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Subcommittee on Aviation
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Challenges in Meeting FAA's Long-Term Goals for the Next Generation Air Transportation System

**Statement of
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Chairman Costello, Ranking Member Petri, and Members of the Subcommittee:

We appreciate the opportunity to testify today on the Federal Aviation Administration's (FAA) Next Generation Air Transportation System (NextGen). FAA is developing NextGen to replace the current air transportation system, which will not be sufficient to meet the anticipated future demand for air travel. FAA's goal for NextGen is to create a system by 2025 that will handle three times more air traffic while reducing FAA's operating costs. The NextGen effort involves a significant overhaul of the National Airspace System to shift from ground-based air traffic control to a satellite-based air traffic management system. Accomplishing this will require multibillion-dollar investments from both the Government and airline industry.

Since the effort began in 2004, we have reported on the cost and schedule risks and testified before this Subcommittee on the operational and management challenges that must be addressed to successfully implement NextGen in the near and midterm. Today, I will discuss three areas that have significant impact on advancing NextGen's long-term goals: (1) challenges and risks with ongoing FAA modernization projects that form the foundation of NextGen's success, (2) fundamental research and development issues that will impact NextGen performance, and (3) actions needed now to maximize a multi-agency approach to NextGen and leverage partner agencies' resources.

IN SUMMARY

FAA continues to face significant challenges in achieving its NextGen long-term goals. Central to this effort is the successful implementation of ongoing modernization projects that will provide platforms for new NextGen capabilities for enhancing capacity. However, key multibillion-dollar programs have experienced problems, and FAA has yet to fully determine their NextGen-specific requirements. These platforms include the \$2.1 billion En Route Automation Modernization (ERAM) program. Delays with this and other projects will have a cascading effect on NextGen plans now and well into the future. One critical step to avoid risks with NextGen's cost, schedule, and capabilities is addressing gaps in partner agencies' research and development efforts and long-term budgets and plans. We identified actions that can be taken now to strengthen the multi-agency approach, better leverage Federal research projects, and prevent duplicative efforts.

BACKGROUND

In 2003, Congress mandated that FAA establish the Joint Planning and Development Office (JPDO) and that it create and carry out a plan for implementing NextGen by 2025. Congress also required the JPDO to coordinate diverse research efforts of other Federal agencies, including the Departments of Defense (DOD), Commerce,

Homeland Security (DHS), and the National Aeronautics and Space Administration (NASA). While the initial planning for NextGen focused on implementing improvements through 2025, FAA has recently refocused and emphasized improvements that can be implemented in the near and midterm, defined as between 2012 and 2018.

FAA FACES CHALLENGES IN KEEPING NEXTGEN-CRITICAL MODERNIZATION PROJECTS ON TRACK

FAA faces challenges in keeping a number of modernization programs on track. These programs are critical as they represent enabling platforms for NextGen initiatives. Delays or performance shortfalls in any of these systems will impact NextGen's development and implementation. For example, FAA has not yet established firm requirements that can be used to develop cost and schedule estimates for modifications to existing terminal automation systems, which will allow controllers to display and use satellite surveillance to better manage traffic. According to FAA, it may take an additional 1 to 2 years to develop requirements for these systems and other mid-term NextGen efforts.

Technical Problems With ERAM Pose Cost and Schedule Risks for NextGen

The \$2.1 billion ERAM program will replace the existing hardware and software at facilities that manage high-altitude traffic. ERAM, however, is experiencing software-related problems at FAA's key initial operating site in Salt Lake City. These problems include radar processor failures, problems in handing off traffic between controllers, and critical flight information being paired to the wrong aircraft. FAA is spending about \$14 million per month to resolve these problems and deploy ERAM at other sites. However, these costs do not include enhancements for NextGen, which have not been established but are expected to cost several billion dollars.

While FAA does not believe the system to be fundamentally flawed, it has postponed the in-service and operational readiness decisions for ERAM at Salt Lake City by 6 months, both originally planned for December 2009.¹ We have not assessed the severity of the problems with ERAM, but FAA officials are concerned about the ERAM transition at larger, more complex sites like Chicago and New York. These locations have unique airspace and operational issues that will require adaptation of the system's software to accommodate their needs.

¹ An in-service decision (ISD) authorizes deployment of a system into the operational environment. It occurs after demonstration of initial operational capability at the key test site. The decision establishes the foundation for operational readiness to be declared at key site and subsequent sites following completion of joint acceptance and inspection by the operating service organization and certification of compliance with information security requirements. The in-service decision is based on testing to verify performance and operational readiness. For ERAM, the Operational Readiness Decision (ORD) is the final operational readiness certification that is required for the system to become operational and no longer require retention of the HOST Computer system as a back-up.

FAA officials acknowledge that it is unlikely that all 20 systems will be fielded nationwide and controlling traffic on a regular basis by December 2010 as planned. FAA must take steps to ensure that problems with ERAM are resolved and make realistic adjustments to the program's schedule. FAA must also assess what trade-offs in capabilities and adjustments to deployment plans and budgets are needed. Prolonged problems with ERAM will directly impact the implementation of NextGen efforts now and in the future, including key NextGen systems such as Automatic Dependent Surveillance-Broadcast (ADS-B)² and Data Communications.³

Failures with FAA's Telecommunications Services Raise Questions as to System Reliability and FAA Oversight

Recent problems with FAA's Telecommunications Infrastructure (FTI) program raise questions about whether the system can be relied on for NextGen initiatives and whether FAA is adequately overseeing the contractor. FTI is a \$3.5 billion major effort to modernize communications among FAA facilities. An FTI failure last November delayed over 800 flights nationwide, and it took FAA and the contractor over 5 hours to diagnose, correct, and restore service. The cause of the failure was traceable to a series of problems and mistakes that occurred when the contractor was transitioning to a new fiber optic network. The incident also impacted DOD and DHS surveillance capability and raised questions about the integrity of the network. In response to the outage, FAA established review teams to examine the soundness of FTI's management as well as the overall architecture and system design.

Our work shows that FAA's oversight of the contractor was not as effective as it should have been. For example, FAA had no indication that a contractor engineer had configured the network in error, which contributed to the outage. FAA was also unaware that an automated tool the contractor uses to generate alerts of a network failure was turned off, which is why it took 5 hours to locate the problem within the network. Our work—and FAA assessments—show that periodic independent reviews of the existing and planned FTI architecture are also needed since FAA has already approved the same contractor to continue modernizing the FTI network.

It remains unclear if the planned FTI network is appropriately designed or managed to support future NextGen initiatives, such as data communications between air and FAA ground systems. Therefore, it will be important for FAA to follow through on its plans to examine the broader implications of the November outage with respect to NextGen and the Agency's management of FTI.

² ADS-B offers surveillance, like radar, but with more precision. ADS-B provides air traffic controllers and pilots with more accurate information to help keep aircraft safely separated in the sky and on runways.

³ Data Communications (Data Comm) will provide comprehensive data connectivity, including ground automation message generation and receipt, message routing and transmission, and aircraft avionics requirements. Data Comm is expected to automate repetitive tasks, supplement voice communications, and enable ground systems to use real-time aircraft data to improve traffic management efficiency.

Delayed Decisions on Modernizing Current Terminal Automation Systems Will Impact Advanced NextGen Capabilities

FAA has not made critical decisions for modernizing air traffic control systems that controllers rely on to manage traffic in the vicinity of airports. FAA currently operates two different terminal systems and faces challenges with sustaining them and introducing new capabilities. For example, the Standard Terminal Automation Replacement System (STARS) is in use at over 50 medium sites, such as Philadelphia. However, much of the system's hardware is out of date and may soon be unsustainable. STARS also lacks processing power and needs upgrades to fully accommodate near-term NextGen surveillance capabilities. Likewise, the Common Automated Radar Terminal System (CARTS) at 7 large, complex sites and 99 small ones needs modernization and enhancements to utilize new capabilities, such as ADS-B for controllers. FAA is concerned that it will not meet its goal of displaying ADS-B information at selected terminal sites by 2013. FAA is examining alternatives for upgrading its terminal modernization needs and expects to make a decision sometime this summer. The cost estimates exceed \$2 billion for each alternative.

FUNDAMENTAL RESEARCH, DESIGN, AND DEVELOPMENT ISSUES THAT WILL DIRECTLY IMPACT NEXTGEN'S LONG-TERM COST, SCHEDULE, AND PERFORMANCE REMAIN UNRESOLVED

FAA is coordinating with JPDO partner agencies on long-term NextGen plans, but has yet to make critical system design decisions. Moreover, we found significant research and development gaps that will affect progress as well as the cost, schedule, and performance of NextGen. The future NextGen system called for in JPDO planning documents is a complex, software-intensive system that relies on advanced automation to track and manage aircraft in all phases of flight. NASA is taking a large role in developing the complex software algorithms envisioned for NextGen capabilities. Overall, NASA's work is fairly well aligned with JPDO plans. However, there are unresolved issues with the Department of Commerce, DOD, and DHS with respect to integrating weather information into advanced automated systems, determining joint surveillance requirements to track aircraft, incorporating Unmanned Aircraft Systems (UAS), and assessing NextGen's human factors impact.

FAA Has Not Made Key Decisions About the Design of the NextGen System

According to FAA, pending decisions on several key design issues will determine NextGen capabilities, timing, and costs. These include:

- **Air/Ground Division of Responsibility:** FAA needs to decide how much responsibility will be delegated to pilots in the cockpit and what duties will remain with controllers and FAA ground systems for tracking aircraft.

- **Level of Automation:** The decision on the degree of human involvement in traffic management and separating aircraft is linked to the outcome of the division of responsibility between aircrew and controllers (and related ground systems). Possible options range from today’s largely manual flight management to a primarily automated system centered on machine-to-machine exchanges with little controller involvement.
- **Facilities Consolidation:** A major factor in both capital and operating costs for NextGen is the degree to which the Agency eliminates or consolidates FAA facilities. FAA must make critical decisions on facility requirements, which in turn will significantly impact the type and number of systems needed to support NextGen.

Continued delays in developing requirements and in making key program decisions will slow NextGen’s progress. A recent NextGen portfolio analysis, commissioned by the JPDO, already shows that some NextGen automated air and ground capabilities originally planned for 2025 may not be implemented until 2035 or later and could cost the Government and airspace users significantly more than the projected cost estimate of \$40 billion.⁴

Disagreements Between FAA and the Department of Commerce Impact NextGen Weather Systems

The Department of Commerce has the lead role in developing the 4D Weather Cube, the weather data system planned for NextGen.⁵ However, technical disagreements with FAA over how to synchronize national applications of observed, forecast, and disseminated data may delay the system beyond its 2013 scheduled completion date. The 4D Weather Cube is expected to provide a common picture of weather for the entire country that airspace users may view and apply directly in flight planning and responding to inclement weather.

The JPDO conducted an assessment of weather efforts, which identified policy, funding, and technical issues. Key issues focus on defining requirements and who pays for what capabilities. For example, in our discussions with officials from Commerce’s National Oceanic and Atmospheric Administration (NOAA), we found that work on the 4D Weather Cube focuses exclusively on Commerce’s requirements. Additionally, NOAA expects FAA to provide funding or reimbursement for costs to support development of NextGen-related requirements.

⁴ The analysis is referred to as the NextGen portfolio or “trade space” analysis. FAA is continuing to update and revise the analysis. The study sought to examine the costs, risks, and benefits of the JPDO Integrated Work Plan targeted for 2025.

⁵ The 4D Weather Cube is to be a distributed, national database of gridded and interpolated weather observations and automated analyses, scaled consistently over time for any location above the continental United States. It is expected to provide observations with respect to latitude, longitude, altitude, and time.

To address these difficult issues, FAA, the Department of Commerce, and DOD have developed a NextGen Weather Plan. In addition, the JPDO created the NextGen Executive Weather Panel, co-chaired by the FAA Senior Vice President for NextGen and Operations Planning and the NOAA Assistant Administrator for Weather Services to improve coordination and cooperation between the three agencies. However, the agencies still have not established a formal NextGen weather agreement to better define their roles and expectations. While these efforts have resulted in improved cooperation, more work is needed to determine if system requirements for the 4D Weather Cube are achievable.

Partner Agencies Have Not Established Joint Surveillance Requirements

Joint surveillance requirements are needed to track aircraft and achieve the integrated surveillance and security capabilities envisioned for NextGen. While DOD and DHS do not have any budget or programs specifically identified for NextGen, one of their main concerns is maintaining security coverage for the United States. This includes tracking aircraft designated as potentially non-cooperative targets, a capability currently provided by FAA.⁶ Moreover, when FAA implements ADS-B, it plans to decommission an undetermined number of unneeded radar.⁷ If DOD or DHS determine that some of these radar must remain in service, these agencies would likely have to assume the responsibility for maintenance and replacement costs. Without closer coordination and agreement about surveillance requirements, there is potential for duplicative efforts and gaps in airspace coverage that could impede the integrated surveillance and security capabilities envisioned for NextGen.

Cross-Agency Attention Is Needed To Safely Incorporate Unmanned Aircraft Systems Into the National Airspace System

Government and private-sector interest in UAS operations is growing dramatically, as the absence of a pilot on board the aircraft allows it to perform missions that generally would not be possible with manned aircraft. Therefore, the evolving use of UAS technology has become an important issue for FAA, DOD, DHS, and other agencies. However, there are no established cross-agency requirements for UAS or a clear understanding of how they will be used in a NextGen environment.

In addition, a number of safety issues must be addressed, such as risks of UAS operations near populated areas and potential collisions with manned aircraft. FAA currently authorizes Government UAS operations on a limited basis but is now developing a regulatory framework to address the unique characteristics of UAS. This will require new standards and procedures to assess the impact of UAS on air traffic operations and safety, which will also impact development of NextGen procedures.

⁶ The term “non-cooperative targets” refers to aircraft that are not transmitting flight information to FAA ground systems.

⁷ We are referring to secondary radar. Secondary radar operates on the coded reply sent from the airborne radio beacon transponder in an aircraft in response to an interrogation signal sent from the ground station.

Addressing UAS operations has been a recurring issue in the JPDO's annual cross-agency gap analysis. The analysis reiterates the need to continue work between agencies to develop cross-agency requirements, standards, procedures, and avionics requirements. Thus far, only NASA has taken actions concerning UAS operations by including an additional \$30 million in its fiscal year 2011 budget request to develop technologies that will allow unmanned aircraft routine access to the National Airspace System. This effort will focus initially on Government-owned and -operated UAS aircraft, followed by private-sector UAS aircraft.

FAA Has Not Yet Developed a Cross-Agency Plan To Identify and Address NextGen Human Factors Issues

NextGen technologies will introduce new systems and responsibilities for controllers and pilots and change the way they use existing systems. As we reported in 2007, a focused research effort on how NextGen changes will impact the roles of controllers and pilots is needed to ensure new concepts and technologies can be safely implemented.⁸ However, FAA has not developed a cross-agency plan to identify and address these issues. FAA will need to develop a plan that (1) establishes an agreed-upon set of initial focus areas for research, (2) inventories existing facilities for research, and (3) capitalizes on past and current research. This is important because both NASA and FAA conduct human factors work specifically for air traffic management. In the past, FAA's failure to provide adequate attention to human factors research when implementing STARS resulted in significant cost increases and schedule slips.

ACTIONS NEEDED TO STRENGTHEN FAA'S COORDINATION WITH PARTNER AGENCIES AND MANAGEMENT OF LONG-TERM NEXTGEN INITIATIVES

A multi-agency approach to NextGen that allows FAA and partner agencies to coordinate and align diverse research and other resources is not only required by law but also key for successful implementation since FAA conducts little long-term air traffic management research. We have identified a number of actions that can strengthen the multi-agency approach, better leverage resources, and prevent duplicative efforts.

Clarify the Role and Mission of the JPDO

There is confusion within FAA and industry about the role the JPDO will play in advancing NextGen other than supporting the multi-agency approach. FAA reorganized its NextGen efforts in 2008 and placed the JPDO under the FAA Senior

⁸ OIG Report Number AV-2005-031, "Joint Planning and Development Office: Actions Needed To Reduce Risks With the Next Generation Air Transportation System," February 12, 2007. OIG reports are available on our website: www.oig.dot.gov.

Vice President for NextGen and Operations Planning within the Air Traffic Organization. FAA then established a separate NextGen Integration and Implementation Office. Last month, FAA announced another organizational change in which the JPDO will now report to the Deputy FAA Administrator. It is uncertain what role, if any, the JPDO will play in critical NextGen development issues, such as simulation and modeling, technology transfer, prototype development, or NextGen policy issues. Department of Transportation and FAA officials have recognized the need to better define the mission of the JPDO.

Establish Research Priorities and Develop an Integrated NextGen Budget Document That Aligns Partner Agency Resources

FAA and the JPDO have been working on a NextGen integrated budget document (similar to the Office of Management and Budget Exhibit 300) for over 4 years.⁹ This tool is important to track the involvement of partner agencies in NextGen and to align resources. While generally supportive of NextGen, some partner agencies have not adjusted their research and development budgets and programs or changed requirements to accommodate NextGen efforts. The budget identifies NextGen-specific funding from FAA and NASA and a token amount from Commerce but does not yet quantify investments from DOD or DHS.

The lack of progress with the integrated budget document is traceable to a number of factors. These include complexity, the lack of a common method to identify NextGen-related budget items, and FAA's focus on running and maintaining the existing system. However, until the integrated budget document is completed, it will be difficult for FAA and Congress to determine (1) if the JPDO is leveraging the right research, (2) if funding is adequate for specific efforts, or (3) how projects will improve the air transportation system and at what cost.

Fully Leverage DOD Research and Development for NextGen

Currently, DOD contributes to NextGen as a member on various committees, boards, and working groups. DOD has also taken the lead in network-centric operations efforts and is working with FAA and the JPDO on surveillance issues.¹⁰ However, neither FAA nor the JPDO have done a complete assessment of DOD's vast research and development portfolio (and already derived capabilities). FAA officials stated this is due in part to an agency culture that is reluctant to embrace technologies not developed by FAA.

DOD's experience with enterprise architecture development, large-scale systems integration, and overall management of high-risk efforts could prove useful. Moreover, DOD's work on a satellite-based Joint Precision Approach and Landing

⁹ The Office of Management and Budget Exhibit 300 is designed to ensure that the business case for investments is made and tied to agency mission statements and long-term goals.

¹⁰ DOD's Network-Centric Operations is a robust networking of information for geographically dispersed forces.

System is a particularly important area where FAA could leverage and use DOD technology to help reduce risk with precision landing systems envisioned for NextGen.¹¹ DOD research and development may also have NextGen value-added capabilities for areas such as surveillance and security of aircraft, communications, and navigation services.

Secure the Skill Set Necessary To Execute NextGen and Ensure Sufficient Contract Oversight

In response to a recommendation we made in 2007, FAA commissioned the National Academy of Public Administration (NAPA) to assess the skill sets needed for NextGen implementation. In its September 2008 report, NAPA identified 26 competencies in which FAA lacks both the skills and capabilities to execute NextGen.¹² These include program management, software development, contract administration, and systems engineering with an emphasis on human factors considerations.

FAA recently completed an initial acquisition workforce plan to address recommendations in the NAPA study—an important first step. However, the plan requires more development and clarification to be useful. For example, while FAA estimates it will require approximately 350 new hires, the plan does not specify how or when FAA will actually secure the necessary skill sets and expertise. We have work underway to examine FAA’s plans for determining its acquisition workforce needs and progress in addressing them.

NextGen implementation will also require significant contract oversight. This is important because FAA plans to award a series of support service contracts worth \$7 billion, referred to as System Engineering 2020 (SE-2020). We have begun a review to assess FAA’s plans, policies, and procedures to administer and oversee these contracts with a focus on whether the contractual arrangements are being structured and implemented to meet NextGen program objectives.

¹¹ The Joint Precision Approach and Landing System (JPALS) is a satellite-based system that will allow aircraft to land on any suitable land or sea-based surface worldwide, while minimizing the impact to airfield operations because of a low ceiling or poor visibility.

¹² Report by a panel of the National Academy of Public Administration, “Identifying the Workforce To Respond to a National Imperative - The Next Generation Air Transportation System (NextGen),” September 2008.

CONCLUSION

The successful implementation of NextGen is important to the Nation as it has potential to significantly enhance capacity and reduce delays. While FAA is making progress in addressing NextGen's challenges, a number of critical actions are still needed, many of which focus on aligning agencies' research and resources to reduce development costs and mitigate risks with a multibillion-dollar effort that will span decades. Unless these issues are effectively addressed in the near term, FAA runs the risk that NextGen may not deliver the long-term benefits needed to meet the expected future demand for air travel.

This concludes my statement, Mr. Chairman. I will be happy to address any questions you or the other Members of the Subcommittee may have.