STATEMENT OF SHELLEY J. YAK
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FEDERAL AVIATION ADMINISTRATION
BEFORE THE UNITED STATES HOUSE OF REPRESENTATIVES
COMMITTEE ON SCIENCE, SPACE, AND TECHNOLOGY
SUBCOMMITTEE ON SPACE AND AERONAUTICS
FAA RESEARCH AND DEVELOPMENT
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Chairman Babin, Ranking Member Sorensen, and members of the subcommittee:

Thank you for the opportunity to appear before you today to discuss the Federal Aviation Administration's (FAA) Research and Development portfolio. My name is Shelley Yak, and I am the Director of the William J. Hughes Technical Center and represent the FAA as its Director of Research.

From 1958 to the present day, many of the concepts, technologies, and systems in the National Airspace System (NAS) were researched, developed, tested, and began their nationwide deployment at the Technical Center and its sister center, the Mike Monroney Aeronautical Center where the Civil Aerospace Medical Institute (CAMI) is located.

Through our federal laboratories, our workforce, and partnerships with industry, academia, and other government agencies, the two Centers are able to turn ideas into value and problems into solutions. The work we do ensures that the United States continues to lead the world in embracing, implementing, and integrating new technologies in support of the aviation ecosystem. Entrepreneurs around the world are exploring innovative ways to use aviation in their commercial activities, and the need for us to integrate these new technologies into the NAS continues to be a national priority.

The research, development, test, and evaluation work of the FAA is best summarized through six domain areas, which I wish to briefly share with you today. To do so, let us go on an imaginary flight together.

We start our trip, of course, at the airport in the **Airport Technologies and Infrastructure domain.** This domain is comprised of research areas that include airport planning and design, airport pavement, airport data mining to prevent or mitigate safety incidents, aircraft rescue and firefighting, wildlife hazard abatement, visual guidance research including airfield marking, lighting and signage, and runway surface technology research. Airport pavement research includes evaluating various innovative pavement materials and assessing their projected life cycle for our runways and taxiways—the largest capital expense of an airport. Airport research also includes surveillance sensors and emerging entrant research. Our current emerging entrant research includes vertiport design research to accommodate powered lift aircraft. Our drone research includes assessing technologies for drone detection and mitigation at airports, as well as assessing the use of drones in the airport environment for such things as pavement inspection and management of wildlife near runways. We are also actively conducting research related to climate change risks and adaptation in order to address airport resiliency and sustainability. This domain also includes the testing we conduct on the performance of airport fire extinguishing agents to replace firefighting foams that contain polyfluoroalkyl substances (PFAS).

We then board the aircraft– this is the **Aircraft Safety Assurance domain**. Our work here has everything to do with the aircraft—including its skin, which may be made of composites and new materials, the propulsion and fuel systems, items carried aboard the aircraft, such as lithium batteries and devices powered by them, and fire protection and detection in the aircraft.

One of our current projects is developing an alternative to Halon as a fire suppression agent for use aboard aircraft.

Still on the aircraft, we begin settling in, and that means interacting with the entertainment system in front of us while our flight crew interacts with their **Digital Systems & Technologies domain**. This includes everything electronic on the plane and across the NAS—including entertainment and aircraft systems, electronic flight bags used on the flight deck, and cybersecurity. One example of cyber research includes using artificial intelligence and machine learning to establish cybersecurity tools that enable proactive monitoring of systems used to manage the national airspace to prevent, detect, and mitigate the effects of cyberattacks.

Well, it looks like we are waiting to take off. The number one cause of delays is weather and weather mitigation is a part of the **Environment and Weather Mitigation domain.** In this domain, we perform research on everything that affects aviation or is affected by aviation, such as improving the accuracy of weather forecasts. Better forecasts can help reduce delays, increase passenger safety and comfort, and keep the NAS running more efficiently. Other efforts in this domain include aircraft deicing and anti-icing methods prior to takeoff, aerodynamic and operational effects of inflight icing on all types of aircraft, and finding ways to reduce the effects of noise and emissions on our communities and the natural environment. We have several efforts on this front. This includes our Continuous Lower Energy Emissions and Noise Program, a public private partnership with industry to accelerate the development of certifiable aircraft and engine technologies that reduce noise, emissions, and fuel use. It also includes a comprehensive program to support the development of sustainable aviation fuels through our Aviation Sustainability Center, or ASCENT, and the Commercial Aviation Alternative Fuels Initiative.

We are also working with industry to eliminate aviation gasoline lead emissions from general aviation.

As we are waiting for takeoff, let us not forget the people we depend upon during our flight. Our **Human and Aeromedical Factors domain** supports our pilots, technicians, and air traffic controllers and is where we look at ways to improve human performance. The research, development, and testing conducted here is on how people best interface with the systems they use and on developing training requirements. The Civil Aerospace Medical Institute is the location for all of our aeromedical research, which focuses on safety sensitive personnel and airline passenger health, safety, and performance ability in current and forecasted future civilian aerospace operations. CAMI's Aerospace Human Factors Research Division also conducts field and laboratory research supporting the performance of front-line aviation personnel, including pilots, air traffic controllers, aviation maintainers, dispatchers, avionics (technical operations) technicians, flight attendants, and ramp workers, with the goal of improving operational efficiency and safety.

We finally take off, and you know your pilot and air traffic controllers are well-trained and checked out. This last domain, to the passenger, is behind the scenes. However, it is the most important domain for getting us to our destination, the **Aerospace Performance and Planning domain**. This domain includes the air traffic management of our flight and the tools/systems we use to ensure we arrive safely. It includes the safety management systems we have in place and the airspace integration work we are doing on growing operations such as commercial space transportation, unmanned aircraft systems, and advanced air mobility.

Our flight proceeds, and we even make up the time we lost waiting on bad weather due to the tools and forecasting systems we talked about in two of our domains. We land safely at our

destination airport—a smart airport that uses technology to manage and plan operations in a digital environment. It is the airport we are envisioning and researching for our future.

Throughout our history, the FAA has adapted to changes in technology and has successfully integrated new operators and equipment into the NAS. We are well-positioned to maintain our global leader status. We are committed to working with Congress and all of our stakeholders to find solutions that balance safety and security with innovation and deliver on our mission to provide the safest, most efficient aerospace system in the world. This concludes my statement. I will be happy to answer your questions at this time.

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