of a 2019 midair collision involving two Part 135 sightseeing tours near Ketchikan, Alaska, we issued the following safety recommendations to the FAA, which are the first recommendations to specify the “Out” and “In” capabilities of ADS-B. All are classified Open—Unacceptable Response.

- Identify areas with a high concentration of air tour traffic and to require that CFR Parts 91 and 135 air tour operators who operate within those areas be equipped with an ADS-B Out-and In-supported traffic advisory system that includes visual and aural alerts. (A-21-15)
- Require that all non-air tour aircraft operating within the airspace identified as a high-traffic tour area in Safety Recommendation A-21-15 be equipped with ADS-B Out. (A-21-16)
- Require the installation of ADS-B Out and In supported airborne traffic advisory systems that include aural alerting functions in all aircraft conducting operations under 14 CFR Part 135. (A-21-17)

In 2023 correspondence, the FAA said its current ADS-B requirements and guidance adequately addressed the needs of aviation safety and it would not pursue additional requirements. The NTSB emphasized that the absence of an ADS-B In requirement for Part 135 passenger-carrying operations fails to take advantage of the demonstrated safety benefit of ADS-B In traffic awareness and alerting and is inconsistent with the “appropriate level of public safety” the FAA itself expects for operations in which passengers bear no responsibility for the aircraft’s operation.

In 2022, because of our investigation of a 2019 helicopter air tour accident in Hawaii, the NTSB issued the following safety recommendations to the FAA (both are classified Open—Acceptable Response):

- Implement ADS-B infrastructure improvements in Hawaii, such as additional ADS-B ground stations, that provide adequate coverage to enable real-time flight tracking and traffic advisory services for ADS-B Out-and In-equipped, low-flying air tour aircraft throughout their entire tour routes. (A-22-12)
- As an interim measure until completion of A-21-15, require Hawaii air tour operators to install ADS-B Out equipment in their aircraft to enable real-time flight position tracking. (A-22-13)

Now, with the conclusion of the DCA midair collision investigation, we have issued additional collision avoidance and ADS-B In recommendations, as detailed elsewhere.

Question 2. To encourage implementation of NTSB recommendations on the installation of ADS-B In, would the NTSB be supportive of a public safety rating system that ranks air carriers on their installation of ADS-B?

Answer. This is beyond the scope of our investigation.

Question Topic: FAA Complacency

There is a known culture of complacency at the FAA. The NTSB has issued similar recommendations to those in the DCA report in previous investigations, but the FAA either failed to act or rejected the recommendations. The FAA must change its culture and not only implement the recommendations required by the NTSB but go beyond those recommendations to create a culture of safety.

Question 1. Please provide a detailed timeline for each recommendation and explain what mechanism the NTSB will use to track implementation.

Answer. Title 49 *United States Code* 1135 requires an initial recipient response within 90 days for nonurgent recommendations (30 days for urgent) issued to the DOT and all DOT modal administrations. After the initial response, recipients should update the NTSB on their progress toward implementing the recommendation whenever a significant activity has been completed, or every 12 months, whichever occurs first. The NTSB will attempt to obtain an update from a recipient through formal or informal means when there has been no update for 12 or more months. If, after 18 months, no update has been received, a formal letter requesting an update will be sent to the recipient. An action recommended by the NTSB should be completed within 5 years after the recommendation is issued. A recommendation over 5 years old may be kept open if the NTSB determines that the recommendation can be successfully completed with additional time or that the issue has significant safety implications, or if the Board votes to keep it open.

Question Topic: NTSB Staffing and Resources

Question 1. What resources were needed to conduct the DCA Midair Collision investigation?

Answer. Every office across the agency directly supported the investigation and the investigators who worked on it. Collectively, agency staff spent over 30,000 hours on the investigation. Fifty investigators supported the investigation, including four directors and eight chiefs, along with three dedicated writers. In addition, eight staff members supported family assistance, five supported media relations, five supported government affairs, and eighteen staff members directly supported the investigation and subsequent investigative hearing and Board meeting. This number does not include the staff that provided indirect support that ensured investigative staff had real-time human resources and travel resources, as well as the technology needed to work on this investigation. The total costs are estimated to be \$3.25 million including labor and mission support costs.

This number does not reflect the work done by staff who, as part of their job duties, support all investigations; it is an estimate rather than the exact monetary cost of this investigation.

Question 2. What is the appropriate level of staffing and funding necessary to carry out NTSB operations at full capacity?

Answer. Our current budget request is \$145 million for Fiscal Year 2027, which will support a staffing level of 450.

RESPONSE TO WRITTEN QUESTIONS SUBMITTED BY HON. JOHN HICKENLOOPER TO
HON. JENNIFER HOMENDY

Culture of Safety

The NTSB's DCA crash investigation revealed that aviation safety personnel had previously raised collision risks to FAA management, yet these concerns were not addressed in a timely manner. We must always raise the bar and promote a culture of safety, transparency, and accountability, especially in aviation, and especially when lives are at risk.

Question 1. Chair Homendy, could stronger legislative protections for voluntary safety reporting help promote a stronger culture of safety across the FAA?

Answer. Yes.

Aircraft Instruments and Spectrum Interference

Aircraft instruments rely on extreme precision, making spectrum interference a serious safety risk. For example, recent counter-drone testing by the Navy and Secret Service near DCA triggered dangerous false alarms for pilots' Traffic Collision Avoidance Systems (TCAS). In Boulder, the Federal Institute for Telecommunication Science (ITS) has worked closely alongside the FAA, DOD, and other agencies to study and minimize spectrum interference to mission-critical systems.

Question 2. Chair Homendy, what specific interagency research and testing is needed to ensure mission-critical systems aren't compromised by emerging wireless technologies?

Answer. This is beyond the scope of our investigation.

Question 3. Do you believe the NTSB and FAA's safety concerns are being given enough weight by the NTIA or FCC before they auction off spectrum bands—like the "Upper C-Band"—near sensitive aircraft frequencies?

Answer. This is beyond the scope of our investigation.

Nationwide Mixed Airspace Review

Following the DCA Crash last year, the FAA confirmed to this Committee that it was conducting a nationwide review of airspace. The FAA stated it was examining airspace where commercial aviation traffic mixed with military airspace activities. The FAA's review is important to ensure any troublesome areas of mixed airspace traffic are identified and risks are mitigated.

Question 4. Chair Homendy, how would you characterize the pace and scope of the FAA's ongoing review of mixed airspace nationwide? Do you have any further recommendations or findings regarding this airspace review?

Answer. Because the FAA's review is ongoing, this question is best posed to that agency.

Runway Incursion

While air traffic controllers perform incredible work, many airports still lack the technology to prevent ground collisions. At most airports, safety relies entirely on human eyes and radio calls rather than automated tracking.

Question 5. Chair Homendy, would expanding ground-based radar and surveillance systems, including at smaller airports, provide the additional required situational awareness to help pilots avoid runway incursions?

Answer. Since 1973, the NTSB has issued numerous recommendations to the FAA regarding the problems with runway incursions/ground collisions with aircraft, including the current recommendations from multiple recent and past incidents and accidents listed below.

Recommendations from a 2017 taxiway overflight at SFO (NTSB Incident Report AIR-18-01):

- Establish a requirement for airplanes landing at primary airports within Class B and Class C airspace to be equipped with a system that alerts pilots when an airplane is not aligned with a runway surface. (A-18-25)
- Collaborate with aircraft and avionics manufacturers and software developers to develop the technology for a cockpit system that provides an alert to pilots when an airplane is not aligned with the intended runway surface, and, once such technology is available, establish a requirement for the technology to be installed on airplanes landing at primary airports within Class B and Class C airspace. (A-18-26)

Recommendations from a 2023 runway incursion and rejected takeoff at JFK (NTSB Aviation Investigation Report AIR-24-01):

- Encourage Title 14 *Code of Federal Regulations* Part 91K, 135, and 121 operators to incorporate into their standard operating procedures a procedural crosscheck that requires flight crews to verbalize the number of a runway they are about to cross, as indicated by runway signs, unless an installed automated system already provides an aural advisory. (A-24-2)
- Collaborate with aircraft and avionics manufacturers and software designers to develop the technology for a flight deck system that would provide visual and aural alerts to flight crews of traffic on a runway or taxiway and traffic on approach to land. (A-24-4; supersedes A-00-66)
- Require that the technology developed in response to Safety Recommendation A-24-4 be installed in all newly certificated transport-category airplanes. (A-24-5; supersedes A-00-66)
- Require that existing transport-category airplanes be retrofitted with the technology developed in response to Safety Recommendation A-24-4. (A-24-6; supersedes A-00-66)
- Evaluate the effectiveness of the activation logic for the runway status light system considering the circumstances of this incident. (A-24-7)
- Using the findings of the evaluation conducted in response to Safety Recommendation A-24-7, update the runway status light system activation logic as necessary to improve system effectiveness. (A-24-8)

Recommendations from a 2023 runway incursion and overflight at AUS (NTSB Aviation Investigation Report AIR-24-02)

- Require air traffic controllers to advise pilots, through direct communication and automatic terminal information system broadcasts, when visual contact with aircraft operating on taxiways and runways cannot be established or maintained and instruct pilots to provide accurate position reports to aid the controller in determining an aircraft's location in such conditions. (A-24-11)
- Amend the Aeronautical Information Manual so that it instructs pilots to inform controllers, before entering an active runway with the intent to depart, when they need time on the runway for any reason before beginning the takeoff roll. (A-24-13)
- Require all airports with a Surface Movement Guidance and Control System plan to ensure that their plans and the associated letters of agreement correspond with each other and the stakeholder duties and responsibilities described in Advisory Circular 120-57, Surface Movement Guidance and Control System. (A-24-14)

Recommendations from the DCA midair collision investigation:

- To the FAA: Develop and implement a risk assessment tool for supervisors that incorporates the principles of threat and error management to assist in risk identification, mitigation, and operational decision making. (A-26-10)
- To the FAA: Initiate rulemaking in 14 *Code of Federal Regulations* Part 93 Subpart K, High Density Traffic Airports, that prescribes air carrier operation limitations at DCA in 30-minute periods, similar to those imposed at LaGuardia Airport, to ensure that the airport does not exceed capacity and to mitigate inconsistent air carrier scheduling practices. (A-26-11)
- To the FAA: Fully implement operational use of the time-based flow management system at Potomac Consolidated Terminal Radar Approach Control and its associated air traffic control towers. (A-26-12)
- To the FAA: Reassess the Ronald Reagan Washington National Airport's airport arrival rate with special consideration to its airspace complexity, airfield limitations, mixed fleet operations, and traffic volume. (A-26-13)
- To the FAA: Require each Class B or Class C air traffic control tower facility to evaluate its existing miles-in-trail procedures or agreements to ensure that the spacing provided is appropriate for operational safety, and make the results publicly available. (A-26-14)
- To the FAA: Conduct a comprehensive evaluation, in conjunction with local operators, to determine the overall safety benefits and risks to requiring all aircraft to use the same frequency when the helicopter and local positions are combined in the Ronald Reagan Washington National Airport air traffic control tower. (A-26-18)
- To the FAA: Implement anti-blocking technology that will alert controllers and/or flight crews to potentially blocked transmissions when simultaneous broadcasting occurs. (A-26-19)
- To the FAA: Develop and implement improvements to the conflict alert system to provide more salient and meaningful alerts to controllers based on the severity of the conflict triggering the alert. (A-26-20)
- To the FAA: Once the improvements to the conflict alert system discussed in Safety Recommendation A-26-20 are implemented, provide training to controllers on its use. (A-26-21)
- To the FAA: Require all aircraft operating in airspace where Automatic Dependent Surveillance-Broadcast (ADS-B) Out is required to also be equipped with ADS B In with a cockpit display of traffic information that is configured to provide alerting audible to the pilot and/or flight crew. (A-26-31)
- To the FAA: Establish a requirement across all air traffic control tower standard operating procedures that the operations supervisor (OS) or controller-in-charge (CIC) document in the daily facility log when any control position is combined with the local control position, or when the OS/CIC position is combined with a control position, along with a rationale for doing so. (A-26-40)
- To the United States Department of War, Policy Board on Federal Aviation: Conduct a study to evaluate the quality of radio transmissions and reception for those aircraft operated within the National Airspace System to identify factors that degrade communications equipment performance and adversely affect the safety of civilian and military flight operations. (A-26-49)

- To the United States Department of War, Policy Board on Federal Aviation: Implement appropriate enhancements, based on the findings of the study recommended in Safety Recommendation A-26-49, to remediate identified deficiencies in air-ground radio communications performance. (A-26-50)

NTSB has issued the following additional recommendations to the FAA, which have been classified Closed—Acceptable Action, calling for research and development efforts to address the need for cost-effective alternatives at airports not scheduled to receive Airport Surface Detection Equipment (ASDE):

- Conduct research and development efforts to provide airports that are not scheduled to receive Airport Surface Detection Equipment with an alternate, cost-effective system to bring controller and pilot attention to pending runway incursions in time to prevent ground collisions. (A-91-30)
- Continue research and development efforts to provide airports that are not scheduled to receive Airport Surface Detection Equipment with an alternate, cost-effective system, such as the ground induction loop, to bring controller attention to pending runway incursions in time to prevent ground collisions. (A-95-94)
- Convene a joint FAA/industry task force on human performance initiatives to produce human performance-related surface operation improvements that could be readily implemented during surface operations by mitigating human error. In identifying those initiatives, consider the recommendations contained in the MITRE Corporation study, "Reports by Airline Pilot Surface Operations." (A-95-96)

Finally, the NTSB has issued the following additional recommendations to the FAA on this issue over many years that have been classified Closed—Unacceptable Action:

- Establish and publish taxi routes for arriving and departing aircraft to be used during periods of restricted visibility on the order of 1/2 mile. (A-73-25)
- Require pilots to obtain the controllers' approval before crossing alighted runway during periods of restricted visibility on the order of 1/2 mile. (A-73-26)
- Require flight crews to read back taxi clearances when operating in visibilities of less than one-half mile. (A-73-55)
- Establish on a trial basis, for the north and for the south control operations in the Chicago O'Hare international airport control tower, local control coordinator positions to monitor and supervise, directly, the local control positions; staff these positions whenever intersecting runways are in concurrent operation. (URGENT) (A-86-45)
- Amend the air traffic control handbook, 711.65f, paragraph 3-127, to preclude the issuance of multiple landing clearances to aircraft outside of the final approach fix. Also, establish a numerical limit so that no more than two landing clearance may be issued to successive arrivals. (A-91-28)
- Retain the national operational position standards as a separate, independent order and: (a) direct the FAA's human factors and air traffic service staffs adequacy of redundancies and incorporate any resultant recommendations into the national order; (b) expedite the development of chapters 5 through 10 of the national order. (A-91-107)
- Amend FAA Order 7110.65, "Air Traffic Control," paragraph 3-9-4, "Takeoff Position Hold," to discontinue the practice of allowing departing aircraft to hold on active runways at nighttime or at any time when ceiling and visibility conditions preclude arriving aircraft from seeing traffic on the runway in time to initiate a safe go-around maneuver. (A-00-69)
- Adopt the landing clearance procedure recommended by International Civil Aviation Organization Document 4444-RAC/501, "Procedures for Air Navigation Services—Rules of the Air and Air Traffic Services," Part V, "Aerodrome Control Service," Paragraph 15.2. (A-00-70)
- Require that all 14 *Code of Federal Regulations* Part 91K, 121, and 135 operators establish procedures requiring all crewmembers on the flight deck to positively confirm and cross-check the airplane's location at the assigned departure runway before crossing the hold short line for takeoff. This required guidance should be consistent with the guidance in Advisory Circular 120-74A and Safety Alert for Operators 06013 and 07003. (Supersedes Safety Recommendation A-06-83) (A-07-44)

- Require that all 14 *Code of Federal Regulations* Part 91K, 121, and 135 operators install on their aircraft cockpit moving map displays or an automatic system that alerts pilots when a takeoff is attempted on a taxiway or a runway other than the one intended. (Supersedes Safety Recommendation A-06-83) (A-07-45)
- Perform a technical review of Airport Surface Detection Equipment-Model X (ASDE-X) to determine if the capability exists systemwide to detect improper operations such as landings on taxiways. (A-11-12)
- At those installation sites where the technical review recommended in Safety Recommendation A-11-12 determines it is feasible, implement modifications to Airport Surface Detection Equipment-Model X (ASDE-X) to detect improper operations, such as landings on taxiways, and provide alerts to air traffic controllers that these potential collision risks exist. (A-11-13)

Safety Recommendations

The NTSB deserves bipartisan praise for its timely investigations and safety recommendations that can save lives. The NTSB has long called for cockpit voice recorders capable of recording 25 hours of audio to be installed in aircraft. While the FAA has recently required new aircraft to include 25-hour cockpit voice recorders, existing aircraft do not have this equipment retrofitted.

Question 6. Chair Homendy, could you underscore the importance of all aircraft having cockpit voice recorders in supporting NTSB's safety investigations? How did this data assist the NTSB in conducting the DCA investigation and providing its final recommendations?

Answer. Cockpit voice recorders (CVRs) are among the most valuable tools used for accident investigation. Information, such as flight crew verbalizations of their intentions and coordination, as well as pilots' awareness of the state of the aircraft and cockpit information, allows investigators to more comprehensively assess accident/incident factors. These factors include flight crews' procedural compliance, distraction, decision-making, workload, fatigue, and situation awareness. Ultimately, CVRs provide unique information with which the NTSB can conduct more thorough investigations to more effectively target safety recommendations.

CVRs provided critical information during the DCA midair collision investigation. For example, the CVR on PAT25 revealed that its crew did not receive salient information regarding flight 5342's circling approach to runway 33 due to degraded radio reception. Additionally, the CVR revealed that simultaneous radio transmissions blocked important information from the controller to PAT25, which reinforced the PAT25 crew's expectation bias that flight 5342 did not pose a conflict. Both findings led directly to NTSB safety recommendations.

Although the FAA's recent rulemaking did not require that existing aircraft be retrofitted with a 25-hour CVR, the FAA Reauthorization Act of 2024 requires that all aircraft operated under Part 121 and certain other aircraft be retrofitted with a CVR that retains the last 25 hours of aircraft operation by 2030.

RESPONSE TO WRITTEN QUESTIONS SUBMITTED BY HON. ANDY KIM TO
HON. JENNIFER HOMENDY

Helicopter Routes Recommendation/Low-Flying Helicopters

Question 1. One of the recommendations made during the NTSB's January 2026 Board Meeting was that annual reviews should be conducted on helicopter routes throughout the entire aviation system to ensure that our airspace is safe. In the New York City region, there are about 80,000 nonessential helicopter flights over this region every year, which is about 220 flights every day. Not only do these helicopter flights cause great disturbances for the residents of these densely populated communities, but they also pose safety risks. There are minimal guidelines for these helicopters to follow, even in densely populated residential areas. The fatal April 10, 2025 helicopter crash in the Hudson River increases concerns of future crashes over these residential areas being likely. *Has the NTSB reviewed safety concerns of low-flying helicopters and aircraft in crowded residential areas? In light of the NTSB recommendations from the DCA collision investigation, what considerations would be most critical to better regulating nonessential travel to ensure the best safety outcomes?*

Answer. All of the NTSB's open recommendations will improve aviation safety. In addition to the recommendations from the DCA investigation, the following open recommendations are directed to the FAA and involved investigations of accidents including helicopters.

- In cooperation with Hawaii commercial air tour operators, aviation psychologists, and meteorologists, among others, develop a cue-based training program for commercial air tour pilots in Hawaii that specifically addresses hazardous aspects of local weather phenomena and in-flight decision-making. (A-07-18)
- Once a cue-based training program that specifically addresses hazardous aspects of local weather phenomena and weather-related, decision-making issues is developed (as requested in Safety Recommendation A-07-18), require all commercial air tour operators in Hawaii to provide this training to newly hired pilots. (A-07-19)
- Require the installation of a crash-resistant flight recorder system on all newly manufactured turbine-powered, nonexperimental, nonrestricted-category aircraft that are not equipped with a flight data recorder and a cockpit voice recorder and are operating under 14 Code of Federal Regulations Parts 91, 121, or 135. The crash-resistant flight recorder system should record cockpit audio and images with a view of the cockpit environment to include as much of the outside view as possible, and parametric data per aircraft and system installation, all as specified in Technical Standard Order C197, "Information Collection and Monitoring Systems." (A-13-12)
- Require all existing turbine-powered, nonexperimental, nonrestricted-category aircraft that are not equipped with a flight data recorder or cockpit voice recorder and are operating under 14 Code of Federal Regulations Parts 91, 121, or 135 to be retrofitted with a crash-resistant flight recorder system. The crash-resistant flight recorder system should record cockpit audio and images with a view of the cockpit environment to include as much of the outside view as possible, and parametric data per aircraft and system installation, all as specified in Technical Standard Order C197, "Information Collection and Monitoring Systems." (A-13-13)
- Initiate an aviation weather camera program in Hawaii that includes the installation and maintenance of aviation weather cameras at critical locations in Hawaii. Establish public access to these aviation weather cameras' real-time imagery. (A-13-25)
- Install and maintain aviation weather cameras in those mountain passes in the continental United States identified in its research as being high risk. Establish public access to these aviation weather cameras' real-time imagery. (A-13-26)
- Equip flight service station specialists responsible for Hawaii and the continental United States with the technical capabilities and training to provide verbal preflight and en route briefings using aviation weather camera imagery. (A-13-27)
- TO THE FEDERAL AVIATION ADMINISTRATION AND THE EUROPEAN AVIATION SAFETY AGENCY: After the actions requested in Safety Recommendation A-17-10 are completed, require operators of Airbus Helicopters dual-hydraulic AS350-series helicopters to incorporate changes to the dual hydraulic system to both ensure pedal control hydraulic assistance and mitigate the possibility of pilot error during any check of the hydraulic system. (A-17-11)
- Modify the supplemental passenger restraint system (SPRS) approval process to (1) require letter of authorization (LOA) applicants to specify a need for and the intended use of an SPRS for each aircraft; (2) require the Federal Aviation Administration to evaluate and review, for each specified aircraft, the need for the SPRS on that aircraft for all intended uses; all SPRS design, manufacture, installation, and operational considerations, including, at a minimum, the potential for passengers to become entangled during emergency egress; the adequacy of passenger emergency egress briefings; and the potential for the SPRS to interfere with aircraft controls; and (3) ensure that each LOA lists the specific aircraft on which the holder is authorized to use an SPRS. (A-19-24)
- Review the activation system designs of Federal Aviation Administration-approved rotorcraft emergency flotation systems for deficiencies that may preclude their proper deployment, such as a lack of a means to identify high pull forces on manual activation handles or inadequate guidance on the intended use of the activation system, and require corrective actions based on the review findings. (A-19-26)
- Revise Miscellaneous Guidance 10 in Advisory Circular (AC) 27 and AC 29 to include design objectives for emergency flotation systems that consider human factors design objectives, such as activation handle pull-force characteristics; provisions for clear, unambiguous, and positive feedback to pilots to indicate

that the float system was successfully deployed; and inspections to ensure that an installation of a manual activation system does not preclude a pilot's ability to deploy the floats, as designed, after it has been fielded. (A-19-27)

- To the FAA: After the actions requested in Safety Recommendation A-19-32 are completed, require owners and operators of existing AS350-series helicopters to incorporate the changes. (A-19-33)
- Develop guidance on how to identify intoxicated or impaired passengers, and distribute it to operators who carry passengers for hire under Title 14 Code of Federal Regulations Part 91 and Part 135. (A-19-34)
- Require that principal operations inspectors (POI) assigned to helicopter air ambulance (HAA) operations possess helicopter and either HAA experience or experience as an assistant POI under a POI with HAA experience. (A-20-13)
- Require the National Weather Service (NWS) to add terminal doppler weather radar data to the HEMS Weather Tool overlay (as recommended in Safety Recommendation A-20-19 to the NWS). (A-20-16)
- Require the National Weather Service (NWS) to provide capability in the HEMS Weather Tool to graphically display areas of weather radar limitations, including areas where beams may lack low-altitude coverage, areas that lack radar coverage, and areas of beam blockages (as recommended in Safety Recommendation A-20-20 to the NWS). (A-20-17)
- Require the use of appropriate simulation devices during initial and recurrent pilot training for Title 14 Code of Federal Regulations Part 135 helicopter operations to provide scenario-based training that addresses the decision-making, skills, and procedures needed to recognize and respond to changing weather conditions in flight, identify and apply mitigation strategies for avoiding adverse weather, practice the transition to the use of flight instruments to reduce the risk of spatial disorientation, and maintain awareness of a variety of influences that can adversely affect pilot decision-making. (A-21-05)
- Install the necessary infrastructure in Hawaii to enable continuous radio communication between the pilots of low-flying tour flights and ground support personnel, such as flight service station specialists and company flight support personnel, along the most heavily trafficked air tour routes. (A-22-11)
- Implement automatic dependent surveillance-broadcast (ADS-B) infrastructure improvements in Hawaii, such as additional ADS-B ground stations, that provide adequate coverage to enable real-time flight tracking and traffic advisory services for ADS-B Out-and In-equipped, low-flying air tour aircraft throughout their entire tour routes. (A-22-12)
- As an interim measure until completion of the action to satisfy Safety Recommendation A-21-15, require Hawaii air tour operators to install Automatic Dependent Surveillance-Broadcast Out (ADS-B) equipment in their aircraft to enable real-time flight position tracking. (A-22-13)
- Require air tour operators to have flight support personnel who are trained to exercise operational control authority, participate in preflight risk analysis, provide pilots with weather briefings, monitor the progress of the flights, and participate in two-way communications with pilots to alert them of any weather hazards. (A-22-14)
- Issue a safety alert for operators to encourage air tour operators to establish safety assurance processes to routinely review recorded onboard videos and automatic dependent surveillance-broadcast (ADS-B) flight tracking data, ideally as part of a safety management system with an integrated flight data monitoring program, for the purpose of identifying and addressing risky trends in weather-related operating practices, such as encounters or near encounters with instrument meteorological conditions-related hazards. (A-22-16)
- Improve the surveillance of air tour operations in Hawaii through the use of technologies and innovative approaches, including but not limited to comparing automatic dependent surveillance-broadcast (ADS-B) flight position data from air tour flights with weather camera imagery for the route and periodically reviewing onboard video recordings, to detect and correct operating practices that may lead to unacceptable weather-related risky behavior. (A-22-17)
- Issue and periodically update a special airworthiness information bulletin that lists newly manufactured helicopters that are equipped with features likely to reduce accidents resulting from inadvertent encounters with instrument meteorological conditions, describes retrofit options for helicopters that do not have such equipment, and encourages the voluntary integration of these safety features. (A-22-18)

- Require operators of Bell 407 helicopters to conduct subsequent torque checks of the tail boom attachment hardware and visual inspection of the tail boom attachment fittings as referenced in Safety Recommendation A-22-28 at an interval significantly less than the currently required interval to provide multiple opportunities for detecting any improperly installed or fractured attachment hardware or fittings. Require operators to report findings to the FAA. (Urgent) (A-22-29)
- Review all experimental exhibition airworthiness certificates issued to turbine-powered rotorcraft and ensure that their operating limitations meet the standards of the latest iteration of Federal Aviation Administration Order 8130.2, Airworthiness Certification of Aircraft. (A-24-20)
- Establish periodic reviews for experimental exhibition airworthiness certificates to ensure that those aircraft are being inspected and maintained according to the latest iteration of Federal Aviation Administration Order 8130.2, Airworthiness Certification of Aircraft. (A-24-21)
- Require operators of aircraft equipped with Ozark Aeroworks T53 series engines to perform recurrent inspections of the rear bearing cover and the exhaust diffuser inner cone and inner struts with the exhaust diffuser cover removed. (A-24-22)
- Remind operators of experimental exhibition aircraft about the requirement to submit, to the appropriate flight standards district office, program letters that list all events at which the aircraft will be exhibited. (A-24-23)
- Develop a method for ensuring that operators of experimental exhibition aircraft meet their annual obligation to submit program letters; such a method could include potential penalties for operators that do not meet this obligation. (A-24-24)
- Revise Federal Aviation Administration Order 8900.1, Flight Standards Information Management System, to include inspector guidance requiring routine surveillance of operators of aircraft with experimental exhibition airworthiness certificates. (A-24-25)

