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

Statement of
The Honorable Calvin L. Scovel III
Inspector General
U.S. Department of Transportation

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 an important and necessary transportation infrastructure project to modernize our nation's aging air traffic system. It is also 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 increases and delays 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. While FAA has taken important steps to improve NextGen's management, such as establishing a new program management office, the Agency has made little progress in shifting from planning to implementation and delivering benefits to airspace users.

Today, I will focus on three priorities the Agency must address to realize NextGen's benefits: (1) addressing underlying causes for difficulties in advancing NextGen, (2) maximizing near-term benefits of new performance-based navigation routes and procedures, and (3) keeping the implementation of critical automation systems on track.

IN SUMMARY

FAA's difficulties in advancing NextGen and transforming the National Airspace System (NAS) stem from a number of underlying causes, including the lack of an executable plan and unresolved critical design decisions. For example, FAA's initial plans for NextGen did not address implementation costs or how technologies would be developed or integrated. Also key to NextGen's success is integrating new performance-based navigation (PBN) routes and procedures at key airports in order to maximize near-term benefits and gain user support. Yet, FAA's lengthy procedure development process has delayed the implementation of new routes, and unresolved obstacles, such as the lack of updated controller policies and procedures, make it uncertain when airspace users can expect widespread benefits. Advancing NextGen also depends on successfully deploying new automation systems that controllers use to manage air traffic. However, FAA continues to face technical, cost, and schedule risks with its efforts to modernize or replace automation systems at terminal facilities because the Agency has not identified and finalized all needed software and hardware requirements. Furthermore, despite recent progress with the En Route Automation Modernization System (ERAM)—a multibillion dollar program for processing flight data—considerable work remains to complete the effort in 2014 as currently planned.

BACKGROUND

NextGen involves a significant and much needed overhaul of the NAS to shift from outdated ground-based air traffic management systems to more effective satellite-based systems. 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.

To accomplish NextGen's long-term goals, Congress mandated in 2003 that FAA create a plan to implement NextGen by 2025. While FAA's initial planning focused on this timeframe, the Agency more recently emphasized near- and mid-term initiatives. The following table highlights FAA's NextGen initiatives and modernization programs underway and their expected benefits.

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 two-way data communication between controllers and flight crews for improved cruise and transition operations to enable more efficient use of available or forecast NAS capacity.
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 NAS flight data.
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.

To solidify Government and industry commitments, FAA asked RTCA[1] to examine NextGen operational improvements planned for the 2012 to 2018 timeframe, help develop plans to maximize NextGen benefits, and justify investment in mid-term

---

[1] 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 system issues. It functions as a Federal advisory committee.

capabilities. The task force made 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.

LACK OF AN EXECUTABLE PLAN, UNRESOLVED CRITICAL DESIGN DECISIONS, AND ORGANIZATIONAL CHALLENGES HAVE HINDERED NEXTGEN PROGRESS

To date, FAA's progress in implementing NextGen has not met the expectations of Congress and industry stakeholders largely due to several underlying programmatic and organizational weaknesses: (1) the lack of an executable plan given unstable requirements, (2) unresolved critical design decisions, (3) organizational culture and frequent turnover in NextGen leadership, and (4) undefined benefits. These weaknesses have contributed to stakeholder skepticism about NextGen's feasibility and reluctance to invest in NextGen.

FAA Continues To Lack an Executable NextGen Plan

FAA's NextGen plans—which initially targeted completion for 2025 at a cost of $40 billion—have lacked realistic strategies for achieving a system that could handle three times more air traffic while reducing FAA's operating costs. Weaknesses in FAA's plans were demonstrated early with the Agency's 2005 progress report to Congress.[2] Specifically, the report did not address implementation costs, establish priorities, specify sequencing for specific airports and airspace, or detail how needed technologies would be developed or integrated. Instead, the report focused on eight strategies for transforming the NAS, such as how to use weather information to improve on-time performance.

Throughout FAA's initial planning efforts, the Agency did not validate whether planned programs would provide needed capabilities, were technically feasible, and would be affordable for FAA or airspace users. In 2009, an internal FAA study[3] found that the Agency's NextGen plans were not risk-adjusted to realistically reflect what was technologically feasible and therefore could not be implemented as promised. The study concluded that implementing NextGen would cost significantly more than the initial $40 billion estimate and take as much as 10 years longer than originally planned.

FAA has been unable to set realistic plans, budgets, and expectations for key NextGen programs, largely due to a lack of firm requirements for NextGen's most critical capabilities. As we reported in April 2012,[4] requirements continue to evolve for major

---

[2] FAA, "2005 Progress Report to the Next Generation Air Transportation System Integrated Plan," March 2006.
[3] Joint Planning and Development Organization (JPDO), "Portfolio Analysis Report," 2009—also referred to as the "Trade Space Analysis." The JPDO commissioned the report for FAA to meet Federal requirements to develop a business case for its 2011 NextGen budget request.
[4] *Status of Transformational Programs and Risks to Achieving NextGen Goals* (OIG Report No. AV-2012-094), Apr. 23, 2012. OIG reports and testimonies are available on our Web site at http://www.oig.dot.gov.

transformational programs[5] such as ADS-B and DataComm. Therefore, decisionmakers and stakeholders lack sufficient information—including reliable cost and schedule estimates for achieving NextGen's goals of enhancing capacity and reducing delays—to assess progress and risk.

FAA Has Not Resolved Key Design Decisions That Will Shape NextGen Requirements, Timing, and Costs

FAA will continue to face difficulties with setting firm requirements for NextGen capabilities because several critical design decisions are still unresolved. Without a clear vision of needed capabilities, NextGen's benefits, timing, and costs—as well as its integration into the NAS—remain uncertain.

Key unresolved design decisions that will determine NextGen capabilities, timing, and costs include the following:

- **Air/Ground Division of Responsibility.** FAA has not decided how much responsibility for tracking aircraft will be delegated to pilots in the cockpit versus what duties will remain with air traffic controllers and ground systems.

- **Level of Automation.** FAA has not decided on the degree of human involvement in air traffic management and separating aircraft, which is key to establishing technical requirements for NextGen. Possible options range from today's largely manual flight management to a mostly automated system centered on machine-to-machine exchanges with little controller involvement.

- **Facility Requirements.** FAA has not decided on the number and locations of air traffic facilities needed to support NextGen. In July 2012,[6] we recommended that FAA develop comprehensive and regularly updated cost estimates for its effort to realign and consolidate the Nation's network of air traffic control facilities into centralized locations. FAA concurred with our recommendation but has since scaled back its plans and will focus only on an integrated facility in the New York metropolitan area.

FAA's Organizational Culture and Frequent Changes in Leadership Contribute to Difficulties in Advancing NextGen

FAA's difficulties in advancing NextGen technologies also stem from underlying organizational and management challenges, including an organizational culture that has been slow to embrace NextGen's transformational vision. For example, a 2010–2011

---

[5] FAA has identified six "transformational programs," which are to provide the foundational technologies and infrastructure needed for NextGen. These programs are Automatic Dependent Surveillance Broadcast (ADS-B), System Wide Information Management (SWIM), Data Communications (DataComm), NextGen Network Enabled Weather (NNEW), NAS Voice System (NVS), and Collaborative Air Traffic Management Technologies (CATM-T).

[6] *The Success of FAA's Long-Term Plan for Air Traffic Facility Realignments and Consolidations Depends on Addressing Key Technical, Financial, and Workforce Challenges* (OIG Report No. AV-2012-151), July 17, 2012.

study conducted at FAA's request,[7] referred to as the Monitor Study, found that the Agency's culture was resistant to the type of significant change needed to achieve NextGen and lacked a sense of urgency. Similarly, officials we spoke with cited a resistance to change as a stumbling block to advancing NextGen.

Both the Monitor Study and our interviews suggest that FAA's highly operational, tactical, and safety-oriented culture can lead to a risk-averse outlook that is slow to embrace change, resulting in an organization that prioritizes day-to-day operations over more strategic and policy-driven change over time. Moreover, as we have previously reported in 2010,[8] FAA's culture is reluctant to embrace outside technologies and has historically not leveraged the work of other departments—such as the U.S. Department of Defense's research and development related to surveillance and security of aircraft.

Organizational instability and inconsistent leadership have also undermined FAA's efforts to establish a culture that could effectively advance NextGen. Since 2003, FAA has had five Administrators, and was without a confirmed Administrator from December 2011 until January 2013. In addition, FAA's current Deputy Administrator was only recently appointed after about a 4-month vacancy, and FAA has yet to permanently fill the Assistant Administrator for NextGen position, which has been vacant since December 2012. Stakeholders we interviewed expressed that frequent turnover in senior leadership has hindered a consistent message and a shared vision for NextGen, along with limiting accountability for NextGen problems and lack of progress.

Since the NextGen effort began in 2004, FAA has undergone several reorganizations intended to assign responsibility, accountability, and authority for NextGen.[9] FAA announced its most recent major reorganization in 2011, which included establishing a new Program Management Office to bridge the gap between NextGen's strategic requirements and program implementation. While such actions could better position NextGen for success, it is too early to assess the overall effectiveness of this change, and it remains unclear how these changes will ultimately advance NextGen.

We are currently conducting an audit further examining FAA's reorganization and the underlying causes for FAA's delays in implementing NextGen, and expect to issue our report later in 2013.

---

[7] Between July 2010 and June 2011, the Monitor Group studied FAA's governance, processes, capabilities, and culture.
[8] *Timely Actions Needed To Advance the Next Generation Air Transportation System* (OIG Report No. AV-2010-068), June 16, 2010.
[9] For example, in May 2008, FAA announced a reorganization of its NextGen efforts, which included establishing a Senior Vice President for NextGen and Operations Planning within the ATO and an office for NextGen Integration and Implementation to support the Senior Vice President. Similar to the 2011 reorganization, FAA believed the change would help move NextGen closer to implementation.

Undefined NextGen Benefits Have Led to Industry Skepticism and Reluctance To Invest in NextGen Systems

NextGen's success depends in part on obtaining buy-in from key stakeholders—particularly airspace users, who elect to purchase and install costly NextGen avionics in their aircraft to achieve NextGen capabilities. Without widespread equipage, such as advanced avionics that will be required for ADS-B and DataComm, FAA will be unable to markedly increase capacity or save fuel through NextGen systems.

FAA recognizes the importance of industry participation and engages stakeholders through various forums, such as RTCA and the NextGen Advisory Committee (NAC),[10] as it works to establish near- and mid-term objectives for NextGen. Despite these efforts, consensus on NextGen priorities beyond the near-term has not been reached, and questions remain between FAA and industry regarding what benefits will be achieved and when. Moreover, as we have previously reported and testified, FAA has not clearly defined the benefits of key NextGen initiatives for enhancing capacity, reducing delays, and reducing operating costs. As a result, airspace users are skeptical about FAA's ability to deliver the technologies and related benefits and remain reluctant to equip with costly NextGen technologies.

Breakdowns in past FAA efforts have also fueled airspace users' reluctance to invest in new technologies—especially if the technologies may later be discarded. For example, FAA abandoned a much smaller but similar effort to implement a controller-pilot data link communications program[11] that was expected to play an important role in enhancing air capacity and reducing flight delays. FAA and industry jointly invested in the program and began using data linking on a limited basis. However, FAA terminated the program in 2005 because of cost growth and technical issues. User concerns and a lack of clearly defined benefits with NextGen technologies have triggered debate among FAA and industry about the need for equipage incentives, such as Government-backed grants or loan guarantees.

In response to these and other concerns, FAA convened a joint FAA-industry RTCA task force in 2009 to identify the major obstacles to user NextGen acceptance.[12] The task force framed several overarching issues for guiding FAA and industry investments and made a series of recommendations to the Agency to address them. For example, the task force emphasized that assigning responsibility, accountability, authority, and funding within FAA is critical to accomplish all associated tasks and achieve NextGen benefits.

---

[10] The NAC is a Federal advisory committee that will develop recommendations for NextGen portfolios 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.

[11] The controller-pilot data link communications program represented a new way for controllers and pilots to communicate that was analogous to wireless email. The program was planned for use at en route centers that manage high-altitude air traffic. Implementing this program—and obtaining expected benefits—required joint investments by FAA and airspace users.

[12] RTCA, "NextGen Mid-Term Implementation Task Force Report," September 9, 2009.

In 2012, we reported[13] that while FAA quickly endorsed the task force's recommendations by incorporating them into its NextGen strategic plans and budgets and establishing a mechanism for continued industry collaboration, the Agency has made limited progress in implementing them. Continued uncertainty about FAA's efforts to resolve the safety, policy, training, and organizational issues addressed by the task force could further deter industry's commitment to invest in NextGen technology.

OBSTACLES FACING IMPLEMENTATION OF NEW PERFORMANCE-BASED NAVIGATION ROUTES UNDERMINE EFFORTS TO MAXIMIZE NEAR-TERM BENEFITS AND ENSURE USER SUPPORT

Introducing new performance-based navigation (PBN) procedures, such as Area Navigation (RNAV) and Required Navigation Performance (RNP),[14] is critical to achieving near-term NextGen benefits, including more direct flight paths, improved on-time aircraft arrival rates, greater fuel savings, and reduced aircraft noise. However, use of PBN procedures has been limited due to unresolved obstacles, such as the lack of updated controller policies and procedures for using PBN and the lengthy flight procedure development process. Although FAA has important PBN efforts underway, these obstacles make it uncertain when airspace users can expect widespread benefits.

Use of PBN Procedures Is Limited

Although FAA has implemented over 100 RNP procedures to date at large airports, the benefits of these procedures remain unrealized because air carriers and airports are not widely using them. In 2012, FAA tasked MITRE[15] to obtain and analyze data to measure the use of PBN procedures and quantify their benefits. According to our analyses of MITRE's preliminary data, RNP use is high at some small- to medium-sized airports, such as Oakland, CA, but overall RNP use is low, particularly at busy airports, such as those in the New York City area. Notably, at the six large airports[16] where FAA has implemented advanced PBN procedures with curved approaches to runways,[17] only about 3 percent of eligible airline flights[18] actually used them.

---

[13] *Challenges With Implementing Near-Term NextGen Capabilities at Congested Airports Could Delay Benefits* (OIG Report No. AV-2012-167), August 1, 2012.

[14] RNAV is a method of navigation in which aircraft use avionics, such as Global Positioning Systems, to fly any desired flight path without the limitations imposed by ground-based navigation systems. RNP is a form of RNAV that adds on-board monitoring and alerting capabilities for pilots, thereby allowing aircraft to fly more precise flight paths.

[15] MITRE Corporation manages a research and development center for FAA, the Center for Advanced Aviation System Development.

[16] The six large airports are: Reagan National, Dulles International, Chicago Midway International, LaGuardia International, Newark Liberty International, and John F. Kennedy International.

[17] Curved approaches to runways improve the use of airspace by allowing aircraft to avoid critical areas of terrain or conflicting airspace, thus increasing capacity.

[18] An eligible flight is one in which (1) the aircraft was authorized to fly the RNAV/RNP procedure and (2) the flight was in a position to join the procedure.

Several obstacles have undermined FAA's efforts to increase use of PBN procedures. For example, according to a March 2012 FAA internal study and a June 2013 NAC report,[19] a key obstacle at busy metroplex locations is the lack of controller tools to manage mixed operations—that is, merging aircraft using straight-in approaches with those on curved paths.[20] Other reported obstacles include the lack of clear procedure design objectives, outdated controller procedures, and the lack of standard training for pilots and controllers. Recognizing the importance of addressing these obstacles, FAA tasked a team with developing an action plan, but it remains unclear as to when they will issue a report on the team's plan.[21]

FAA is also working to streamline its process for implementing new procedures in response to improvements from an internal FAA review—the NAV Lean project.[22] In September 2010, FAA reported numerous problems with the process, such as the lack of an expedited method for approving procedures that have only minor revisions, inconsistent interpretation of environmental policies and guidance, and inconsistencies in data. To address these problems, FAA made 21 recommendations for streamlining the process for deploying new procedures. In June 2011, FAA issued its plan for executing the 21 recommendations and to date has implemented 4. However, FAA does not expect to complete the entire NAV Lean initiative until September 2015. We plan to issue a report on FAA's NAV Lean progress later this year.

Key PBN Projects Are Underway, but Benefits Remain Uncertain

In 2010, FAA launched its metroplex initiative—a 7-year effort to improve the flow of traffic and efficiency at congested airports in 13 major metropolitan areas.[23] The metroplex project is a step in the right direction to achieving the near-term benefits of reduced congestion, as it involves introducing new PBN procedures. While FAA has completed initial studies or begun design work at 9 of 13 metroplex locations, it has only begun the implementation phase for one location—Houston, TX. According to FAA, airline procedure design and other issues have caused delays at the first two sites (Washington, DC and North Texas), and some metroplex activities were recently halted or delayed due to sequestration.

---

[19] NAC (in response to tasking from FAA), "Recommendation for Increased Utilization of Performance Based Navigation (PBN) in the National Airspace System (NAS)," June 2013.

[20] According to MITRE, other causal factors, such as weather or operational conditions that do not necessitate the use of PBN instrument approaches, can also affect RNP use.

[21] The PBN Action Team was formed to develop mitigations to obstacles impacting the implementation and operational use of PBN procedures. Three NATCA representatives and three FAA management representatives identified 31 obstacles with corresponding action plans for mitigations; however, the plans have not yet been approved by FAA management.

[22] NAV Lean was a cross-agency project to streamline policies and processes used to implement instrument flight procedures in response to a 2009 joint FAA-industry task force report recommendation. FAA used the "Lean Management Process" to identify areas of waste.

[23] The 13 metroplex locations are: Atlanta, Charlotte, Chicago, Houston, Memphis, Northern California, North Texas, Phoenix, Southern California, Washington, DC, Cleveland/Detroit, and South/Central Florida.

Additionally, in March of this year, after 4 years of planning and development, FAA began publishing new PBN procedures as part of its Greener Skies[24] project in Seattle. According to FAA, the Agency found errors with some of the new procedures and has ongoing efforts to fully implement them. However, controllers will not be able to optimize the use of these procedures until FAA completes critical safety studies—due this September—and deploys new controller automation decision support tools. As a result, it is uncertain when users will see widespread benefits and whether this model can be applied NAS-wide.

As we reported in August 2012,[25] industry representatives have expressed concerns that FAA has not yet integrated efforts from other related initiatives, such as better managing airport surface operations.[26] In addition, many airspace users that are equipped with advanced avionics would like more advanced PBN procedures than FAA's current efforts provide—specifically, those that regularly allow for more precise and curved approaches.

FAA FACES PROGRAMMATIC AND COST RISKS WITH NEXTGEN'S AUTOMATION SYSTEMS

FAA's goals for NextGen in the near- and mid-term ultimately depend on the success of its ongoing efforts to deploy new automation systems that controllers rely on to manage air traffic. FAA cannot maximize new PBN routes or implement NextGen technologies (such as ADS-B and DataComm) without delivering new automation platforms for controllers in terminal airspace (near airports) and en route (high altitude) airspace. However, despite recent progress, FAA continues to face technical, cost, and schedule risks with both its Terminal Automation Modernization/Replacement (TAMR) program—FAA's effort to modernize terminal air traffic control facilities—and ERAM—a $2.1 billion system for processing en route flight data.

FAA Faces Significant Cost, Schedule, and Technical Risks in Modernizing or Replacing Automation at Terminal Facilities

FAA's TAMR program aims to modernize or replace all of the automation systems that controllers rely on to manage traffic at terminal facilities with a single automation platform—the Standard Terminal Automation Replacement System (STARS). If effectively implemented, TAMR is expected to reduce Agency costs and facilitate the implementation of NextGen capabilities. TAMR currently involves modernizing automation systems at 11 terminal facilities, 7 of which are the largest and busiest in the Nation. FAA estimates this effort will cost $438 million and be completed between 2015 and 2017.

---

[24] Greener Skies is an airspace redesign project focused on using PBN procedures to reduce environmental impact of air traffic around Seattle-Tacoma International Airport.

[25] *Challenges With Implementing Near-Term NextGen Capabilities at Congested Airports Could Delay Benefits* (OIG Report No. AV-2012-167), August 1, 2012.

[26] Surface operations include the management of airport taxiways, gates, and parking areas.

However, as we reported in May 2013,[27] the Agency faces significant cost, schedule, and technical risks to modernize these facilities. Specifically, FAA has yet to identify and finalize all software and hardware requirements that are needed to successfully replace the existing automation system[28] with STARS. Finalizing these requirements involves extensive software development and testing—a lengthy and potentially costly process should issues arise in testing. FAA is currently developing software to address 94 requirements gaps but anticipates identifying more gaps once it begins transitioning to STARS at the busiest facilities. Moreover, because full STARS capability at the 11 terminal facilities is still years away, FAA continues to add new capabilities to existing systems at select facilities to support air traffic operations. The longer FAA must maintain and update existing systems at these sites, the greater the implementation and cost risk because FAA will have to add the same new capabilities to STARS.

Our audit also found that FAA's current cost and schedule estimates for its TAMR effort may not be reliable. For example, FAA's approved program schedule does not include detailed milestones for software testing and implementation, and was not assessed for risk per Agency requirements. In addition, FAA's cost estimates exclude major program cost elements, such as an estimated $270 million in technical refresh[29] and modernization costs. As a result, the true timelines and costs to modernize terminal automation remain unknown.

We made a number of recommendations to better and more cost efficiently manage FAA's terminal modernization efforts. FAA concurred or partially concurred with our recommendations and has begun working to address them.

FAA Is Making Considerable Progress Toward Getting ERAM on Track, but Critical Work on Complex Facilities and Key Capabilities Remains

FAA's NextGen goals depend on the successful deployment of ERAM—a $2.1 billion system for processing flight data at en route locations. Without ERAM, FAA will not realize the key benefits of NextGen's transformational programs, such as new satellite-based surveillance systems and data communications for controllers and pilots. FAA originally planned to complete ERAM by the end of 2010, but significant software problems impacted the system's ability to safely manage and separate aircraft and raised questions as to what capabilities ERAM would ultimately deliver. As a result, FAA rebaselined the program in June 2011, pushing its expected completion to 2014 and increasing cost estimates by $330 million.

---

[27] *FAA's Acquisition Strategy for Terminal Modernization Is at Risk for Cost Increases, Schedule Delays, and Performance Shortfalls* (OIG Report No. AV-2013-097), May 29, 2013.
[28] Common Automated Radar Terminal System (CARTS-IIIE) is the existing automation system currently at the 11 large terminal facilities.
[29] Technical refresh or technology refreshment is associated with keeping fielded products, systems, and services maintained and operational.

FAA is making considerable progress with fielding ERAM. The Agency is now using ERAM at 16 of 20 sites either on a full- or part-time basis—a significant step forward given the extensive problems at the two initial sites. FAA plans for all 20 sites to achieve full operational capability and to decommission[30] the legacy system by August 2014. However, as FAA deploys ERAM to the Nation's busiest facilities, such as those in the New York and Washington, DC area, it expects to identify new problems that could impact cost and schedule. FAA is currently spending about $12 million a month on the ERAM contract, excluding NextGen efforts funded through the contract. If the current contract burn rate does not decline significantly, the Agency will need additional funds to complete this stage of the program.[31]

Moreover, controllers and experts continue to raise concerns about ERAM's capabilities. While these issues are not expected to delay ERAM's 2014 implementation, they will need to be addressed for the system to support most NextGen initiatives.

● **Flight Plan Trajectory Modeler—**This capability models aircraft flight paths to predict aircraft collision conflicts and to ensure accurate handoffs between controllers as they communicate with pilots who transit to airspace controlled by another facility. However, the modeler software has often required adjustments to change the flight plan trajectory to ensure accurate handoffs. According to controllers, improvements are needed to support current operations and NextGen capabilities that use trajectory-based operations.[32]

● **Aircraft Tracking and Sensor Fusion—**This capability allows ERAM to integrate—or "fuse"—multiple radars and satellite-based information for controllers. However, thus far, controllers have not been able to take advantage of this improved capability because of problems with the ability to track aircraft accurately and consistently. A MITRE analysis found that the ERAM tracker will require adjustments to use ADS-B and radar together to manage air traffic.

CONCLUSION

NextGen is a necessary and complex undertaking—one that involves cutting edge technologies, new procedures, and a myriad of stakeholders whose priorities may conflict. Given these complexities, it is essential that FAA develop an executable plan with firm requirements, resolve critical design decisions, and address other underlying causes for delays in advancing NextGen. Until FAA implements new performance-based

---

[30] Decommissioning involves the disconnection, removal, and disposal of the HOST computer system once ERAM has been declared operationally ready at a site.

[31] The Office of Management and Budget approved shifting $44 million from the ERAM operations and maintenance account to the facilities and equipment (F&E) account, increasing total ERAM F&E funding to $374 million. As of February 2013, FAA had spent a total of $241.86 million—about 64.7 percent of the $374 million in F&E funding allocated since the June 2011 rebaseline.

[32] Trajectory-based operations focus on more precisely managing aircraft from departure to arrival with the benefits of reduced fuel consumption, lower operating costs, and reduced emissions.

routes and procedures at congested airports and develops important NextGen automation systems, NextGen benefits will remain unrealized. FAA's recent reorganization is a step toward improving the management and direction of these efforts, but sustained leadership, with clear lines of accountability and authority, will be key to achieving intended outcomes.