National Aeronautics and
Space Administration

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March 29, 2023

Committee on Commerce, Science,
and Transportation

United States Senate

Statement by:

Mr. Robert Pearce, Associate Administrator, NASA Aeronautics Research Mission Directorate

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Chair Cantwell, Ranking Member Cruz, and distinguished members of the Committee, I want to thank you for the opportunity to appear here today and discuss NASA aeronautics and how it will help usher in the next generation of aviation innovation and competitiveness in the United States.

NASA's Aeronautics programs focus on research, development, and testing of aviation technology advancements that will benefit humankind and retain U.S. leadership in a vital manufacturing and transportation sector. The President's Fiscal Year 2024 budget request proposes $996 million for NASA Aeronautics efforts that will transform aviation in four key areas: ultra-efficient aircraft, high-speed commercial flight, advanced air mobility, and a safe national airspace system made more sustainable through collaborative digital technologies.

The history of modern aviation is one of continuously reducing fuel burn, noise, and emissions, while improving safety. NASA’s Sustainable Flight National Partnership, a cost-sharing industry partnership, aims to continue this trend by making a large leap in reducing fuel burn and enabling U.S. industry competitiveness. Coupled with Sustainable Aviation Fuels and improved operations, NASA research will help the aviation sector to meet its goal of net-zero greenhouse gas emissions.

NASA's Sustainable Flight National Partnership seeks to achieve critical milestones that accelerate U.S. progress toward net-zero greenhouse gas emissions by 2050, such as:

- 2025: First flight tests, by industry partners, of megawatt-class electrified powertrain systems and components to reduce fuel burn by up to 5 percent.

- 2027: Demonstration, with industry partners, of a full-scale fuselage section and/or wing section made from lightweight composites at an economical production rate four to six times faster than today's rate.
- 2027: Ground tests of advanced small core gas turbine engines that achieve a 5 to 10 percent fuel burn reduction compared to current best-in-class engines.
- Through 2027: Field demonstrations with the Federal Aviation Administration (FAA), airline, and airport partners of digital departure and oceanic airborne rerouting tools that reduce delays, fuel burn, and emissions.
- 2028: Flight tests of the Sustainable Flight Demonstrator, a large-scale aircraft with a transonic truss-braced wing configuration that can reduce fuel burn by up to 10 percent. When combined with additional technologies, the ultra-efficient design could reduce fuel burn up to 30 percent compared to today's best in class aircraft.

We are demonstrating these initiatives at a sufficiently high technology readiness level in the late 2020s so that industry can take the next steps to bring them to commercial application in the mid-2030s. Concurrently, we are leveraging our highly successful University Leadership Initiative to explore concepts for aircraft that can achieve zero emissions overall for mid-century application. Later this year we will solicit ideas from industry to inform which technology advancements we will pursue for the next generation of aircraft.

NASA is enabling more rapid global connections through high-speed commercial flight. We are removing barriers to commercial supersonic flight over land by proving that we can reduce the enroute noise associated with supersonic flight to acceptable levels, tackling the next challenges in local noise and emissions, and investigating the potential of even higher speed flight. This year marks the first flights of NASA's X-59 quiet supersonic technologies aircraft. This program will allow U.S. industry to lead the development of a new commercial supersonic market. NASA has developed guidelines for supersonic vehicle design that, when followed, significantly reduce the annoyance factors associated with supersonic flight. NASA will complete flight acoustics testing of the X-59 quiet supersonic technologies aircraft, and then fly it over a diverse set of communities, collecting noise and community response data, and provide the data to U.S. and international regulators. This data

will be used by the domestic and global regulatory communities to reassess the current prohibition on commercial supersonic flight over land.

NASA is enabling a transformation in how people and goods move around communities and regions through research and demonstration of Advanced Air Mobility (AAM) concepts and technologies. With more than 80 industry partners, and close engagement with the FAA, NASA is exploring new vehicles and vehicle operations, airspace design and operations, and community integration solutions to enable a sustainable advanced air mobility system that supports U.S. economic growth and benefits the public through missions including cargo/medical deliveries, disaster response, and on-demand passenger service. NASA is broadly sharing knowledge gained through development and testing of the all-electric X-57 Maxwell aircraft to inform standards and regulations for small electric aircraft that will be common in the AAM environment.

We have an opportunity to apply Unmanned Aircraft Systems (UAS) and AAM technology to a current critical challenge – wildland fires. Through workshops and studies, we have identified opportunities to apply existing NASA technology in and near flight restricted areas during active wildland fires to enhance safety, enable expanded operations, and improve communication. We successfully demonstrated initial capabilities in active wildland fire management operations with the United States Forest Service and CAL FIRE, and we continue to explore how to further the use of these technologies during firefighting training sessions. NASA is also working with other government agencies to create an interagency concept of operations to describe how advances in Unmanned Aircraft Systems Traffic Management (UTM), AAM, remote sensing, satellite, and other technologies could be leveraged for wildland fire management.

NASA is transforming the efficiency and safety of the entire global aviation system through future airspace tools and system design that supports traditional operators as well as new market entrants. NASA is partnering with the FAA and the aviation community to build a vision for a “Sky for All” -- a mid-21st century airspace that is highly automated, safe, scalable, and accommodating to an increasingly diverse fleet of air vehicles.

To continue this transformation of aviation over the years to come, NASA looks to cultivate the future generation of explorers and innovators. We are expanding partnerships with universities to leverage their insights and capabilities while training and inspiring a strong, diverse future aerospace workforce. We have just announced the sixth round of awards through our University Leadership Initiative (ULI), in which we challenge universities to partner across academia and industry to provide their solutions to aviation's toughest challenges, with special focus on building capacities among underrepresented students and organizations. Through ULI grants and student research challenges we have directly engaged 95 universities in NASA's aeronautics research mission. NASA conducts foundational research on cross-cutting ideas and technologies, models, and engineering tools critical to innovation, while developing the next generation of scientists, researchers, and engineers. The resulting capabilities are critical enablers for these transformations in aviation and the broader aerospace community.

NASA is also conducting fundamental research on reducing the barriers to reusable hypersonic systems (speed of greater than Mach 5). This fundamental research will enable a broad spectrum of hypersonic systems and missions by advancing the core capabilities and critical technologies for hypersonic flight. The resulting technology advancements will be a benefit to national hypersonic programs both within NASA and in collaboration with the Department of Defense. We are working with a variety of government and industry partners to understand the challenges and evaluate the viability of a commercial high-speed market from supersonic through hypersonic speed regimes.

NASA sets the vision of what is possible based on deep insight into the goals and needs of the aviation community and engages with U.S. industry early in the technology development cycle. We invest in aeronautics research to address the most critical challenges and collaborate with our partners to develop and demonstrate the most promising technologies. We then share the results of our research with the broader community to support further development and commercialization.

NASA works closely with the FAA to align our research to their long-term needs so the results can be transitioned to the FAA to support certification or implementation. Data from the results of our research is used to develop

standards and regulations by rulemaking committees and domestic and international standards bodies. Collaboration with other federal agencies, such as Departments of Defense, Energy, and Transportation, enables us to leverage complementary research to the greatest benefit to taxpayers and the aerospace industry.

These collaborations with industry, academia, and other federal agencies translate directly into economic strength and high-skilled, high paying jobs. Innovation is the foundation of an aviation sector that annually generates more than $1.9 trillion of total U.S. economic activity[1] and contributes a positive trade balance totaling nearly $41 billion[2].

In summary, NASA's work in aeronautics is critical to meeting the Nation's and aviation industry's goal of net zero greenhouse emissions in the aviation industry by 2050 by accelerating research and development of aircraft technologies that are more efficient and quieter without compromising safety. Achieving this goal is also critical to the competitiveness of the U.S. aviation industry. Our vision and partnerships don't stop there. Through ambitious experimental programs, including the X-57 electric aircraft, X-59 low boom supersonic aircraft, and the Sustainable Flight Demonstrator, NASA is poised to revolutionize the future of air travel.

Thank you once again for allowing me to address you today. I would also like to thank this Committee for your continued support of NASA's aeronautics research, and I look forward to answering your questions.

[1] Federal Aviation Administration. "The Economic Impact U.S. Civil Aviation: 2020". https://www.faa.gov/sites/faa.gov/files/2022-08/2022-APL-038%202022_economic%20impact_report.pdf. Released August 2022

[2] "Leading Indicators for the U.S. Aerospace Industry," International Trade Administration, March 2019