STATEMENT OF MICHAEL G. WHITAKER, DEPUTY ADMINISTRATOR, FEDERAL AVIATION ADMINISTRATION AND DENNIS FILLER, DIRECTOR, WILLIAM J. HUGHES TECHNICAL CENTER, BEFORE THE U.S. HOUSE OF REPRESENTATIVES COMMITTEE ON TRANSPORTATION AND INFRASTRUCTURE, SUBCOMMITTEE ON AVIATION, MARCH 11, 2014.

Chairman LoBiondo, Congressman Larsen, Members of the Subcommittee:

Thank you for the opportunity to testify today about the Next Generation Air Transportation System (NextGen), Unmanned Aircraft Systems (UAS), and the valuable assets of the Federal Aviation Administration (FAA) William J. Hughes Technical Center.

NextGen

NextGen is a significant undertaking for the United States. It is one of the largest aviation infrastructure projects in history and it is crucial to our nation's aviation system and success in the global economy. We have already made tremendous strides in delivering NextGen and we must continue to move forward with its deployment. We are nearing completion of NextGen's foundational programs that are necessary for us to implement NextGen capabilities.

Our initial focus has been on an advancement of the basic infrastructure that runs our airspace – moving us from a ground-based radar system to a satellite-based system. This has included an upgrade of the basic hardware and software systems that allow us to control the airspace. We are in the final stages of upgrading the 1980s-era computer system that has been running our nation's high altitude airspace system with much more sophisticated equipment. This program – En Route Automation Modernization, or ERAM – will provide benefits for users and the flying public by increasing capacity and efficiency, as well as allowing us to add new capabilities into

the airspace system. We have made significant progress on ERAM and continue to move ahead with upgrading our en-route centers.

We have also made progress upgrading the aging computer systems that run our nation's approach radar airspace. This program, Terminal Automation Modernization and Replacement, or TAMR, will increase efficiency by combining and upgrading several air traffic control technologies into a single system. This is a massive project that requires switching out the computer processors, screens and software, and re-training controllers in more than 150 TRACONS—all without disrupting service. The large TRACON segment, which is a substantial part of the TAMR program, will be largely complete in 2016.

We have already completed the upgrade of our oceanic centers in New York, California and Alaska – with the program known as Advanced Technologies and Oceanic Procedures, or ATOP. This technology allows us to benefit from the efficiency of NextGen in controlling air traffic in 24 million square miles of oceanic airspace.

And, finally, we have installed more than 90 percent of the ground transceivers needed across the country to enable Automatic Dependent Surveillance-Broadcast. ADS-B will transmit aircraft location to controllers and other ADS-B equipped aircraft with a dramatically faster update than radar – in essence, taking us from two-Dimensional to three-dimensional awareness of aircraft location. This added awareness enhances safety and saves operators and passengers time, fuel and money. Ground station installations will be completed later this year.

All of this software, hardware, and equipment form the foundation of NextGen. In addition to building this new foundational infrastructure, we are building new procedures that allow users to take advantage of new technologies. These procedures allow the FAA to guide and track aircraft more precisely on more direct routes, which cuts flight miles and reduces fuel burn, making air travel more convenient, predictable, and environmentally friendly, while providing additional capacity for air traffic.

Performance-Based Navigation (PBN) uses the precision of GPS to create more efficient approaches into and out of major airports. New descent procedures allow aircraft to reduce engine power and virtually glide down to the runway. This leads to reduced fuel burn, which reduces the carbon footprint of large air carriers, as well as reduced noise. New approaches at Phoenix Sky Harbor International Airport are saving more than $6.4 million per year. In Seattle, as part of the FAA's Greener Skies Initiative, airlines are using NextGen precision routing to shave four to six minutes off flight times, providing an annual projected savings of more than $13 million. In Atlanta, the precision of NextGen performance-based navigation means we can safely allow jets to take off on headings that are slightly closer together. This small but important change has resulted in a 10 percent increase in departures per hour from the world's busiest airport, saving valuable time and increasing system capacity. We expect these improvements to save more than $20 million annually in Atlanta alone. We intend to bring this efficiency to other major airports across the country as we continue to implement NextGen capabilities.

One of the most exciting new capabilities we have underway is Data Communications (Data Comm). Data Comm allows us to communicate through digital written instructions to pilots, which reduces the possibility of error with radio communications. More importantly, Data

Comm allows us to communicate highly complex clearances that are difficult to convey over the radio – instructions that can be automatically loaded into the aircraft's flight management system. This will ultimately save operators and passengers time and money, and will vastly improve the flexibility and efficiency of our operations.

While we are already seeing the benefits of NextGen capabilities, there is much more to come.

Unmanned Aircraft Systems (UAS)

The FAA has successfully brought new technology into the nation's aviation system for more than 50 years, while maintaining the safest aviation system in the world. Unmanned Aircraft Systems (UAS) are the latest aircraft technology to be developed and integrated into the National Airspace System (NAS). Our goal is to safely and efficiently incorporate UAS into the NAS. The announcements of the UAS Roadmap, the Comprehensive Plan, and UAS test site selections are all concrete steps in support of that goal.

For the last two decades, the FAA has authorized the limited use of unmanned aircraft for important missions in the public interest. These include firefighting, disaster relief, search and rescue, law enforcement, border security, military training, and testing and evaluation. About 36 law enforcement agencies now operate unmanned aircraft under certificates of authorization. Universities also use unmanned aircraft for research into weather, agriculture, and industrial uses. The FAA estimates that we can expect 7,500 small unmanned aircraft in the NAS over the next five years. That will include a large number of commercial UAS.

In December 2013, the FAA announced the selection of six UAS test site operators. The FAA made a concerted effort to pick sites that reflected both geographic and climatic diversity. We also took into consideration the location of ground infrastructure. We looked at the type of research that would be conducted at each site and the aviation experience of the applicants, as well as the type and volume of aircraft that fly near the sites. Our research goals are focused on (1) gathering system safety data, (2) aircraft certification, (3) command and control link issues, (4) control station layout and certification criteria, (5) ground and airborne detect and avoid capabilities, and (6) impacts on affected populations and the environment.[1]

The FAA's long term goal of UAS integration will utilize the test sites to help answer key questions and provide some solutions to the issues noted above, as well as how UAS will interface with the air traffic control system. This information will help the FAA to develop regulations and operational procedures for future civil commercial use of UAS in the NAS.

Data from the test sites in these areas will help identify elements of the certification and navigation requirements we will need to establish for unmanned aircraft. And a significant portion of analyzing this data will take place at the Technical Center in Atlantic City. To date, the Technical Center has been involved with the test sites and UAS integration efforts in a variety of ways, including:

- Providing program management and research evaluation personnel for the site selection process;
- Managing the agreements with each of the test site operators;

[1] The six UAS test sites selected are: the University of Alaska, the State of Nevada, New York's Griffiss International Airport, the North Dakota Department of Commerce, Texas A&M University – Corpus Christi, and Virginia Polytechnic Institute and State University (Virginia Tech).

- Administering the partnership the Agency has with New Mexico State University for a UAS Flight Test Center;
- And conducting various UAS Research & Development activities utilizing labs and personnel located at the Technical Center.

Once the test sites are operational, the Technical Center will continue to collaborate with the sites, and that collaboration will evolve based on the research activities being conducted.

NextGen is Key to the Safe and Efficient Integration of UAS into the NAS

The safe integration of UAS in the NAS will be facilitated by new technologies being deployed as part of NextGen. NAS Voice System (NVS), Data Communications (Data Comm) and System Wide Information Management (SWIM) will provide more information, flexibility, situational awareness and a greater ability to communicate. These features are necessary to enable safe and efficient integration of UAS into the NAS. Additionally, the FAA is aware of and is actively working on cybersecurity issues related to our NextGen programs.

NVS will allow ground-based UAS pilots to communicate directly with the air traffic controllers – a key requirement in integration – over the ground-to-ground communications network. Safe integration will lead us from today's need for accommodation of UAS through individual approvals to a time when unmanned aircraft can "file and fly" in the NextGen environment. It will improve the efficiency and reliability of exchanges between the UAS flight crew and air traffic control. NVS networking capabilities enable greater flexibility in developing and using airspace/traffic assignments in all airspace. Additionally, a "party line" requirement integral to

NVS adds to the overall situational awareness of UAS flight crews by allowing multiple participants to communicate.

Data Comm applications enable controllers to send digital instructions and clearances to pilots, and to exchange more complex four-dimensional (comprising latitude, longitude, altitude and time) trajectory data, including position, navigation and timing information. For UAS operators that elect to equip their aircraft, air traffic control messages and instructions will be exchanged via Data Comm to the pilot in control.

SWIM is the network structure that will carry NextGen digital information. SWIM will enable cost-effective, real-time data exchange and sharing among all airspace users, enabling increased common situational awareness and improved NAS agility. SWIM supports a loosely coupled service-oriented architecture that allows for easier addition of new systems and connections to include UAS users of the NAS.

Network-enabled access to more timely and improved information throughout the NAS serves as a major enabler for future operations, including UAS. All information about a given flight (e.g., capabilities, constraints, preferences) is contained within the flight object and made available to system stakeholders and air traffic management service providers based on information needs and security protocol.

Information on Special Activity Airspace and other airspace status is contained in ground automation systems and is available to the FAA and operators to improve the speed, efficiency and quality of collaborative decision-making. These improvements provide information for all

airspace operators, including UAS, to better plan flights. Net-enabled information sharing improves situational awareness and facilitates the collaborative decision-making process needed to mitigate potential adverse effects of weather, Special Activity Airspace status, and infrastructure status on UAS and other NAS operators.

Data sharing is a key NextGen component – getting the right information to the right people at the right time. This is especially important when it comes to weather information. Common Support Services–Weather (CSS-Wx) will provide the FAA and NAS users with same-time access to a unified aviation weather picture via the SWIM network. This will enable collaborative and dynamic decision making among all users of the NAS, and give them the flexibility to proactively plan and execute aviation operations ahead of weather impacts. Consumers will include public, commercial and general aviation users such as UAS operators.

The William J. Hughes Technical Center

The FAA Technical Center has served as the core facility for modernizing the air traffic management system, and for advancing programs to enhance aviation safety, efficiency, and capacity since 1958. The Technical Center is the nation's premier air transportation system laboratory. The Technical Center's highly technical and diverse workforce conducts research and development, test and evaluation, verification and validation, sustainment, and ultimately, de-commissioning of the FAA's full spectrum of aviation systems. They develop scientific solutions to current and future air transportation safety, efficiency, and capacity challenges. Technical Center engineers, scientists, mathematicians, and technical experts utilize a robust, one-of-a-kind, world-class laboratory environment to identify integrated system solutions for the modernization and sustainment of the NAS and for developing and integrating NextGen

operational capabilities. ADS-B, ERAM and DataComm were all developed, tested and began their nation-wide deployment at the Technical Center through its engineering, testing, evaluation, and deployment platforms.

There is no facility like this anywhere in the world - replicating the entire NAS under one roof, with the capability to support not only NextGen, but all aviation systems through their complete life cycle. The Technical Center's areas of focus include air traffic management, communications, navigation, surveillance, aeronautical information, weather, human factors, airports and aircraft safety. The Technical Center also provides 24-hour, daily operational support to FAA field facilities all over the country. Technical Center specialists diagnose and correct problems so that critical systems remain operational. The Technical Center also actively engages with controllers, and other labor partners, to ensure both the legacy and new equipment successfully perform in the real-world. In addition, the Technical Center provides strategic direction to the agency's Research, Engineering and Development portfolio and ensures that it is integrated, well planned, budgeted and executed.

Successful Technical Center efforts have an impact across the country and indeed, around the world. The Center has assumed a leadership role in promoting international interoperability and global harmonization, through standards and technical guidance to other countries. The Technical Center has contributed to aviation safety in countless ways. Some unique Technical Center laboratories include: air traffic management and simulation facilities, a human factors laboratory, the NextGen Integration and Evaluation Capability, a Cockpit Simulation Facility, a fleet of specially-instrumented in-flight test aircraft, the world's largest full-scale aviation fire test facility, a chemistry laboratory for analyzing the toxicity of materials involved in a fire,

surveillance test laboratories, a full-scale aircraft structural test evaluation and research facility, the National Airport Pavement Test Facility, and a UAS research and development simulation laboratory.

The Technical Center has led the way for the development of critical safety systems. Technical Center employees, working with industry, developed seats that can withstand 16 times the force of gravity and remain anchored to the floor in the event of an accident. These seats are now an industry standard, as are heat-resistant evacuation slides, in-floor and emergency exit lighting and fire resistant voice and cockpit recorders. Advancements in flammability standards both inside the aircraft and in the insulation, with fire-blocked seats and low-heat-release panels, also provide passengers extra time to escape in the event of an emergency. All of these critical safety mechanisms stemmed from research at the Technical Center. The Technical Center also developed and fielded a soft-ground arresting system that provides a nondestructive means for decelerating an aircraft that would otherwise be unable to stop safely within the confines of the runway, including the safety or overrun area. The Technical Center is also currently involved in research to improve the safe transportation of lithium batteries. This research directly supports and advances the position of the U.S. delegation on the ICAO Dangerous Goods Panel, which develops international standards for the safe transportation of all hazardous materials.

Much of the work performed at the Technical Center is in partnership with private industry, academic institutions, other agencies such as NASA and the Department of Defense, and international organizations. The Department of Homeland Security and military entities also have space at the Technical Center. It is the home of the Federal Air Marshal Service training program and the Transportation Security Laboratory, which is the test and evaluation site for

new, advanced airport security technologies. The U.S. Coast Guard Group Air Station Atlantic City, the U.S. Marshal Service, and the New Jersey Air National Guard 177th Fighter Wing are also based at the Technical Center. The Atlantic City International Airport is also on the Center's 5,000-acre campus. These other entities help to create a synergistic aviation-centered site that is without rival anywhere in the world.

The Path Ahead

The Technical Center will continue to play a critical role in aviation safety as technology continues to evolve. The aviation industry is marked by constant evolution and there will always be a need for research and evolving technology in response to changes in aviation needs. We are committed to ensuring that America continues to lead the world in the development and implementation of aviation technology and to operate the safest and most efficient aviation system in the world.

Mr. Chairman, this concludes our prepared remarks. We would be pleased to answer any questions you may have.