U.S. Senate
Committee on Commerce, Science, and Transportation

"New Entrants in the National Airspace: Policy, Technology, and Security Issues for Congress"

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Good morning Chairman Wicker, Ranking Member Cantwell, and members of the Committee. Airbus is honored to participate in today's important hearing on new entrants in the aerospace market and we appreciate your interest in the future of our industry. We look forward to sharing Airbus' vision for Urban Air Mobility (UAM) and providing a brief overview of our efforts to safely integrate new aircraft into the National Airspace System (NAS).

My name is Zach Lovering and I'm a senior member of Airbus' global UAM team based here in the United States. I joined Airbus three years ago as a Chief Engineer and and then Project Executive leading the development of Vahana, a self-piloted electric vertical take-off and landing (eVTOL) demonstrator aircraft. In my current role as Vice President, UAM Systems, I lead the teams that are integrating all the individual systems, like air traffic management, vehicles, and infrastructure, into a single mobility framework, to ensure our UAM vision fully lives up to its promise.

About Airbus

Airbus is a pioneer in the global aerospace industry and has a major presence in the United States. We design, manufacture, and deliver industry-leading commercial aircraft, helicopters, military transports, urban mobility systems, unmanned aircraft systems (UAS), satellites and launch vehicles, as well as provide data services, navigation services, secure communications, and other solutions for customers on a global scale.

More than 50 years ago, Airbus opened its first production line in Grand Prairie, TX and today operates three other major production facilities in Mobile, Alabama; Columbus, Mississippi; and Exploration Park, Florida. Airbus spends approximately $15 billion each year with U.S.-based suppliers in over 40 states, supporting more than 275,000 U.S.-based jobs. Over the next 12 months, Airbus plans to add 1,000 new jobs and invest approximately $500 million in new facilities.

Airbus UAM

In addition to our growing business in the U.S., Airbus' teams in California, New York, Oregon, and Washington D.C. are working to build sustainable and safe UAM solutions to transform our local communities for the better. In June 2018, Airbus created a Unit to lead its global UAM activities across the company. Airbus Urban Mobility is focused on on-demand mobility, unmanned traffic management, infrastructure and community integration, industry partnerships, and government regulations. The Unit also steers the development of Airbus' ongoing eVTOL technology demonstrators Vahana, a small tilt-wing self-piloted eVTOL, and CityAirbus, a multi-passenger self-piloted eVTOL.

By 2030, over 60 percent of the world's population will live in urban areas and we believe our UAM solutions can help cities cope with this massive population growth and better connect our urban, suburban and rural communities. For Airbus, UAM is not just about developing new vertical take-off and landing vehicles. In some ways, that's the achievable part for a company like Airbus with deep experience designing, manufacturing, and certifying aircraft. The real challenge is safely and securely integrating this new class of vehicles in the urban environment with public and regulatory acceptance.

By pushing the limits of technology in the fields of connectivity, artificial intelligence, autonomous systems, and electric propulsion, our aim is to create a seamless multi-modal air and ground transport network for cities. Emerging technology such as digital design and manufacturing, automated composite production, and 3D printing, will allow us to build and test UAM vehicles efficiently and affordably. Advanced avionics and new approaches to air traffic management are maturing and will be used to further safety and efficiency for unmanned airspace operations in the NAS. Citizens today are increasingly connected and welcome on-demand services to better navigate congested cities. This on-demand and sharing economy is encouraging us to explore business models to realize the future potential of UAM today.

The challenge of making UAM a reality is bigger than any one company. And ensuring this industry lives up to its promise will require the collaboration of stakeholders inside and outside of the aerospace community.

Over the last few years, Airbus has made steady progress on our efforts to reimagine how aviation safely integrates into the NAS. To date, Airbus Urban Mobility is focused on demonstrating safe UAM vehicles, building unmanned traffic management (UTM) solutions and services, enabling city integration through infrastructure design, exploring tomorrow's UAM passenger experience today, and responding to critical policy and regulatory gaps with solutions. Some recent milestones include:

- **Demonstrating Safe UAM Vehicles:** Since January 2018, Vahana has been flying a full-scale demonstrator at the Pendleton UAS Test Range in Eastern Oregon. After nearly 60 full scale flights and over 1000 subscale flights, it has recently proven its capability to take off vertically and then transition to full-

wingborne flight, marking the completion of its nominal flight test program. In addition, CityAirbus has recently completed its first full-scale tethered hovering flight.

- **Building UTM Solutions & Services:** Airbus continues to directly support and build UAS integration solutions with regulators around the world. Recently, Airbus was approved as a Federal Aviation Administration (FAA) Low Altitude Authorization and Notification Capability (LAANC) service supplier providing automated flight authorizations to operators near airports.

- **Exploring Tomorrow's UAM Passenger Experience Today:** Airbus' UAM on-demand helicopter booking platform called Voom is busy enhancing current UAM Operations in both Brazil and Mexico and is actively pursuing a launch in the U.S. market this year. To date, the Voom booking platform has enabled thousands of passengers to request a seat on a helicopter within minutes.

- **Responding to Critical Policy & Regulatory Gaps with Solutions:** Airbus UAM is actively working with industry to set performance-based standards for future UAM operations, and collaborating with governments on rulemaking efforts to identify solutions for airspace access, detect and avoid technology, spectrum and communications, and more.

Airbus UAM Value Chain

Airbus is exploring a portfolio of safe and secure products and services, because we believe that UAM is about more than just the vehicle. This Airbus UAM value chain includes, but is not limited to, vehicle development, UTM solutions and services, community integration and infrastructure, and passenger experience.

Demonstrating Safe UAM Vehicles — CityAirbus & Vahana

Vahana is a demonstrator focused on advancing self-piloted, eVTOL flight. We envision Vahana being used by travelers and everyday commuters as a cost-comparable replacement for short-range city transportation methods like cars or trains. It uses eight electric motors and a tilt-wing configuration to enable both hover and cross-city range on battery power alone. A core premise of this demonstrator is that self-piloted operations will allow us to achieve higher safety and will also allow more vehicles to share the sky. Vahana follows predetermined flight paths with only minor deviations if obstacle avoidance is needed. Also, this vehicle could be used to transport heavy cargo, as a medevac service, or even to deploy emergency operations centers at disaster sites.

On January 31, 2018 Vahana successfully completed its first full-scale flight test, reaching a height of 16 feet (5 meters) before descending safely. Since then, we've completed nearly 60 successful test flights at the Pendleton UAS Test Range that include all flight tests associated with the mission we intended to perform at the outset

of the project. Additional tests are being conducted as we speak to study maneuvering capabilities, noise, and the self-piloted hazard detection features. The ability to test here in the U.S. is critical to maturing the vehicle and we applaud Congress for their continued focus on UAS research and test sites.

In addition to Vahana, Airbus has another demonstrator called CityAirbus. CityAirbus, is a self-piloted eVTOL designed to carry up to four passengers over cities in a fast, affordable, and environmentally friendly way. CityAirbus will transport passengers on fixed routes from hub to hub (e.g. city to airport or vice versa). In May 2019, the team completed their first tethered hovering flight.

Building UTM Solutions & Services

The aerospace industry is moving quickly to innovate with new aircraft types, sizes, and flight capabilities. In 2017, the number of registered UAS in the U.S., including both commercial and consumer, eclipsed one million -- more than double the number of general aviation aircraft in the U.S. To support this growth, a more modernized and scalable solution to airspace management is needed.

Through research, simulations, and industry collaboration, Airbus is building digital air traffic management solutions to enable the next age of aviation. Under the umbrella of Airbus Urban Mobility, our UTM team is designing, developing, and building the solutions necessary to allow these new aircraft, including new UAM vehicles, to safely integrate into the NAS. Airbus' UTM solutions are already beginning to integrate with today's Air Traffic Management (ATM) through efforts like the FAA LAANC program to help UTM service providers such as Airbus provide FAA authorizations for flights near airports. Our UTM solutions are also being used to enable beyond visual line of sight operations and advanced use cases like package delivery.

In September 2018, Airbus released "Blueprint for the Sky", a roadmap for the safe and efficient integration of UAS and other self-piloted aircraft into our airspace. The document outlines policies that can help government regulate new operations and ensure that air transport remains as safe tomorrow as it is today. The Blueprint was reviewed by leading industry experts from the Massachusetts Institute of Technology, the National Air Traffic Controllers Association, Stanford University, the World Economic Forum and more.

Enabling Community Integration through Infrastructure Design

The Airbus Urban Mobility Unit is also actively exploring mobility solutions to enhance a city's existing network for the benefit of its citizens and determining what additional infrastructure, like takeoff and landing areas (e.g. vertiports), would be required. By using city-level data and powerful modelling tools, Airbus can simulate mobility patterns of people and design convenient, sustainable systems that could seamlessly integrate into an existing city infrastructure. To help government and industry partners better integrate future mobility services and address energy consumption demands, the Airbus

Urban Mobility team is also working to streamline the exchange of mobility data and strengthen the digital infrastructure in our increasingly connected cities.

Exploring Tomorrow's UAM Passenger Experience Today

Through its in-market booking platform Voom, Airbus provides an on-demand helicopter mobility service that allows passengers to request a seat on a certified helicopter within minutes. Voom has provided thousands of passengers the opportunity to fly efficiently in congested cities and is laying the groundwork for Airbus' longer-term vision of UAM using eVTOL vehicles supported by the necessary infrastructure. Voom has proven to be a fantastic mechanism to glean key insights into the potential of the on-demand air mobility market and passenger preferences, and Airbus Urban Mobility is collecting those insights to advance vehicle development.

Voom currently offers its services in Sao Paulo and Mexico City, and is exploring expansion in the U.S. soon. By providing a more efficient transportation option to daily commuters, Voom aims to address mobility challenges in some of the world's most congested cities.

For the foreseeable future, the cost of helicopter travel can be better optimized. This is why we are exploring other types of UAM vehicles and operations to lower costs and enable future city dwellers the ability to affordably take advantage of UAM. Over time competition and will lower costs and allow UAM to evolve into a broad solution for a diverse set of passengers.

Responding to Critical Policy & Regulatory Gaps with Solutions

As we explore the full value chain to build UAM solutions and services, we are leaning into the many policy and regulatory areas this innovation can impact. Our team is actively working on solutions across a plethora of policy areas including but not limited to certification, safety & security and public acceptance.

- Certification: Promulgated in 2016, the "Revision of Airworthiness Standards for Normal, Utility, Acrobatic, and Commuter Category Airplanes" (or Part 23) is a key enabler and viable pathway to certifying UAM aircraft in the U.S. The revision "provides greater flexibility to applicants seeking certification of their airplane designs, and facilitates faster adoption of safety enhancing technology in type-certificated products while reducing regulatory time and cost burdens for the aviation industry and FAA"[1].

- Safety & Security: Airbus' dedication to safety is reflected across the company's operations to build UAM solutions to connect our urban, suburban and rural communities. Our approach to UAM Security is directly inherited from the company's experience in managing security for large aircraft and helicopters. Our approach is risk based, holistic and will extend through the lifecycle of our UAM

[1] 81 FR 96657.

products including supply-chain and manufacturing.

- Public Acceptance: Buy-in from regulators and local communities is critical to scaling UAM and advancing UAS operations. Airbus is a proud participant of the FAA's Integrated Pilot Program (IPP) with North Dakota and Virginia, and leader of the UAM Initiative of the European Innovation Partnership on Smart Cities and Communities. These community-centric and citizen-driven initiatives help governments and the private sector better address local concerns well in advance of scaled operations.

Conclusion

At Airbus, we're committed to transforming our cities and towns by developing UAM solutions that offer a sustainable complement to ground transportation. We believe our work is meaningful only if it improves our cities and the way we live. Our solutions are focused on helping people save time, on better connecting cities and regions, and on reducing emissions.

Thank you again for inviting me to be part of today's hearing on behalf of Airbus. I look forward to answering the Committee's questions.