**Before the Committee on Transportation and Infrastructure
Subcommittee on Aviation
United States House of Representatives**

Update on FAA's Progress and Challenges in Advancing the Next Generation Air Transportation System

**Statement of
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Mr. Chairman and Members of the Subcommittee:

Thank you for inviting me here today to testify on the Federal Aviation Administration's (FAA) progress in developing the Next Generation Air Transportation System (NextGen)—a system that is expected to provide safer and more efficient air traffic management. As you know, NextGen is FAA's most complex effort to date and will require multibillion-dollar investments from both the Federal Government and airspace users.

Since the effort began in fiscal year 2004, we have reported on cost and schedule risks as well as challenges that FAA must address to successfully transition from legacy air traffic systems to NextGen. In September 2009, a Federal Government-industry task force—established at FAA's request—recommended several strategies for accelerating NextGen's benefits in the near term. However, last October, we testified that delivering near-term benefits and resolving problems with ongoing projects continue to challenge FAA.[1] While FAA has taken important steps over the past year to improve the management of NextGen, such as establishing a new program management office, the Agency has made limited progress in shifting from planning to actual implementation and delivering benefits to airspace users.

Today, I will focus on three key challenges that continue to impact FAA's ability to realize NextGen's benefits: (1) implementing NextGen capabilities at congested airports, (2) resolving technical and program management problems with the En Route Automation Modernization (ERAM) program, and (3) managing program costs and schedules in developing and implementing NextGen's transformational programs.

IN SUMMARY

FAA has made progress in improving air traffic management at congested airports in major cities—one of the task force's most critical recommendations. For example, FAA has completed studies to identify recommended changes for seven metroplex locations and is performing airspace and procedures design work at six of them. However, industry representatives are concerned that the effort may not deliver all desired benefits and that FAA has not yet integrated metroplex with other related initiatives, such as better managing surface operations. Additionally, FAA has not fully resolved key organizational, policy, and training barriers to implementing NextGen capabilities in the near term. Central to realizing benefits from the task force recommendations and other NextGen initiatives is the successful deployment of ERAM—a multibillion dollar program for processing flight data. However, extensive software-related problems have significantly delayed ERAM's nationwide deployment, resulting in hundreds of millions of dollars in increased costs. FAA is taking steps to address our concerns about a number of ERAM programmatic and contract management issues, such as modifying its contract

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[1] OIG Testimony Number CC-2011-036, "Progress and Challenges in Developing to the Next Generation Air Transportation System," October 5, 2011. OIG reports and testimonies are available on our Web site at http://www.oig.dot.gov/.

to better track costs, but considerable risks remain to complete the effort within the Agency's revised cost and schedule parameters. FAA faces similar cost and schedule risks with its NextGen transformational programs, as the Agency has not approved total cost, schedule, or performance baselines for any of the programs or developed an integrated master schedule for managing and executing NextGen.

BACKGROUND

NextGen involves a significant overhaul of the National Airspace System (NAS) to shift from ground- to satellite-based air traffic management. This effort includes several components, such as:

- Redesigning airspace and deploying new performance-based flight procedures,

- Developing systems to help controllers better manage air traffic, and

- Providing critical technologies and infrastructure for NextGen.

As shown in the following table, FAA has several NextGen initiatives and programs under way that are expected to deliver benefits to the NAS.

Table. Examples of Key NextGen-Related Initiatives and Programs

Initiative/Program	Expected Benefits
Metroplex Airspace	Improve the efficiency of airspace that affects multiple airports near large metropolitan areas.
Airport Surface Operations	Improve the management of airport taxiways, gates, and parking areas.
Data Communications (DataComm)	Provide 2-way data communication between controllers and flight crews for improved cruise and transition operations to enable more efficient use of available or forecast capacity in the NAS.
ERAM	Replace and significantly enhance existing software at the 20 FAA Centers that manage high-altitude air traffic. ERAM is FAA's key platform for NextGen to process flight data across the NAS.
Automatic Dependent Surveillance-Broadcast (ADS-B)	Enhance information about aircraft location for pilots and air traffic controllers using satellite-based surveillance technology.
System Wide Information Management (SWIM)	Provide a more agile exchange of information through a secure, NAS-wide information web that will connect FAA systems with other agencies and airspace users.

Source: OIG analysis

In 2009, FAA asked an RTCA[2] task force to reach consensus on the NextGen operational improvements planned for 2012 to 2018, help develop plans to maximize NextGen benefits, and justify investment in mid-term capabilities. The task force made

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[2] Organized in 1935 as the Radio Technical Commission for Aeronautics, RTCA, Inc., is a private, not-for-profit corporation that develops consensus-based recommendations regarding communications, navigation, surveillance, and air traffic management (CNS/ATM) system issues. It functions as a Federal advisory committee.

32 recommendations and stated that focusing on delivering near-term operational benefits, rather than major infrastructure programs, would help gain industry confidence in FAA's plans and encourage users to invest in NextGen. The task force also emphasized the need to assign responsibility, accountability, authority, and funding within the Agency to accomplish all required non-infrastructure tasks, such as developing needed policies and procedures.

Recently, we reported that FAA is facing challenges with implementing near-term NextGen capabilities, which could delay benefits,[3] and that FAA has not yet established total program costs, schedules, or performance baselines for any of the six NextGen transformational programs, which limits visibility into the total costs and timelines required to achieve benefits.[4]

CHALLENGES REMAIN FOR FAA IMPLEMENTATION OF NEXTGEN CAPABILITIES IN THE NEAR TERM AT CONGESTED AIRPORTS

FAA has made important progress in responding to the task force recommendations to improve air traffic management at congested airports by aligning budgets and plans, completing airspace and procedure studies at specific airports, and performing design work. However, FAA's efforts have been delayed in several critical areas, including airspace affecting multiple airports near large metropolitan areas, airport surface operations, and data communications. In addition, FAA has not fully addressed key barriers to implementing task force recommendations, which could further delay the delivery of much needed benefits at congested airports.

FAA Has Responded to Task Force Recommendations by Aligning Budgets and Plans and Performing Study and Design Work at Specific Airports

Within 4 months of the RTCA report, FAA issued a plan to implement all recommendations and incorporated its response in its NextGen Implementation Plan,[5] as recommended by the task force. In addition, FAA allocated over $600 million in funding for fiscal years 2011 and 2012 to fund task force-related activities. Further, FAA established the NextGen Advisory Committee (NAC)[6] to address the task force's recommendation for providing a mechanism for continued industry collaboration.

FAA has made progress in improving airspace around congested airports in major cities—one of the task force's most critical recommendations. The task force and FAA

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[3] OIG Report Number AV-2012-167, "Challenges With Implementing Near-Term NextGen Capabilities at Congested Airports Could Delay Benefits," August 1, 2012.

[4] OIG Report Number AV-2012-094, "Status of Transformational Programs and Risks to Achieving NextGen Goals," April 23, 2012.

[5] FAA's NextGen Implementation Plan is an annual plan that sets out FAA's vision for NextGen, now and into the midterm. The plan further identifies the goals FAA has set for technology and program deployment and the commitments FAA has made in support of that vision.

[6] The NAC is a Federal advisory committee that will develop recommendations for NextGen priorities with an emphasis on the midterm (through 2018). The NAC includes representation from affected user groups, including operators, manufacturers, air traffic management, aviation safety, airports, and environmental experts.

identified the metroplex initiative as a key area that could provide the most near-term benefits by improving traffic flow and reducing delays at congested airports in 13 major metropolitan areas.[7] Work at each of these 13 sites will consist of study[8] and design phases[9] that will take about 3 years at each location. FAA has completed initial studies at 7 of the 13 locations and is performing design work at 6 of these locations.[10] Since we testified last October, FAA developed an operational plan with milestones for this effort and began one additional study—the South Florida metroplex.

Work Remains in Areas Critical for Improving NAS Performance

Despite FAA's progress, significant work remains on the metroplex initiative as well as other critical areas, such as airport surface operations and data communications.

- **Metroplex Airspace (*Improve airspace affecting multiple airports near large metropolitan areas).*** The expected completion date for all metroplex sites is 15 months later than previously planned. FAA's early plans were to complete work at all metroplex sites by June 2016; however, the Agency postponed completion to September 2017 because it determined the initial schedule was too aggressive. FAA also reduced the number of metroplex sites from 21 to 13.[11] For example, a critical site with systemwide impacts, such as New York, is not included in FAA's current metroplex effort due to a major ongoing airspace and procedures project. This project has been ongoing for several years due to public concerns about the environmental impact on the area.

   Additionally, industry representatives are concerned that the metroplex effort may not deliver all planned or desired benefits because FAA has focused solely on limited airspace and procedure improvements, rather than implementing advanced procedures, as recommended by the task force. For example, of the 136 solutions proposed for the first 7 metroplex sites, only 3 involve more advanced procedures that allow aircraft to fly more precise routes and curved approaches to airports. Further, FAA has not yet integrated efforts from other related initiatives, such as better managing surface operations, into its metroplex initiative. In October 2010, over 1 year after the task force report, FAA tasked the NAC to develop recommendations on how FAA can better integrate its efforts. FAA expects recommendations from the

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[7] Washington, DC; North Texas (Dallas); Charlotte; Atlanta; Northern California; Houston; Southern California; Chicago; South Florida; Boston; Cleveland/Detroit; Memphis; Phoenix.

[8] Study teams are the first step in the metroplex process to provide a front-end strategic look at each major metroplex. These teams analyze the operational challenges, assess current/planed airspace and procedures efforts, explore new solution opportunities, and issue a study report with recommended procedure and airspace solutions.

[9] Design and implementation teams are responsible for executing the design, evaluation, and implementation portions at each metroplex site.

[10] The seven locations are Washington, DC; North Texas (Dallas); Charlotte; Northern California; Houston, Atlanta, and Southern California. Design work has begun at Washington, DC; North Texas; Charlotte; Houston; Atlanta; and Northern California.

[11] FAA reduced the number of metroplex projects from 21 to 13 by combining some and dropping others because of other ongoing airspace and performance-based navigation initiatives. The sites dropped were: New York/Philadelphia, Minneapolis-St. Paul, Seattle, and Las Vegas Valley.

NAC in September 2012 on the committee's recently completed work to map NextGen capabilities to specific metroplex sites.

- **Airport Surface Operations** (*Improve management of airport taxiways, gates, and parking areas*). FAA did not designate an office director with responsibility for implementing surface initiatives until March 2011—18 months after the task force recommended it as a high priority. Currently, FAA's ongoing surface management projects span multiple air traffic organizations without a coordinated plan. Representatives in FAA's surface operations office are working to coordinate their efforts within the air traffic organizations responsible for these projects, but it is not yet clear how or if they will integrate their efforts with the metroplex initiative.

- **Data Communications (DataComm)** (*Enable more efficient use of available or forecast capacity*). Due to delays in modernizing automation that controllers use to manage high-altitude air traffic, FAA's timeline for developing this capability slipped by 2 years, from 2016 to 2018. Industry representatives stated that they need assurance that FAA's revised implementation date for high altitude traffic management is attainable. They view DataComm as the key building block for improved communications needed to shift to NextGen's concept of more precisely managing aircraft from departure to arrival, with the benefits of reduced fuel consumption, lower operating costs, and reduced emissions.

For recommendations related to runway access and high-altitude cruise, FAA is not planning to follow the timelines and locations recommended by the task force, because the Agency determined it needed to perform its own cost-benefit analysis before accepting the recommendations.

- **Runway Access** (*Improve the use of converging or closely spaced runways during low visibility conditions*). Making better use of existing runways, as RTCA recommended, requires updated safety studies for new, complex runway configurations—such as closely spaced parallel runways[12] and converging or intersecting runways—at several busy airports. While the Agency adopted the task force's recommended dates and locations for closely spaced parallel runway projects, it has not defined locations and dates for implementing other key recommendations, such as a precision surveillance system for runways and a new automated tool to maximize benefits of routes. FAA stated this is due to the need to perform cost-benefit analysis and further safety studies.

- **High-Altitude Cruise** (*Improve high-altitude flight by better using available airspace to increase capacity and reduce delays*). The task force recommended that FAA take action in 2011 to expand the use of an existing high-altitude automated controller tool for managing aircraft. Instead, FAA focused its actions on

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[12] Closely spaced parallel runways are those in which the centerlines are separated by less than 4,300 feet.

implementing a longer-term solution called Time-Based Flow Management.[13] FAA's target implementation date for this system is November 2014, about 3 years beyond the timeframes recommended by the task force.

Given these delays, task force representatives remain concerned with the Agency's overall timelines for NextGen. For example, the task force stated that if some DataComm capabilities are delayed to 2018, as FAA has currently proposed, airspace users will need to revisit their business cases and commitment to advance NextGen. Task force industry representatives have also emphasized the need for FAA to shift from planning to implementation, as meeting implementation milestones will be critical to securing operator investment.

FAA Has Not Fully Resolved Key Organizational, Policy, and Training Barriers To Implementing Task Force Recommendations

FAA has not yet resolved many of the barriers that will impede the implementation of the task force recommendations. These barriers include working across diverse Agency lines of business, streamlining the process for implementing new flight procedures, updating policies, and training controllers on new advanced procedures. While FAA has plans to address these barriers, progress has been slow, and none of these initiatives have been fully implemented.

- **Working across diverse lines of business.** To complete the task force's recommendations, FAA will have to coordinate with various organizations within the Agency—including its Aircraft Certification Service, Flight Standards Service, and Air Traffic Organization (ATO). Such coordination has been a challenge for FAA in the past. For example, as we testified in July 2009, organizational barriers and fragmented efforts hindered FAA's process for approving new flight procedures.[14] To address these concerns and other NextGen-related problems that we have reported, in September 2011, FAA began making significant organizational changes in how it manages NextGen. However, given the scope of FAA's effort, the Agency needs a reasonable amount of time before it can fully implement these organizational changes and ensure it achieves the desired outcome of working effectively across different lines of business.

- **Implementing new flight procedures.** FAA's process for developing and implementing new flight procedures is time-consuming and fragmented. In September 2010,[15] FAA reported that it planned to implement 21 recommendations made by 6 internal work groups for streamlining its process to develop and deploy these procedures. However, FAA has yet to implement the majority of the

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[13] Time Based Flow Management enhances system efficiency and improves the traffic flow by leveraging the capabilities of controller decision support tools designed to optimize the flow of aircraft into capacity constrained areas.

[14] OIG Testimony Number CC-2009-086, "Challenges in Implementing Performance-Based Navigation in the U.S. Air Transportation System," July 29, 2009.

[15] FAA's Navigation Procedures (NAV Lean) Instrument Flight Procedures Final Report, September 2010.

recommendations and estimates it may take as long as 4 years to implement all of them. FAA has recently begun to determine flight procedure utilization rates and examine causes for a lack or drop in usage for advanced performance-based flight procedures—an issue we raised in December 2010.[16] We recently initiated an audit to update our prior work on FAA's implementation of new flight procedures and the Agency's efforts to streamline the process.[17] We will continue to monitor the Agency's progress in this critical area.

- **Updating key policies.** The task force encouraged FAA to continue to develop a "best-equipped, best-served policy"—that is, prioritize air traffic control services for those users equipped with new systems—and revamp information sharing systems to better manage airport surfaces. FAA recognizes the importance of these issues and continues to work with industry to reach consensus on strategies concerning equipage for NextGen and to identify processes and standards for data sharing. However, FAA does not yet have a clear plan for transitioning to the new policies.

  Additionally, many air traffic control policies and procedures have not been updated to incorporate the increased capabilities of satellite-based technologies. For example, FAA has not updated the controller handbook to provide guidance on phraseology, separation, and other requirements to safely manage performance-based operations in a mixed equipage environment.

- **Training controllers on new advanced procedures.** While FAA has begun training controllers on NextGen initiatives, FAA's training on existing and emerging advanced procedures has been limited. National Air Traffic Controllers Association officials stated that training on new performance-based flight procedures should be timely and include simulator training to be effective. Yet, FAA's recent NextGen-related training often consisted solely of high-level briefings. Without comprehensive training and familiarity with the new instrument flight procedures, controllers are reluctant to allow pilots to use these procedures—especially in a mixed equipage environment, where many aircraft are not equipped or approved to use the new procedures.

If FAA does not resolve these issues, its metroplex effort and implementation of other recommendations will likely face delays, and benefits may not be realized within recommended timeframes. In an August 2012 report, we made recommendations to improve FAA's ability to effectively implement the task force's recommendations and resolve barriers in a timely manner.[18] FAA agreed to integrate other NextGen capabilities into its metroplex initiative when they mature, streamline its metroplex process where

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[16] OIG Report Number AV-2011-025, "FAA Needs To Implement More Efficient Performance-Based Navigation Procedures and Clarify the Role of Third Parties," December 10, 2010.

[17] OIG Audit Announcement Number 12A3007A000, "Audit Initiated of FAA's Efforts to Streamline its Processes for Implementing New Performance-Based Flight Procedures," May 09, 2012.

[18] OIG Report Number AV-2012-167, "Challenges With Implementing Near-Term NextGen Capabilities at Congested Airports Could Delay Benefits," August 1, 2012.

possible, and report barriers identified at each metroplex site to appropriate offices for resolution.

UNRESOLVED PROBLEMS WITH ERAM CONTINUE TO IMPACT THE COST AND PACE OF NEXTGEN

Central to realizing benefits from FAA's NextGen efforts is the successful implementation of ERAM—a multibillion dollar enabling program for processing flight data. However, extensive software-related problems have significantly delayed ERAM's nationwide implementation, resulting in hundreds of millions of dollars in increased costs. While FAA is making progress in using ERAM to manage air traffic at several locations, it has not fully resolved critical software-related issues that impact the system's ability to separate and control aircraft. These problems raise significant concerns about the Agency's program management and contract oversight. Prolonged problems with ERAM also pose risks to other NextGen initiatives.

ERAM Software-Related Problems Have Caused Cost Overruns and Schedule Delays

ERAM is up and running at nine sites—full-time at five sites[19]—a significant step forward since testing at the two key initial sites in Salt Lake City and Seattle revealed extensive software problems with the system's core capabilities to safely manage aircraft. Recent progress at the two initial sites has also allowed FAA to decommission legacy systems at these locations. FAA's progress with ERAM is largely due to a sustained commitment by senior leadership to resolve problems, improve risk mitigation, and work closely with controllers. However, the facilities using ERAM continue to identify software problems, such as errors that display flight data to the wrong aircraft and aircraft handoff problems among facilities, which distract controllers from their primary task of safely managing aircraft. As a result, FAA is currently spending about $24 million a month in deploying ERAM, integrating other systems, and fixing identified problems. In June 2011, FAA rebaselined ERAM, estimating that the cost to complete the program would increase by an additional $330 million. FAA now believes that it can deploy ERAM at the remaining 11 sites by the end of fiscal year 2013, completing deployment and declaring the system operationally ready nationwide by 2014—a delay of nearly 4 years from the original schedule of December 2010. However, our work and a study by the MITRE Corporation show that if problems persist, cost increases could exceed $500 million and further delay implementation.

Input from controllers and technicians at the nine sites currently using ERAM, along with the national user work group, have identified and reported in excess of 900 new high-priority software issues that need to be addressed. Until FAA is able to assess these new issues and determine the nature and extent of corrective actions needed, the impact to the ERAM cost and schedule is unknown. Moreover, in the fall of 2012, FAA will

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[19] The five sites are Albuquerque, Denver, Minneapolis, Salt Lake City, and Seattle.

resume deployment of the remaining sites, such as New York and Boston—several of which are even more complex than any of the previous locations. The addition of all the remaining sites will likely result in the identification of new problems, which raises the risk that program costs will grow.

In March 2012, FAA's Joint Resources Council (JRC)[20] approved funds for ERAM software release 4 that will add additional NextGen capabilities and address software problems. This new ERAM software package is projected to cost in excess of $400 million in capital costs alone and will include work that will extend past fiscal year 2016. However, FAA documentation shows that a portion of those funds—in addition to the $330 million already added to the program baseline—will be used to address ERAM maintenance problems and other software changes.

Problems With ERAM Exposed Fundamental Weaknesses in Program Management and Contract Oversight

Our ongoing work shows that initial problems with ERAM were directly traceable to weaknesses in program management and contract oversight. During ERAM's planning and deployment stages, FAA did not establish program management controls that would put FAA in a position to address significant problems as they occurred. For example:

- FAA and its contractor significantly underestimated the complexity in fielding ERAM. They were overly optimistic that ERAM could be fielded to all 20 sites within 1 year, and did not consider the impact of early problems during initial site deployment.

- Software testing at FAA's Technical Center was too limited to allow FAA to fully understand the maturity and stability of the software prior to deployment. As a result, the software was released to the key sites with significant defects.

- FAA did not implement required program management tools to ensure ERAM would achieve performance and schedule goals. First, the program office did not review the ERAM budget when major increases in contract value occurred (those over $100 million). FAA will now conduct detailed budget reviews for all major contract modifications. Second, FAA did not correctly implement earned value management (EVM), which OMB and FAA require for all major information technology investments. EVM is a management tool intended to forecast performance trends and help managers identify cost and schedule problems early on. FAA's EVM measurement baseline was based on the contract's structure, rather than the overall program structure and milestones, as required by EVM standards. As a result, the EVM system did not detect significant schedule and cost variances, which began to occur when the program experienced software problems at the initial key test site. Third, FAA's risk management process did not begin to detect and mitigate

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[20] The JRC is an FAA executive governance board responsible for the approval and oversight of major systems acquisitions.

significant risks, such as not achieving deployment milestones for ERAM at key sites due to core functionality software issues, until almost 2 years after software problems surfaced at a key test site. Recently, FAA's new program manager significantly improved ERAM's risk management process by providing a more accurate portrayal of active ERAM risks.

In addition to lacking critical program management controls, FAA did not structure or administer its ERAM contract to effectively manage costs and achieve desired outcomes. For example:

- FAA did not fully adopt best practices for major information technology acquisitions when designing ERAM's contract structure. Specifically, FAA did not fully apply modular contracting concepts, which call for dividing a large contract into manageable contract segments delivered in shorter increments. Instead, FAA designed larger contract segments that could span several years, an approach that does not offer as much flexibility. In May 2012, in response to our draft audit report on ERAM, FAA modified the ERAM contract to implement a more modular structure for contract segments related to software development. However, other line items in the contract could also benefit from a modular approach.

- ERAM's cost incentive fee did not motivate the contractor to stay below predefined cost targets because FAA simply increased the target costs as requirements grew. At the time of our review, FAA paid the contractor over $150 million in cost incentives for meeting target costs even though ERAM costs exceeded the budget by at least $330 million. In May 2012, FAA modified the ERAM contract to revise its incentive fee structure related to new ERAM software releases. A significant portion of the cost incentive is now being allocated to five performance targets for new software releases.

Prolonged Problems With ERAM Pose Risks to NextGen Initiatives

ERAM's implementation is central to realizing the key benefits of several other programs, such as new satellite-based surveillance systems and data communications for controllers and pilots. Continued problems with ERAM have already had implications for FAA's NextGen transformational programs, such as DataComm and ADS-B. FAA plans to allocate almost $500 million to integrate and align these systems with ERAM. In addition to the transformational programs, delays with ERAM will impact other NextGen efforts, including the following:

- Implementing FAA's new performance-based navigation routes and procedures that allow aircraft to fly more flexible routes, based on aircraft avionics and satellite-based navigation. New performance-based navigation routes are an important stepping stone for near-term NextGen initiatives and boosting capacity at already congested airports.

New automated systems for controllers, such as ERAM, are key to maximizing the benefits of new routes.

- Managing aircraft strategically through all phases of flight through trajectory-based operations. This capability is expected to predict the path of each aircraft in time and space and thereby facilitate the transition from today's ground-based radar to more accurate satellite-based systems and reduce fuel consumption by the airlines and aircraft emissions. Progress with ERAM is important because this new way of managing traffic will require many other systems to use flight information from ERAM.

- Introducing new capabilities at facilities that manage high-altitude traffic, such as flexible and dynamic airspace that will allow controllers to shift airspace segments to other controllers based on weather and traffic pattern changes. However, FAA must fix core capabilities for managing aircraft before the new capabilities can be implemented.

- Combining both terminal and en route operations into a common automation system. Currently, FAA operates and maintains diverse automation systems with unique displays, software, and hardware. FAA believes that a common automation platform will reduce costs, improve air traffic and airspace management, and allow the Agency to consolidate and realign its facilities. Problems with ERAM contribute significantly to FAA's inability to determine when it can begin to develop and transition to a common automation platform.

Schedule delays and corresponding cost growth with ERAM have forced FAA to reprogram funds from other FAA capital programs. According to Agency officials responsible for capital planning and budgeting, FAA thus far has reallocated funds from development efforts for NextGen capabilities and procedures, tower replacement, electrical power systems for air traffic control facilities, and planned technical improvements to communications and oceanic automation systems. Continuing cost growth with ERAM, especially in the current budget environment, will crowd out other capital programs.

Throughout the course of our work, we communicated our views to FAA officials on actions needed to reduce programmatic risk and strengthen contract oversight. In response, FAA is taking steps to address our concerns. For example, FAA has made strides toward improving the way it tracks ERAM costs by modifying the contract to begin definitizing its implementation efforts. However, achieving NextGen's goal of more efficient airspace for the future will ultimately depend on FAA's ability to effectively manage, within cost and schedule, large-scale acquisitions such as ERAM to support its NextGen portfolio.

COSTS, SCHEDULES, AND BENEFITS ARE UNCERTAIN FOR NEXTGEN'S TRANSFORMATIONAL PROGRAMS

Between fiscal years 2013 and 2017, FAA plans to spend $2.4 billion on NextGen's six transformational programs. While FAA is making some progress implementing these programs, their costs, schedules, and performance remain uncertain because FAA has yet to baseline the total programs or develop an integrated master schedule to manage and coordinate NextGen's implementation. Three programs in particular—ADS-B, SWIM, and DataComm—will provide critical technologies and infrastructure for NextGen and allow for more efficient data sharing among airspace users, a key NextGen goal.

FAA Has Not Fully Addressed ADS-B Requirements and System Risks

Successful implementation of ADS-B—a satellite-based surveillance technology that combines the use of aircraft avionics and ground-based systems—will require resolving critical issues related to system requirements and security risks. FAA plans to implement ADS-B in four segments and has approved approximately $2.7 billion through 2020 for the initial three segments to deploy the system's ground infrastructure, develop baseline services and applications, and expand services in the Gulf of Mexico.

As of July 2012, FAA has deployed 400 of the planned 730 radio ground stations, and the Agency published a final rule mandating airspace users to equip ADS-B avionics by 2020. However, as we have previously reported,[21] FAA faces a number of challenges to realize the full range of ADS-B benefits. These include (1) finalizing requirements for capabilities to display traffic information in the cockpit, (2) modifying the systems controllers rely on to manage traffic, (3) addressing broadcast frequency congestion concerns, (4) implementing procedures for separating aircraft, and (5) assessing security vulnerabilities. We recently initiated an audit to update our prior work on FAA's implementation of ADS-B and will continue to monitor the Agency's progress in these critical areas.[22]

FAA Faces Challenges in Establishing Clear Lines of Accountability for Managing and Implementing SWIM

While FAA recently revised its implementation strategy for the SWIM program, key challenges remain in stabilizing requirements and establishing firm timelines. SWIM is expected to form the basis for a secure network that manages and shares information more efficiently among the air traffic systems that will comprise NextGen. Key benefits expected from SWIM are streamlined data communications and real-time information that will improve air traffic management, enhance airspace capacity, reduce flight delays,

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[21] OIG Report Number AV-2011-002, "FAA Faces Significant Risks in Implementing Automatic Dependent Surveillance-Broadcast System and Realizing Benefits," October 12, 2010.

[22] OIG Audit Announcement Number 12A3004A000, "Audit Initiated of FAA's Automatic Dependent Surveillance – Broadcast (ADS-B) Program," May 14, 2012.

and decrease costs for FAA and aviation users. In June 2011,[23] we reported that FAA had yet to establish clear lines of accountability for overseeing SWIM's development and management, making it difficult to implement requirements and control the program's cost and schedule. As a result, FAA increased costs for SWIM's first segment by more than $100 million (original estimate was $179 million) and delayed its completion by at least 2 years.

Since our 2011 report, FAA has revised its implementation approach, due in part to cost and schedule issues with ERAM. FAA now plans to develop and deploy a new system to provide SWIM en route flight plan services without impacting ERAM. Additionally, FAA has approved an additional $120 million to support the first phase of the second segment, which will assist FAA in transitioning to a new common infrastructure for SWIM air traffic systems. This is a critical first step in FAA's goal of moving from a decentralized to a centralized process where all NAS data are managed and shared over a common infrastructure to support NextGen improvements. However, FAA's previous management challenges remain. Without stable and consistent requirements and clearly defined program priorities, the true cost and timeline to deploy SWIM and the realization of expected benefits will continue to be unknown.

FAA Faces Industry Concerns With DataComm Plans

Developing and implementing DataComm will be a complex, high-risk effort, and industry officials have expressed skepticism about FAA's ability to deliver the program. DataComm will provide two-way data communications between controllers and pilots, similar to wireless e-mail. Like ADS-B, FAA faces challenges with integrating DataComm with multiple FAA automation systems. Total acquisition costs for DataComm are uncertain, but FAA estimates that they could be as much as $3 billion.

FAA plans to implement DataComm in two segments. In May 2012, the Agency approved approximately $741.5 million through 2019 for the first phase of segment one to implement departure clearance services in the tower environment. However, this phase relies on using a data link capability that already exists, which the Agency acknowledges provides limited benefits. The majority of NextGen benefits from DataComm will emerge from the second phase of segment one, which will support the development of en route services. However, FAA has already delayed plans to deploy DataComm's en route capabilities from 2016 to 2018, and the Agency has yet to schedule a final investment decision for this phase to approve the effort's cost and schedule.

Until FAA makes a final investment decision on when the majority of the benefits for the en route services (e.g., routine data communications) will be provided, users are likely to remain skeptical and reluctant to equip—especially since the Agency abandoned a similar

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[23] OIG Report Number AV-2011-131, "FAA's Approach to SWIM Has Led to Cost and Schedule Uncertainty and No Clear Path for Achieving NextGen Goals," June 15, 2011.

communications program[24] in 2005 due to concerns about cost growth and schedule delays. These concerns resulted from unplanned, additional integration requirements that posed a risk to the program as well as concerns over how quickly airlines would equip with the avionics.[25]

FAA Lacks an Integrated Master Schedule To Manage NextGen

Dividing larger programs into smaller more manageable segments—as FAA has done for ADS-B, SWIM, and DataComm—can reduce some risks in the short-term. However, this approach also obscures visibility into the true total timelines and costs of FAA's overall NextGen efforts. As requirements continue to evolve, programs are left with no clear end-state, and decisionmakers lack sufficient information to assess progress. Moreover, delays with one program can significantly slow another, since the programs have complex interdependencies with FAA's existing automation and communications systems.

In an April 2012 report, we recommended that FAA establish firm costs and schedules and an integrated master schedule to manage the implementation of all NextGen programs.[26] Since our report, FAA has begun developing an integrated schedule and populating it with some of the transformational programs' planned capabilities. However, the Agency continues to identify the additional type of data required, such as key system dependencies, to fully populate the schedule. Without a complete master schedule, FAA will continue to be challenged to fully mitigate operational, technical, and programmatic risks, and prioritize trade-offs among its NextGen programs.

CONCLUSION

While FAA has demonstrated its commitment to improve the management of NextGen and its major acquisitions, the Agency continues to face significant challenges and risks with developing and implementing NextGen initiatives and delivering the benefits envisioned by the RTCA task force. FAA's efforts to reorganize to better manage NextGen are in the early stages, and must be done in concert with effectively improving airspace efficiency at congested airports, resolving problems with ERAM, and addressing uncertainty with the NextGen transformational programs. These challenges are significant and will require sustained management attention and action to safeguard taxpayers' investment while improving NAS efficiency and safety. We will continue to monitor the results of FAA's organizational changes and efforts to improve the management of NextGen.

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[24] Controller-Pilot Data Link is a method by which air traffic controllers can communicate with pilots over a datalink system, similar to wireless email.

[25] OIG Report Number AV-2004-101, "Observations on FAA's Controller-Pilot Data Link Communications Program," September 30, 2004.

[26] OIG Report Number AV-2012-094, "Status of Transformational Programs and Risks to Achieving NextGen Goals," April 23, 2012.