
Office of Inspector General

Audit Report

**ADDRESSING UNDERLYING CAUSES FOR
NEXTGEN DELAYS WILL REQUIRE SUSTAINED
FAA LEADERSHIP AND ACTION**

Federal Aviation Administration

Report Number: AV-2014-031
Date Issued: February 25, 2014





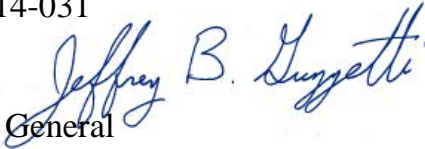
Memorandum

U.S. Department of
Transportation

Office of the Secretary
of Transportation
Office of Inspector General

Subject: **ACTION:** Addressing Underlying Causes for
NextGen Delays Will Require Sustained FAA
Leadership and Action
Federal Aviation Administration
Report No. AV-2014-031

Date: February 25, 2014

From: Jeffrey B. Guzzetti 
Assistant Inspector General
for Aviation Audits

Reply to
Attn. of: JA-10

To: Federal Aviation Administrator

Over the past 8 years, the Federal Aviation Administration (FAA) has been working to develop the Next Generation Air Transportation System (NextGen)—a multibillion-dollar program intended to fundamentally change air traffic management and meet anticipated surges in air travel. As required by law,¹ FAA developed the National Airspace System (NAS) Enterprise Architecture (EA)—a sweeping blueprint for making sound investments across FAA’s entire air traffic organization, including NextGen. The EA emphasizes investing in projects with reasonable costs and solid risk management strategies and includes specific milestones for acquisition, policy, and executive decisions needed to deliver NextGen capabilities.

While FAA is making progress with elements of NextGen, our work continues to find longstanding problems with cost increases, schedule slips, and performance shortfalls with NextGen-related air traffic control projects. In 2010, FAA commissioned a study to determine how the Agency could better position itself to execute NextGen.² In September 2011, FAA introduced its Foundation for Success initiative, which included reorganizing the Agency’s structure and establishing a new Program Management Office (PMO) responsible for NextGen implementation and other major air traffic control acquisitions. Despite these

¹ The Clinger-Cohen Act (formerly the Information Technology Management Reform Act), Pub. L. No. 104-106 (1996); codified at 40 U.S.C. § 11101, *et seq.* (2011).

² Between July 2010 and June 2011, the Monitor Group—a management consulting firm specializing in such areas as organization and leadership—studied FAA’s governance, processes, capabilities, and culture.

important steps, the Agency has made little progress in shifting from planning to implementation and delivering benefits to airspace users.

Concerned about limited NextGen progress, the Chairmen and Ranking Members of the House Transportation and Infrastructure Committee and its Subcommittee on Aviation requested that we provide an update on FAA's progress with key NextGen decisions and examine the root causes for longstanding challenges. Accordingly, we (1) determined FAA's progress on key NAS EA decisions related to achieving NextGen capabilities, (2) identified underlying causes for FAA's delays in advancing NextGen, and (3) assessed FAA's recent reorganization to improve the management and execution of NextGen initiatives.

We conducted our audit work in accordance with generally accepted Government auditing standards. Exhibit A details our scope and methodology.

RESULTS IN BRIEF

From January 2009 through May 2013, FAA made 157 key NextGen-related decisions in its NAS EA, including critical investment decisions for automation systems that controllers rely on to manage air traffic, an important foundation for NextGen. However, other key EA decisions have not yet been made, such as investments needed for a NextGen weather-related system that was scheduled for 2010. In addition, FAA has deleted or replaced decisions without a clear understanding of how postponing these decisions could affect NextGen's progress. Overall, the EA's usefulness as a strategic planning tool for guiding NextGen's implementation has been limited due to (1) incomplete information on decisions that have an impact on NextGen progress; (2) a lack of policy and guidance that establish criteria for defining "high-priority" decisions; and (3) unresolved design decisions that will determine NextGen capabilities, timing, and costs, such as the level of automation that can reasonably be accommodated by controllers.

Longstanding programmatic and organizational challenges—many of which we have previously reported—further undermine NextGen's progress. FAA's NextGen plans—which initially targeted completion for 2025 at a cost of \$40 billion—were overly ambitious, and FAA has yet to develop an executable implementation plan that addresses costs and technology development and integration. At the same time, key modernization projects that are needed to implement NextGen capabilities, such as the En Route Automation Modernization (ERAM) project,³ have experienced delays and are not yet

³ ERAM is a \$2.5 billion program to replace and enhance the existing hardware and software at facilities that manage high-altitude air traffic; FAA considers it a foundational component of NextGen and critical to meeting its goals for increasing airspace capacity and reducing flight delays.

complete. An FAA-commissioned study⁴ and senior FAA officials cited organizational culture as a major stumbling block to advancing NextGen. For example, the study and officials indicated the Agency lacks a sense of urgency for advancing NextGen and is resistant to large-scale change. Frequent turnover in leadership along with fragmented accountability and authority have further complicated FAA's progress. These weaknesses have contributed to stakeholder skepticism about NextGen's feasibility and reluctance to invest, particularly efforts that require airspace users to purchase and install costly new avionics in their aircraft to achieve NextGen capabilities.

It remains unclear whether FAA's recent reorganization—the Agency's third such reorganization in 10 years—will be adequate to meet NextGen's complex management needs. FAA's decision to elevate the NextGen Office—creating an Assistant Administrator for NextGen who reports directly to the Deputy Administrator—may better position the Agency to bridge the gap between maintaining daily operations and implementing new capabilities intended to transform the NAS. In addition, FAA believes the newly established PMO will centralize the management of key major acquisitions and enable the sharing of best practices. However, FAA has been slow to fill key leadership positions and has not clearly defined the relationships and decisionmaking authority among its most senior leaders. The reorganization's success will depend in part on effectively linking the PMO and the NextGen Office—a relationship that is evolving. Finally, FAA has not developed performance indicators to assess whether the reorganization is achieving the expected outcomes.

We are making recommendations to FAA to provide greater visibility into critical NextGen decisions and to assist in achieving a successful reorganization outcome.

BACKGROUND

Over the next 2 decades, FAA expects air travel to increase substantially. To address this surge, FAA has been working to develop NextGen, which is expected to provide safer and more efficient air traffic management. NextGen involves a significant overhaul of the NAS to shift from outdated ground-based air traffic management systems to more effective satellite-based systems. In 2003, Congress mandated⁵ that FAA establish the Joint Planning and Development Office (JPDO) and that it create and carry out plans for implementing NextGen by 2025.

⁴ The Monitor Study team interviewed more than 100 FAA executives, former FAA employees, representatives from the Department of Transportation, and other stakeholders. They also surveyed over 2,500 managers representing a cross-section of the Agency, across lines of business and staff offices. The survey addressed FAA personnel's view points on barriers to performance.

⁵ Vision 100—Century of Aviation Reauthorization Act, Pub. L. No. 108-176 (2003).

FAA's NAS EA—a key strategic planning tool for transforming the Nation's air traffic system—includes 14 roadmaps with numerous NextGen integration and investment decision points (DP). These decisions indicate FAA's approval of (1) a particular improvement/sustainment initiative, (2) an investment decision that must precede implementation of an improvement initiative, or (3) the research and/or analysis needed prior to an investment decision or implementation. The EA and supporting roadmaps and decision points are approved annually by the Joint Resources Council (JRC).⁶

Since 2006, we have reported and testified extensively on FAA's progress and challenges with advancing NextGen. In 2008, we reported⁷ that decisions on transitioning to NextGen depend heavily on an EA, but the NAS EA did not detail how FAA will complete the transition. In 2010 we reported⁸ FAA had not made a number of high-priority decisions for advancing NextGen that were scheduled for 2009.⁹ Moreover, we identified a number of actions needed to move NextGen from planning to implementation. Among them was setting realistic expectations and firm requirements for what can be achieved in the mid-term and the associated risks. A full list of our body of work to date can be found in exhibit C.

FAA HAS MADE SOME KEY NAS EA DECISIONS, BUT THE IMPACT ON NEXTGEN PROGRESS IS UNCLEAR

From January 2009 through May 2013, FAA made 157 decisions in its NAS EA, such as investments related to automation systems for controllers. However, many other decisions remain unresolved or have either been deleted or replaced without a clear understanding of the impact. Additionally, the EA's usefulness as a strategic planning tool is limited because it does not provide a complete picture of all decisions critical to NextGen implementation, nor does it stipulate the criteria for high-priority decisions. Ultimately, NextGen's progress, benefits, and expectations for transforming the NAS will be uncertain until FAA resolves several critical design decisions, such as determining the level of automation that can reasonably be accommodated by controllers.

NAS EA Continues To Evolve

Each year, FAA updates its NAS EA roadmaps and DPs to reflect adjusted assumptions, changes in existing or planned systems, and other revisions that

⁶ JRC is an FAA executive governance board responsible for the approval and oversight of major systems acquisitions.

⁷ *Air Traffic Control Modernization: FAA Faces Challenges in Managing Ongoing Projects, Sustaining Existing Facilities, and Introducing New Capabilities*, (OIG Report No. AV-2008-049), April 14, 2008. OIG reports are available on our Web site at <http://www.oig.dot.gov/>.

⁸ *Timely Actions Needed to Advance the Next Generation Air Transportation System* (OIG Report No. AV-2010-068) June 16, 2010.

⁹ We reported that the EA contained more than 340 key decisions to reach envisioned mid-term capabilities. FAA identified 51 DPs for fiscal year 2009, but the Agency had only made 11 decisions.

affect its air traffic organization. The updates are approved by JRC and communicated to stakeholders. According to FAA, changes in program funding, approach, or available technology drive the annual updates.

Between January 2009 and May 2013, FAA completed 157 DPs (see table 1). However, during this same period, as table 1 shows, 355 decisions originally in the EA were deleted and 47 were replaced by another decision.¹⁰

Table 1. Status and Evolution of Enterprise Architecture DPs

Status of Decision Points		January 2009	May 2013	Change
Active	Decision ongoing	262	255	-7
Completed	Decision reached	32	189	157
Deleted	Decision removed from EA	22	377	355
Replaced	Replaced by another decision	9	56	47

Source: OIG Analysis of NAS EA DP Database

As of May 2013, FAA completed 45 of the 198 decisions that the EA identified as “high-priority” at that time. For example, FAA completed a final investment decision¹¹ for modernizing the current air traffic automation system used to optimize the flow of aircraft as they approach and depart airports. FAA also approved the final investment decision for NextGen transformational¹² programs, such as for segment 2A of the System Wide Information Management (SWIM)¹³ program.

Of the 56 high-priority decisions that remain active, 18 have been pushed out by 3 years or more from the original target dates. For example, the initial investment decision for the NextGen Weather Processor—part of FAA’s efforts to improve how weather information is used to reduce delays—was scheduled for 2010, but is now expected in 2013. According to FAA, this target date was impacted by technical issues and other delays in earlier acquisition decisions.

¹⁰ The number of decisions in the EA is not static—new decisions are added while existing ones may be completed, replaced, deleted, or delayed. Determining the number of additions and delays was not possible.

¹¹ A Final Investment Decision is an acquisition milestone decision where the FAA through its JRC approves an overall investment and the cost and schedule parameters, as well as the specific performance requirements the program is expected to accomplish.

¹² NextGen has six “transformational programs” that are to provide the 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).

¹³ As envisioned, SWIM will form the basis for a secure network that manages and shares information more efficiently among all air traffic systems that will comprise NextGen. Segment 2A assists with transitioning to a common messaging infrastructure.

Although revisions to the EA are to be expected, FAA does not always clearly justify the changes. For example:

- FAA deleted investment decisions for upgrading and evolving legacy NAS facilities to accommodate NextGen technologies. However, the Agency did not provide a clearly documented justification for this change or its impact on related decisions, such as needed investments for communications equipment.
- JRC approved FAA's change to push 12 of 14 investment-related decisions from 2012 to 2013, but the explanation for the change and its related impact on other roadmaps—some of which contain the same decisions—is not clearly documented.
- JRC delayed a key decision for a runway safety tool that enables air traffic controllers to detect potential runway conflicts. Specifically, the decision involved determining whether the tool's preliminary requirements and viable alternatives were sufficiently defined to move to an investment decision. Even though delaying this early decision would likely delay other related decisions, such as the investments needed, FAA did not reflect these changes in the EA.

Understanding the consequences of changes in decisions is key because the EA should present integrated decisions and synchronized investments needed to deliver NextGen capabilities. Without this information, FAA decisionmakers are unable to fully assess risk, set priorities, and manage investment portfolios to avoid potential delays in interdependent programs.

The NAS EA Has Limitations for Planning the Transition to NextGen

According to FAA, the NAS EA is intended for executives and stakeholders to see the “big picture” and to understand when critical milestones for important investments must occur. FAA relies heavily on the EA to prepare its annual NextGen Implementation Plan—a key outreach vehicle for updating Congress and the aviation community on the vision for NextGen and the commitments in support of that vision.

However, the EA is insufficient as a strategic planning tool to manage NextGen portfolios, reduce costs, prevent duplication of effort, improve efficiency and interoperability, or communicate the Agency's goals. For example, two factors that limit the EA's usefulness for transitioning to NextGen:

- **Incomplete identification and status of critical NextGen-related decision points.** FAA's EA does not clearly identify all decisions related to achieving a particular NextGen capability or operational improvement. While the EA database includes a data field to identify NextGen-related decisions, the data and the status of decisions over time are not captured. Moreover, FAA

officials told us they are evaluating whether to continue to include this data field. However, without this information, FAA decisionmakers do not have a full and accurate picture of DPs critical to NextGen implementation, including schedule adjustments, to track its progress.

- **Insufficient documented criteria for what constitutes a high-priority decision point.** Although FAA has general guidance for EA development and identifies some DPs as high-priority, the Agency lacks a specific policy or guidance that establishes criteria for this designation. As a result, FAA decisionmakers lack reliable indicators for determining the highest priority operational improvements or investments that may be needed to implement NextGen. FAA officials acknowledged the need for documented criteria for designating DPs as high-priority.

Recognizing the importance of the NAS EA, Congress directed FAA in the FAA Modernization and Reform Act of 2012¹⁴ to have the National Research Council¹⁵ review the EA, NextGen’s software development approach, and safety and human aspects in NextGen’s design. The review is underway.

Key Design Decisions That Will Shape the NAS EA and Future NextGen Requirements, Timing, and Costs Remain Active

Several design decisions that are fundamental for shaping the EA and ultimately defining key NextGen requirements and capabilities have not been completed. For example:

- **Division of Air-Ground Responsibility.** FAA has not decided how much responsibility for tracking aircraft will be delegated to pilots in the cockpit versus the duties that 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 aircraft separation, 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.

Without a clear vision of such requirements and capabilities, NextGen’s benefits, timing, and costs—as well as its integration into the NAS—remain uncertain.

¹⁴ Public Law 112-95, signed into law on February 14, 2012. The FAA Modernization and Reform Act of 2012 includes provisions intended to advance NextGen and enhance FAA’s management of its modernization efforts.

¹⁵ The NRC is an organization established to improve government decisionmaking and public policy in matters involving science, engineering, technology, and health.

PROGRAMMATIC AND ORGANIZATIONAL CHALLENGES FURTHER UNDERMINE NEXTGEN PROGRESS

FAA's lack of progress in advancing NextGen has been further undermined by multiple underlying programmatic and organizational challenges, including the lack of an executable plan, delays in fielding foundational air traffic management hardware and software, frequent changes in senior leadership, and an industry that remains reluctant to invest in NextGen.

FAA Continues To Lack an Executable NextGen Plan With Firm Requirements

FAA's NextGen plans—which initially targeted completion for 2025 at a cost of \$40 billion—have proven to be overly ambitious. Weaknesses in FAA's plans were demonstrated early on. Specifically, the Agency's 2005 progress report to Congress¹⁶ 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 broad 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 were technically feasible and affordable for FAA and airspace users, or even if they would provide needed capabilities. In 2009, FAA's Portfolio Analysis Report¹⁷ showed that the Agency's NextGen plans were not risk-adjusted to reflect technological maturity and therefore could not be implemented as promised. For example, the study concluded that NextGen, as originally envisioned, was going to cost significantly more than the estimated \$40 billion and could not be implemented before 2035. Some estimates at that time suggested the costs for the Government and airspace users would be as much as \$150 billion—with the cost to airspace users to equip with a wide range of NextGen avionics as the major cost driver.

While the study led FAA to rethink what was realistically achievable by 2025, the Agency continues to lack realistic strategies for achieving a system that can handle three times more air traffic while reducing FAA's operating costs. For example, the study called for a disciplined approach to establishing new research priorities and developing requirements for aircraft avionics versus ground systems, but these issues remain unresolved.

¹⁶ FAA, "2005 Progress Report to the Next Generation Air Transportation System Integrated Plan," March 2006.

¹⁷ JPDO, "Portfolio Analysis Report," 2009. This analysis—done to meet OMB requirements for the fiscal year 2011 budget and for building a business case for NextGen—examined the costs, risks, and benefits of the JPDO Integrated Work Plan targeted for 2025.

FAA’s inability to set realistic plans, budgets, and expectations for key NextGen programs is largely due to a lack of firm requirements for NextGen’s most critical capabilities. As we reported in April 2012,¹⁸ requirements continue to evolve for major transformational programs,¹⁹ such as Automatic Dependent Surveillance–Broadcast (ADS-B) and Data Communications (DataComm). Without firm requirements, decisionmakers and stakeholders cannot develop reliable cost and schedule estimates for achieving NextGen’s goals, much less assess progress and risk.

Delays in FAA’s Modernization Programs Impact NextGen’s Transformational Programs

FAA has gradually redefined NextGen to include key modernization programs. While these programs were not initially part of the NextGen transformational umbrella, they are considered “foundational” to moving NextGen forward. However, including foundational programs poses the risk of shifting focus away from FAA’s transformational NextGen goals because the foundational programs are experiencing delays. Specifically, FAA cannot implement transformational NextGen technologies, such as ADS-B and DataComm, without delivering new, foundational automation platforms for controllers in terminal airspace (near airports) and en route (high altitude) airspace.

FAA continues to face technical, cost, and schedule risks with two foundational programs: the Terminal Automation Modernization Replacement (TAMR) program and ERAM.

- TAMR 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. If effectively implemented, TAMR is expected to reduce Agency costs and facilitate the implementation of NextGen capabilities.²⁰ However, as we reported in May 2013,²¹ the Agency faces significant cost, schedule, and technical risks to modernize these facilities.
- FAA originally planned to complete ERAM—a \$2.5 billion system for processing en route flight data—by the end of 2010, but significant software problems impacted the system’s ability to safely manage and separate aircraft. FAA rebaselined the program in June 2011, pushing its expected completion to

¹⁸ *Status of Transformational Programs and Risks to Achieving NextGen Goals* (OIG Report No. AV-2012-094), Apr. 23, 2012.

¹⁹ See footnote 12.

²⁰ 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 through 2015.

²¹ *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.

2014 and increasing cost estimates by \$330 million. FAA is making considerable progress with fielding ERAM, but as FAA deploys ERAM to the Nation's busiest facilities—such as those in the New York and Washington, DC, areas—it expects to identify new problems that could impact cost and schedule. 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.

In addition, planned operational concepts, such as Trajectory-based Operations (TBO)²²—an ERAM capability that is foundational for other NextGen initiatives—are turning out to be more difficult than expected to develop. In May 2009, FAA identified TBO as key to NextGen transformation.²³ However, controllers and experts continue to raise concerns about ERAM's capability to model aircraft flight paths to predict aircraft collision conflicts and ensure accurate handoffs as pilots transit from one facility's controlled airspace to another's. The modeler software has often required adjustments to change the flight plan trajectory and ensure accurate handoffs. Controllers confirmed that improvements are needed to support current operations and NextGen capabilities that use TBO.

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

FAA has been slow to embrace NextGen's transformational vision. A study commissioned in 2010 at FAA's request, referred to as the Monitor Study, found that the Agency's organizational culture was resistant to the type of significant change needed to achieve NextGen.²⁴ Officials we spoke with similarly cited a lack of urgency and a resistance to change as stumbling blocks to advancing NextGen.

The Monitor Study and interviews we conducted with FAA and industry officials suggest that FAA's highly operational, tactical, and safety-oriented focus can create a risk-averse culture in which day-to-day operations have priority over more strategic and policy-driven changes. Moreover, as we reported in 2010,²⁵ FAA 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—indicating a culture that is reluctant to embrace outside technologies.

²² TBO focuses on more precisely managing aircraft from departure to arrival with the benefits of reduced fuel consumption, lower operating costs, and reduced emissions.

²³ JPDO, "Communicating FAA's NextGen Challenge," May 28, 2009.

²⁴ See footnote 4.

²⁵ *Timely Actions Needed To Advance the Next Generation Air Transportation System* (OIG Report No. AV-2010-068), June 16, 2010.

Organizational instability and gaps in leadership have also undermined FAA's efforts to 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 a 4-month vacancy, and the Assistant Administrator for NextGen position, which had been vacant since December 2012, was not filled until September 2013. 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.

Delays in Defining NextGen Benefits Deepen Industry Skepticism and Reluctance To Invest

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),²⁶ 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 noted in numerous reports and testimonies, 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 program²⁷ 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

²⁶ 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.

²⁷ 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.

basis. However, cost growth and technical issues prompted FAA to terminate the program in 2005. 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 NextGen acceptance.²⁸ The task force framed several overarching issues for guiding FAA and industry investments, such as:

- Users are willing to support FAA communications, navigation, and surveillance infrastructure programs that require user investments *only if* those programs provide a clear and unambiguous path to immediate and tangible benefits.
- Focusing on delivering *near-term operational benefits*, rather than on the entire infrastructure, would help gain operator confidence in FAA plans and encourage users to invest in NextGen. A key element for accomplishing this is to obtain industry and FAA agreement on common metrics to measure benefits.
- Assigning responsibility, accountability, authority, and funding within the Agency is critical to accomplish all associated tasks (that is, developing procedures and policy) in order to achieve NextGen benefits.

In 2012, we reported²⁹ 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 investing in NextGen technology.

A FULL ASSESSMENT OF FAA'S RECENT REORGANIZATION IS PREMATURE, ALTHOUGH CONSISTENT LEADERSHIP AND CLEAR ACCOUNTABILITY ARE KEY

FAA's recent reorganization specifically aims to improve the management and direction of NextGen. Several organizational changes—such as linking the PMO and NextGen office and establishing performance indicators to measure

²⁸ RTCA, "NextGen Mid-Term Implementation Task Force Report," September 9, 2009.

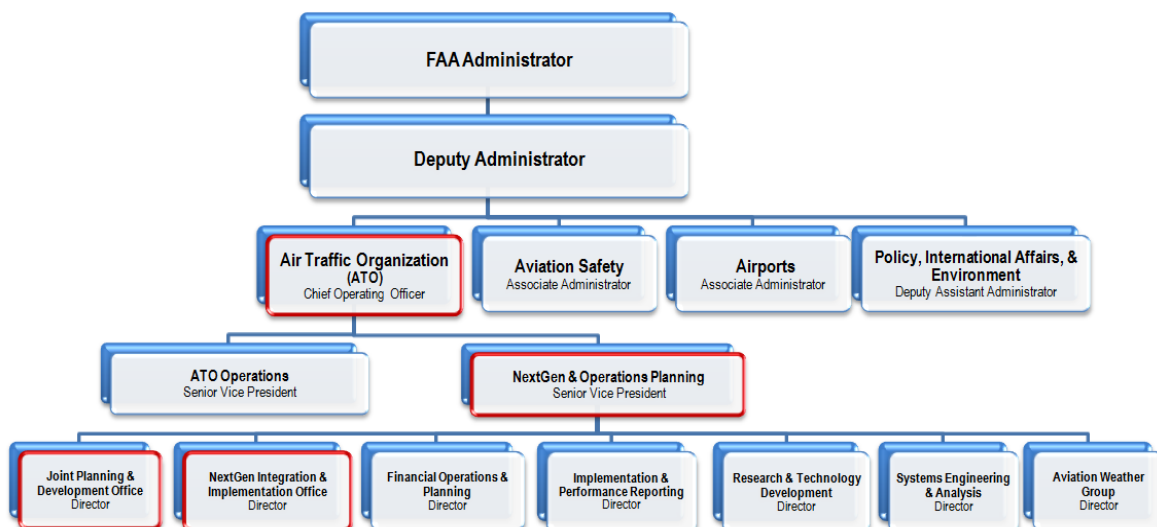
²⁹ *Challenges With Implementing Near-Term NextGen Capabilities at Congested Airports Could Delay Benefits* (OIG Report No. AV-2012-167), August 1, 2012.

progress—could better position FAA to successfully achieve NextGen goals. However, it is too early to fully assess the reorganization’s effectiveness, in part because FAA has been slow to fill key leadership positions and best practices have yet to be captured or implemented.

FAA’s Reorganization To Better Manage NextGen

Before the reorganization, NextGen-related offices were within the Air Traffic Organization (ATO) (see figure 1). According to FAA officials, this structure limited NextGen’s visibility and authority to strategically manage complicated programs that cut across lines of business.

Figure 1. NextGen Leadership Before Reorganization

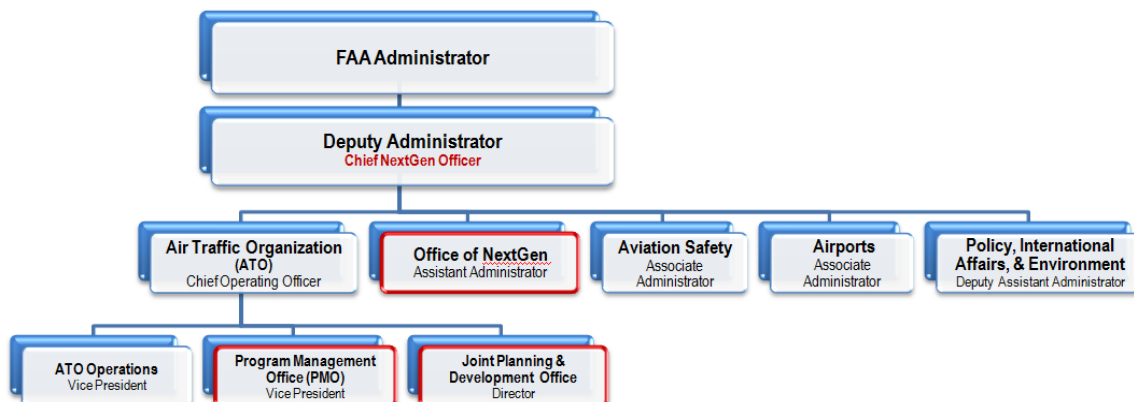


Legend: Red outline depicts NextGen-related organizations.

Source: FAA

Under the 2011 reorganization, FAA elevated the NextGen offices by establishing an Assistant Administrator for NextGen who reports directly to the Deputy Administrator (see figure 2). In May 2012, FAA also established the PMO, which reports directly to the ATO’s Chief Operating Officer.

Figure 2. NextGen Leadership After Reorganization



Legend: Red outline depicts NextGen-related organizations.

Source: FAA

In FAA's view, establishing a NextGen office that reports directly to FAA's Deputy Administrator better positions the Agency to move forward with NextGen. FAA also pointed out that assembling the majority of NextGen programs in one office facilitates communication and emphasizes accountability. Previously, program managers were embedded in several air traffic offices, and program management was viewed as an additional duty rather than a primary responsibility.

FAA also realigned its NextGen committee structure—reshaping the NextGen Management Board (NMB)³⁰ to serve as the Board of Directors for oversight of NextGen strategy and execution. The Deputy FAA Administrator—who also serves as the Chief NextGen Officer—chairs this group. Before the reorganization, there were two separate boards that provided oversight, status, prioritization, and guidance on NextGen initiatives—NMB and the NextGen Review Board (NRB) serving in a supporting role. However, the Monitor Study found that the boards had overlapping responsibilities and members were unclear about their respective roles regarding policy questions and decision rights. Therefore, the study recommended eliminating NRB.

Success of FAA's 2011 Reorganization Will Depend on Resolving Critical Factors

FAA's recent reorganization is the latest in several that have occurred since 2004 intended to assign responsibility, accountability, and authority for NextGen. 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

³⁰ The NMB was formally chartered in 2011. Comprised of representatives from all key FAA lines of business, the NMB serves as an advisory committee to the Chief NextGen Officer—Deputy Administrator.

Implementation to support the Senior Vice President. The 2011 reorganization has the potential for success, but FAA has been slow to fill key leadership positions, and best practices have yet to be captured. Three critical factors will ultimately determine the reorganization's success.

The first factor involves the need for clear lines of responsibility, accountability, and authority. Our audit work and the work of industry task forces have repeatedly reported that satisfying this need is critical to successfully realize NextGen benefits. However:

- FAA has not defined or communicated the relationships and decisionmaking authority among key players in the NextGen governance structure, including the Deputy Administrator, the Assistant Administrator for NextGen, the JPDO, and NMB. This is particularly important given that FAA's culture focuses on running the air traffic system safely on a day-to-day basis and is slow to embrace the sweeping change needed to achieve NextGen.
- Decisionmaking authority has not been clarified in the roles and responsibilities of the Assistant Administrator for NextGen and the Deputy Administrator. The Monitor Study found that FAA's ineffective decisionmaking process—one that lacked structure and was not well understood by stakeholders—was a top barrier to NextGen's performance. Monitor recommended a process that allocated responsibility for the majority of policy-making decisions to the Deputy Administrator—the Chief NextGen Officer—while tactical decisions would be spread between the NextGen Office and the JRC.
- FAA has not clearly defined accountability for program decisions. As part of the reorganization, FAA reshaped NMB's role to provide oversight and ensure accountability of program integration. However, the Board's charter—which has not been updated since November 2011—does not clearly delineate how oversight and accountability should be provided or applied to the decisions involved. NMB is chaired by the Deputy Administrator/Chief NextGen Officer and the charter describes it as a decisionmaking body, but it not clear on where those decisions will stand in relation to other key players, such as the Assistant Administrator for NextGen.
- Finally, FAA has yet to redesignate the JPDO director as an Associate Administrator, which was called for by the FAA Modernization and Reform Act of 2012.

The second factor involves linking the PMO with the NextGen office to improve coordination and share best practices. Linking the PMO with the NextGen office

is critical to bridging the gap between planning, requirements, development, and implementation. However:

- The PMO is still in the process of taking shape, and staffing remains a challenge. Key positions have only recently been filled, due in part to difficulties in finding individuals with the appropriate skill sets. Notably, as NextGen advances, FAA will need a sufficient workforce to manage FAA's increasing acquisition workload. For example, in 2010, FAA awarded seven Systems Engineering contracts to augment FAA's in-house technical and professional capabilities in support of NextGen and other key initiatives.³¹ These contracts will require an unprecedented level of FAA contract oversight.
- FAA has not ensured adequate support for managing interdependencies among diverse programs while integrating systems, such as linking legacy and new systems. For example, FAA is integrating satellite-based technologies (such as ADS-B) with new and existing controller automation systems. According to the Monitor Study, systems engineers with integration skills had previously been funneled to other roles where their skills were not well used. Under the reorganization, FAA attempted to create a central integration function, establishing within the PMO a Systems Integration and Requirements Analysis Directorate to act as the capabilities "integrator" for the program directorates. However, the PMO eliminated this directorate in March 2013, calling into question how FAA intends to ensure effective centralized integration of its most critical NextGen systems.
- FAA has not yet clarified or established policies for how best practices will be captured, communicated, and implemented. FAA envisions that by assembling the majority of NextGen programs within PMO, the Agency will achieve stronger program management, improved consistency and sharing of best practices, and better cost control.

The third factor involves developing performance indicators to measure the Agency's progress in achieving expected reorganization outcomes. Achieving cultural change typically takes 5 or more years to fully implement. A key component of cultural change is measuring adherence to mission, goals, and objectives. However:

- The Agency has not developed performance indicators to assess whether the reorganization has improved (1) collaboration and coordination across Agency lines of business, (2) NextGen's strategic direction, (3) program performance,

³¹ Contracts were for services ranging from air traffic management to cost benefit analysis.

and (4) the use of best practices. The Monitor Study provided a baseline measurement of the organizational climate in the 2010 timeframe.

- FAA has yet to evaluate progress on the organizational transformation. In September 2012, FAA contracted with an outside consultant to evaluate four components of the Agency: structure, resources, competencies, and motivation. However, FAA put the contract on hold due to sequestration.³²

CONCLUSION

NextGen is essential for fundamentally changing air traffic management to meet the future needs of air travel. FAA has made progress with some elements of NextGen and demonstrated its commitment to improving the management of this critical effort. While FAA's NAS EA provides key decision points for transforming the Nation's air traffic organization, the overall blueprint provides limited visibility into achieving future NextGen capabilities. Moreover, FAA's overly ambitious plans for NextGen targeted for 2025 are still proving difficult to execute. Now that a Deputy Administrator—who will serve as the Chief NextGen Officer—has recently been named, the opportunity exists to address many of the barriers to progress, such as a lack of an executable plan and stakeholder skepticism. Nevertheless, advancing NextGen will require sustained leadership attention—with clear lines of accountability and authority—to set realistic expectations and priorities needed to ensure prudent use of taxpayer investments.

RECOMMENDATIONS

We have made a number of recommendations over the years related to addressing underlying causes for limited NextGen progress, such as managing NextGen investments as portfolios, defining requirements, and reducing risk with foundational and transformational programs. We encourage FAA to follow through on those actions underway to implement those recommendations. In this report, to provide greater visibility and understanding of decisions in the critical path of NextGen, we recommend that FAA:

1. Document in its NAS Enterprise Architecture decision point database all decisions that are needed to achieve NextGen capabilities.
2. Develop criteria for high-priority decisions. The criteria should, at a minimum, consider those decisions critical to NextGen implementation and the related impact if a decision slips.

³² P.L.112-25 (Aug.2, 2011). Due to sequestration, which began on March 1, 2013, FAA incurred a \$637 million dollar reduction in funding for the remainder of fiscal year 2013.

3. Document in the updates to the NAS Enterprise Architecture roadmaps the rationale for pushing out, deleting, or changing a decision and its impact on other related decisions in the critical path of NextGen.

To assist in achieving a successful reorganization outcome, we recommend that FAA:

4. Define and communicate the specific relationships and decisionmaking authority among the Deputy Administrator, Assistant Administrator for NextGen, JPDO, and NextGen Management Board.
5. Update the NextGen Management Board's charter to clearly define its oversight role for NextGen.
6. Develop performance indicators to measure the progress of NextGen in meeting the intended goals from the reorganization. These indicators should include progress with regard to collaboration and coordination across Agency lines of business, the ability to set NextGen's strategic direction, and program performance.

AGENCY COMMENTS AND OFFICE OF INSPECTOR GENERAL RESPONSE

We provided FAA with our draft report on November 8, 2013, and received its formal response on January 28, 2014. FAA's response is included in its entirety as an appendix to this report. FAA concurred with four of our six recommendations and partially concurred with two recommendations. FAA's response to recommendations 2 and 5 address the intent of those recommendations and we consider them resolved but open pending completion of planned actions. We are requesting additional information for recommendations 1, 3, 4, and 6, as detailed below.

For recommendation 1, FAA concurred and requested that the recommendation be closed based on its plan to combine the data collection for the NAS EA with the data collection for the NextGen Segment Implementation Plan. However, it is unclear when and if combining these collection efforts will result in more detailed information about the impact of EA decisions on NextGen capabilities. Therefore, we request that FAA submit a planned completion date for when data will be added to the NAS EA that explicitly identifies how and when a decision point will impact the delivery of NextGen capabilities.

For recommendation 3, FAA concurred and described the process the Agency uses to capture the rationale for a decision point change and its potential impact on achieving a technical capability. Although FAA stated that it documents this

process when creating a new decision point or baseline, it is not clear from FAA's response whether the NAS EA roadmaps also document the justification for these changes, or their impact on related decisions, which is the intent of our recommendation. As we note in our report, the NAS EA is intended for executives and stakeholders to see the "big picture" and to understand when critical milestones for important investments must occur. Accordingly, the EA's usefulness as a strategic planning tool to effectively manage NextGen portfolios is diminished when information is omitted regarding why a decision has changed. Therefore, we request that FAA clarify how the rationale for decision changes is reflected in the NAS EA roadmaps.

For recommendation 4, FAA concurred and described the NextGen governance structure and responsibilities of the Deputy Administrator, Assistant Administrator for NextGen, JPDO, and NextGen Management Board in accomplishing the vision and deployment of NextGen. However, FAA did not clearly describe the decisionmaking authority among these key players. As we state in our report, FAA's decisionmaking process lacked structure and was not well-understood by stakeholders, resulting in a significant barrier to implementing NextGen capabilities. Therefore, we request that FAA clarify the specific decisionmaking authority among each of these four key players.

For recommendation 6, FAA concurred in part, citing its Foundation for Success initiative and an existing framework of milestones and governance to drive investment decisions aligned with its NextGen strategy. FAA also referred to other performance metrics in place to track NextGen's progress overall. However, it is not clear from FAA's response how these mechanisms will allow the Agency to specifically measure success in achieving the outcomes expected from elevating the NextGen office and establishing the PMO, such as improved collaboration, coordination, and strategic direction. Therefore, we request that FAA provide specific information describing how it intends to measure and track whether its reorganization efforts are better positioning the Agency to advance NextGen.

ACTIONS REQUIRED

FAA's planned actions for recommendation 2 and 5 are responsive and we consider these recommendations resolved but open pending completion of the planned actions. We are requesting additional information for recommendations 1, 3, 4, and 6, as detailed above. In accordance with DOT Order 8000.1C, please provide this information within 30 days of issuance of this report. Until we receive this additional information, we consider these recommendations open and unresolved.

We appreciate the courtesies and cooperation of FAA representatives during this audit. If you have any questions concerning this report, please call me at (202) 366-0500 or Barry DeWeese, Program Director, at (415) 744-0420.

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cc: DOT Audit Liaison, M-1
FAA Audit Liaison, AAE-100

EXHIBIT A. SCOPE AND METHODOLOGY

We conducted this performance audit between July 2012 and November 2013 in accordance with generally accepted Government auditing standards as prescribed. Those standards require that we plan and perform the audit to obtain sufficient, appropriate evidence to provide a reasonable basis for our findings and conclusions based on our audit objectives. We believe that the evidence obtained provides a reasonable basis for our findings and conclusion based on our audit objectives.

Our audit was conducted at the request of the Chairmen of the House Committee on Transportation and Infrastructure and the House Subcommittee on Aviation to update our June 2010 report.³³ Specifically, our audit objectives were to (1) determine FAA's progress on key NAS EA decisions related to achieving NextGen capabilities, (2) identify underlying causes for FAA's delays in advancing NextGen, and (3) assess FAA's recent reorganization to improve the management and execution of NextGen initiatives.

To determine FAA's progress on key NAS EA decisions related to achieving NextGen capabilities, we obtained and analyzed applicable guidance and policy regarding NAS EA decision points. We reviewed criteria and process for updating the EA and discussed with FAA officials who maintain the decision point database. Given that we relied on the EA decision point database for determining the status of decisions, we performed a limited reliability test to include examining documentation supporting any updates and the audit history files. Based on that analysis, we determined the database to be sufficiently reliable for the purposes of our audit. We then comparatively analyzed NAS EA decision points reports for 2009 and 2013 to determine the current status of the decision points identified in the June 2010 OIG audit report. We reviewed available documentation on the rationale for any deletions or other changes to decision points and the related impact on other decisions. We obtained access to the FAA's internal NAS EA portal database to further review information regarding the status of decision points. We also reviewed previous MITRE studies related to the NAS EA—limitations and context for decision points. To obtain perspectives on these and a number of related issues, to include decision point tracking and the EA's usefulness as a strategic planning tool, we met with FAA officials including the Chief Architect, the Senior Acquisition Executive, former FAA officials responsible for NextGen implementation, and MITRE. We also met with FAA program managers and roadmap leads to understand their roles and responsibilities and how they use the EA. In addition, we attended public meetings held to discuss the National Research Council's ongoing review of the NAS EA.

³³ *Timely Actions Needed To Advance the Next Generation Air Transportation System* (OIG Report No. AV-2010-068), June 16, 2010.

To identify underlying causes for FAA's difficulties in advancing NextGen, we reviewed previous OIG and Government Accountability Office (GAO) audit reports and testimonies for a historical perspective on air traffic control modernization program implementation challenges and to identify common themes, such as organizational culture issues. We reviewed independent studies on NextGen issues commissioned by FAA from the National Academy of Public Administration (NAPA). We obtained and analyzed FAA's original and current NextGen plans to understand the extent to which the Agency validated whether planned programs would provide needed capabilities, were technically feasible, and would be affordable for FAA or airspace users. We also attended industry-sponsored conferences and symposiums to gain a perspective of stakeholder concerns regarding NextGen progress. In addition, we interviewed the RTCA Inc. president and attended NextGen Advisory Committee (NAC) and subcommittee (NACSC) meetings. During these meetings, we engaged industry members as appropriate to obtain their perspective on NextGen progress and underlying causes for limited progress. Moreover, we met with current and former FAA officials responsible for NextGen planning and implementation to discuss NextGen progress. See exhibit B for a complete list of organizations visited or contacted.

To review FAA's recent reorganization to improve the management and execution of NextGen initiatives, we examined the Monitor Study's diagnostic survey results as well as other past OIG and GAO audit reports that identified cultural issues and internal studies commissioned by the FAA, such as NAPA's *Identifying the Workforce to Respond to a National Imperative*. We met with FAA officials (and Monitor Group) to understand the Monitor Study's results, rationale for the organizational changes, and current status of these efforts. We analyzed previous FAA reorganization efforts and organization charts from 2002 to 2012. We met with FAA and industry officials to obtain perspectives on the outcome of previous reorganizations as well as whether the current reorganization will better position NextGen for success and challenges. We analyzed decisionmaking authority and responsibilities for NextGen leadership before and after the reorganization to understand changes and discussed with responsible FAA officials.

EXHIBIT B. ORGANIZATIONS VISITED OR CONTACTED

FAA Headquarters:

- Office of the Administrator/Chief of Staff

Air Traffic Organization/Program Management Office (PMO):

- Office of the Vice President
- Program Control
- Air Traffic Systems

NextGen Organization:

- Office of the Assistant Administrator/Deputy Administrator
- Office of the Chief Scientist
- Engineering Services
- Advanced Concepts & Technology Development
- NAS Lifecycle Integration
- NextGen Performance and Outreach

Finance and Management:

- Office of the Assistant Administrator
- Acquisition and Business Services
- Budget and Programs—Capital Budgets

Aviation Safety:

- Office of the Assistant Administrator/Deputy Administrator

Other FAA Locations:

- NextGen Branch, Southern Region – Flight Standards Division

Other Organizations:

- Joint Planning and Development Office (JPDO)
- MITRE Corporation/CAASD
- National Air Traffic Controllers Association (NATCA) Headquarters
- RTCA
- Monitor-Deloitte (Formally Monitor Government Venture Services)
- Aerospace Industries Association (AIA)

EXHIBIT C. OIG NEXTGEN-RELATED REPORTS AND TESTIMONIES

Since 2006, our office has reported and testified extensively on FAA's progress and challenges with advancing NextGen. See below for a list of our NextGen-related reports and testimonies. All OIG reports and testimonies are available on our Web site at <http://www.oig.dot.gov/>.

2013

FAA's Progress and Challenges in Advancing the Next Generation Air Transportation System (OIG Testimony No. CC-2013-028), July 17, 2013

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

Improvements to DOT's Governance Processes Are Needed To Enhance Oversight of Major IT Investments (OIG Report ZA-2013-057), March 27, 2013

FAA Has Not Adequately Implemented Security Requirements for Its En Route Automation Modernization System (OIG Report No. FI-2013-028), December 19, 2012

2012

Weaknesses in Program and Contract Management Contribute to ERAM Delays and Put Other NextGen Initiatives at Risk (OIG Report No. AV-2012-179), September 13, 2012

Update on FAA's Progress and Challenges in Advancing the Next Generation Air Transportation System (OIG Testimony No. CC-2012-027), September 12, 2012

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

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

Status of Transformational Programs and Risks to Achieving NextGen Goals (OIG Report No. AV-2012-094), April 23, 2012

2011

Progress and Challenges in Developing and Transitioning to the NextGen Air Transportation System (OIG Testimony No. CC-2011-036), October 5, 2011

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

Actions Needed To Meet FAA's Long-Term Goals for NextGen (OIG Testimony No. CC-2011-016), February 16, 2011

Letter to Chairmen Oberstar and Costello and Ranking Members Mica and Petri Regarding FAA's Efforts To Implement RTCA Task Force Recommendations for NextGen (OIG Correspondence No. CC-2011-001), December 21, 2010

FAA Needs To Implement More Efficient Performance-Based Navigation Procedures and Clarify the Role of Third Parties (OIG Report No. AV-2011-025), December 10, 2010

Exhibit C. OIG NextGen-Related Reports and Testimonies

FAA Faces Significant Risk in Implementing the Automatic Dependent Surveillance-Broadcast System and Realizing Benefits (OIG Report No. AV-2011-002), October 12, 2010

2010

Timely Actions Needed To Advance the NextGen Air Transportation System (OIG Report No. AV-2010-068), June 16, 2010

Challenges in Meeting FAA's Long-Term Goals for the Next Generation Air Transportation System (OIG Testimony No. CC-2010-048), April 21, 2010

Actions Needed To Meet Expectations for Next Generation Air Transportation System in the Mid-Term (OIG Testimony No. CC-2010-001), October 28, 2009

2009

Challenges in Implementing Performance-Based Navigation in the U.S. Air Transportation System (OIG Testimony No. CC-2009-086), July 29, 2009

Federal Aviation Administration: Actions Needed To Achieve Mid-Term NextGen Goals (OIG Testimony No. CC-2009-044), March 18, 2009

2008

Status of FAA's Efforts To Develop the Next Generation Air Transportation System (OIG Testimony No. CC-2008-118), September 11, 2008

Key Safety and Modernization Challenges Facing the Federal Aviation Administration (OIG Testimony No. CC-2008-070), April 17, 2008

Air Traffic Control Modernization: FAA Faces Challenges in Managing Ongoing Projects, Sustaining Existing Facilities, and Introducing New Capabilities (OIG Report No. AV-2008-049) April 14, 2008

2007

Actions Needed To Reduce Risk With the Next Generation Air Transportation System (OIG Testimony No. CC-2007-047), May 9, 2007

Joint Planning and Development Office: Actions Needed To Reduce Risks With the Next Generation Air Transportation (OIG Report No. AV-2007-031), February 12, 2007

2006

Perspectives on the Progress and Actions Needed To Address the Next Generation Air Transportation System (OIG Testimony No. CC-2006-065), July 25, 2006

Observations on Progress and Actions Needed To Address the Next Generation Air Transportation System (OIG Testimony No. CC-2006-032), March 29, 2006

EXHIBIT D. MAJOR CONTRIBUTORS TO THIS REPORT

Name	Title
Barry DeWeese	Program Director
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Audre Azuolas	Writer-Editor
Karen Sloan	Communications Officer




Federal Aviation Administration

Memorandum

Date: January 28, 2014

To: Jeffery B. Guzzetti, Assistant Inspector General for Aviation Audits

From: H. Clayton Foushee, Director, Office of Audit and Evaluation, AAE-1 

Subject: Federal Aviation Administration's (FAA) Response to Office of Inspector General (OIG) Draft Report: Underlying Causes for NextGen Delays

The FAA is completing the Next Generation Air Transportation System (NextGen) foundational infrastructure and implementing new systems, which will continue to increase the efficiency and capacity of the National Airspace System (NAS). With the input of stakeholders, the FAA has accelerated a few elements of NextGen including Performance Based Navigation (PBN).

While we appreciate the OIG's recognition of our progress on many elements of NextGen, we believe that this audit report fails to fully recognize the deliberative actions taken to enhance a strong, efficient, and more effective leadership model for continuous program improvement. Our efforts, including an internal organizational realignment, proactive stakeholder outreach and collaboration, as well as the designation of a Chief NextGen Officer, clearly demonstrate an unwavering commitment to NextGen success.

NextGen will provide a number of benefits for NAS users, our environment, and our economy. FAA's latest estimates predict that by the end of 2020, NextGen improvements will reduce delays by 41 percent compared to today's baseline. The FAA also estimates a 16 million metric ton reduction in carbon dioxide emissions and a 1.6 billion gallon reduction in fuel use through 2020. Delay reduction, fuel savings, and other efficiency improvements will provide an estimated \$38 billion in cumulative benefits to aircraft operators, the traveling public, and the FAA.

RECOMMENDATIONS AND RESPONSES

Recommendation 1: Document in its NAS Enterprise Architecture decision point database all decisions that are needed to achieve NextGen capabilities.

FAA Response: Concur. All decision points and NAS investments, by definition, have an impact on the NextGen program. The Infrastructure Roadmaps depict the state of the NAS as it transitions from the legacy NAS of the early 2000s to that envisioned in the NextGen Concept of Operations (ConOps). From sustainment of legacy infrastructure that NextGen capabilities must leverage, to technical refreshments that include new NextGen capabilities, to completely new

investments for systems dedicated to NextGen operational capabilities; all NAS investments must be considered holistically.

In calendar year (CY) 2012, the NAS Chief Architect implemented capabilities within the NAS Enterprise Architecture (EA) Portal and incorporated additional data coordination within the NAS Infrastructure Roadmap update process to create a more holistic relationship between the NAS Infrastructure Roadmap data (i.e., programs, projects, decision points, etc.) and the projects outlined in the FAA Capital Investment Plan.

This year, by combining NAS EA data collection with NextGen Segment Implementation Plan (NSIP) data collection, data attributes are being added to NAS EA data elements that explicitly identify how and when a decision point will impact the delivery of NextGen products. The FAA believes it has met the intent of this recommendation and requests that it be closed.

Recommendation 2: Develop criteria for high-priority decisions. The criteria should at a minimum, consider those decisions critical to NextGen implementation and the related impact if a decision slips.

FAA Response: Concur. While qualitative criteria for high-priority decisions have been briefed to the roadmap development teams and to the Joint Resources Council (JRC), these criteria do require additional definition and formal governance. Existing criteria and processes for identifying high-priority decisions are currently being refined and will be documented in the next release of the NAS Integrated Systems Engineering Framework (ISEF). The next update of the ISEF is expected by January 31, 2014, and the updated decision point priority criteria will be communicated during the CY2014 NAS Infrastructure Roadmap approval process.

Recommendation 3: Document in the updates to the NAS Enterprise Architecture roadmaps the rationale for pushing out, deleting, or changing a decision and its impact on other related decisions in the critical path of NextGen.

FAA Response: Concur. The NAS Infrastructure Roadmaps, an EA product, are used to define the FAA's plan for the enterprise level system and for project evolution over time. The roadmaps are updated annually and visually depict the acquisition milestones (i.e. decision points (DP), and synchronized investments needed to deliver NextGen. The NAS EA data and any proposed changes, including changes to Infrastructure Roadmap DP, are closely managed per the processes outlined in the NAS ISEF and Configuration Management Plan.

As part of the annual Infrastructure Roadmap update of the approved baseline for DP changes identified, DP owners must submit change request forms to the NAS Chief Architect. The change form captures the rationale for the change, the owner contact information, and the proposed change is posted for comment. Once the comment period closes, the NAS Chief Architect coordinates with program managers, Infrastructure Roadmap Domain Leads, and Investment Portfolio Managers to review and adjudicate all change requests. Cross-infrastructure domain and portfolio discussions and review sessions are held to understand the impact that a change request may have on other projects and corresponding decision points. After comment adjudication, the proposed DP changes are reviewed by the Technical Review

Board, the FAA EA Board, and the JRC. During the reviews, the approval boards discuss the impact the DP changes may have on technical capability realization, the financial landscape, and the internal resources required to complete the DP. Upon JRC approval of the Infrastructure Roadmaps, the new decision point data are uploaded to the NAS EA Portal to be used as the new baseline.

For any out-of-cycle changes and shifts or deletions to Infrastructure Roadmap DP, an Architecture Change Notice (ACN) is submitted for concurrence to the NAS Chief Architect for an Acquisition Quarterly Program Review or JRC Acquisition Management System Review. The ACN details rationale for and NAS impact of the DP change. Specifically, it captures the following:

- **Project Identification:** including the project name, the organization that manages the project, organization designation and Capital Investment Plan number.
- **Brief Explanation of Proposed DP Changes:** including executive level summary information outlining the proposed DP change to the current baseline Infrastructure Roadmaps, and the rationale for the change.
- **Architecture Impacts:** including the impacts a DP date change will have on the NAS, and any interdependent programs. The NAS EA Division coordinates with the project team to identify these impacts.
- **Architect and Lead Information:** including the names, organization titles, phone numbers and email addresses for the Project Lead responsible for the DP, the lead architect responsible for the architecture development for the DP, and any other applicable key points of contact (e.g., Systems Engineering, Finance, etc.).

Based upon these actions, the FAA requests that this recommendation be closed.

Recommendation 4: Define and communicate the specific relationships and decision making authority among the Deputy Administrator, Assistant Administrator for NextGen, JPDO, and NextGen Management Board.

FAA Response: Concur. The management of NextGen calls for a highly effective governance structure, and the agency believes that such a structure is now in place. The agency has taken a comprehensive, cross-agency portfolio approach to NextGen implementation that recognizes the implementation of NextGen as an integrated effort, rather than a series of independent programs. The FAA's Deputy Administrator (ADA), who also serves as the Chief NextGen Officer, leads these efforts and ensures focus on progress and achieving overarching results.

The ADA is responsible for the development and implementation of NextGen, oversees, and provides direction to the Assistant Administrator for NextGen, the Director of the Joint Planning and Development Office (JPDO), and the NextGen Management Board (NMB). Each of these organizations assists the ADA in accomplishing the vision and deployment of all NextGen programs and capabilities.

The Assistant Administrator for NextGen reports directly to the ADA and is responsible for delivering enhanced capabilities, for providing systems engineering services, and for identifying advanced concepts and systems. The Assistant Administrator for NextGen works directly with the NextGen team and the Air Traffic Organization's (ATO) Program Management Office (PMO) to ensure the alignment of requirements, as well as program management and deployment.

The ADA chairs the NMB, a team of FAA executives and outside subject matter experts. The NMB meets monthly and ensures that NextGen capabilities are delivered in a timely, coordinated, and cost-effective manner. The NMB is chartered to provide visibility across lines of business and provides executive oversight of NextGen progress, performance metrics, and makes strategic policy decisions required for fielding and implementation.

The JPDO is responsible for managing inter-agency partnerships and works collaboratively with stakeholders to develop future technological requirements. These partnerships include private-sector organizations, academia, and the other government departments and agencies (Department of Transportation; Department of Commerce; Department of Defense; Department of Homeland Security; National Aeronautics and Space Administration; White House Office of Science and Technology Policy; and the Office of the Director of National Intelligence). The FAA believes that it has clearly addressed this recommendation and requests that it be closed.

Recommendation 5: Update the NextGen Management Board's charter to clearly define its oversight role for NextGen.

FAA Response: Concur in Part. The NMB adopted a charter for oversight of NextGen in the fall of 2011. Specifically, the NMB takes an enterprise approach to:

- Provide oversight of NextGen implementation by monitoring key performance metrics and implementation progress; and
- Resolve policy issues necessary for the successful implementation of NextGen.

As the federal official with overall responsibility for NextGen, the FAA's ADA takes an active lead in further defining the NMB's role in oversight with the support of the Assistant Administrator for NextGen. Since the NMB charter's adoption, the FAA developed a reporting mechanism to review all portfolios in the NSIP, which is the agency's internal planning document for NextGen that ties into the EA. This provides for an improved process targeted at oversight and decision making for NextGen planning and implementation activities. The FAA will review the current NMB charter before June 1, 2014, to determine whether or how the charter should be revised in light of changes that have occurred over time. The FAA will update the charter, if required, and advise the OIG when such a decision is made.

Recommendation 6: Develop performance indicators to measure the progress of NextGen in meeting the intended goals from the reorganization. These indicators should address progress with regard to collaboration and coordination across agency lines of business, the ability to set the strategic direction of NextGen, program performance, and capturing of best practices.

FAA Response: Concur in part. In 2011, the FAA submitted a reprogramming request to the Congressional Appropriations Committees to reorganize some of its internal functions. Known as “Foundations for Success,” this effort was meant to better control costs, improve efficiency, and ensure that decisions are made based upon what is best for the entire agency.

Effective September 23, 2011, the NextGen organization was elevated to an FAA staff office separate from the ATO, with the NextGen Assistant Administrator formally reporting to the FAA’s ADA. This reprogramming change was implemented to:

- Elevate NextGen’s visibility within the FAA;
- Reduce transactional distance between NextGen and non-ATO lines of business; and
- Validate stakeholders’ requests for organizational change.

In May 2012, the FAA created the PMO within the ATO. The PMO was created to consolidate the majority of programs that specialize in program management into one organization. The PMO was designed to:

- Improve consistency of program execution through robust information sharing with stakeholders;
- Institutionalize acquisition best practices and community review of lessons learned; and
- Form a collaborative working relationship with NextGen to help determine, from an air traffic perspective, how to merge NextGen’s vision with solutions that work in the operations environment.

As part of the Foundation for Success effort, the NextGen organization initiated a cross-agency team to address the need for change in process, governance and culture that will result in “One FAA Delivering NextGen.” The Ideas to In-Service (i2i) process was developed to define the collaboration, structure, and coordination required of all FAA lines of business and staff offices to integrate NextGen innovations while maintaining the current system. The i2i process represents a movement away from a system-by-system requirements mentality to a capability level across platforms. The i2i process seeks to provide the necessary structure and governance to address changes to policy, procedures, programs, and systems within a NAS-wide context.

In April 2013, the key principles of i2i were integrated into the FAA’s Acquisition Management System (AMS) to achieve:

Stable NextGen strategic direction

- The NAS ConOps is the governing document specifying how the NAS will evolve over time. Changes to the NAS ConOps are controlled by the NMB to ensure it remains stable, and only the best new concepts are added after careful analyses and validation. The NAS ConOps establishes the foundation for the FAA EA and the roadmaps and for all NAS-related investment activity.

Close cooperation between the PMO, NextGen organization, and other lines of business to sustain safe and secure air transportation services while transitioning to NextGen.

Appendix. Agency Comments

- All lines of business have representation on key FAA governing bodies. This includes the JRC that governs FAA investment decisions, the NMB that governs FAA NextGen technical decisions, and the EA Board that manages the FAA EA.
- Changes to the NAS ConOps are coordinated and validated by “concept steering groups” with members representing all lines of business. Proven and validated changes are approved by the NMB and reviewed by the JRC to ensure they are both technically and financially sound.
- Once the ConOps changes are developed into new NextGen operational capabilities, they must again be reviewed and approved by the NMB and reviewed by the JRC to ensure that they are technically and financially sound.

The FAA believes these changes provide a sound framework of milestones and governance to drive investment decisions aligned with NextGen strategy, monitor NextGen development and deployment progress, and ensure collaboration and coordination across agency lines of business.

The FAA does recognize the value of establishing metrics to track NextGen’s progress, and in the spring of 2013, the FAA began posting the NextGen Performance Snapshots on the FAA’s website (<http://www.faa.gov/nextgen/snapshots/>). These targeted metrics clearly show FAA’s progress in implementing NextGen across the country along with the measurable benefits that are already occurring in the system. This tool allows both users of the system, including airlines, airports, and the general public, to see the benefits of NextGen programs and technologies. In addition, the website posts the PBN Implementation and Usage Dashboard, to track the rollout and utilization of PBN procedures across the country. Finally, the FAA is working with the NextGen Advisory Committee to develop additional metrics to measure NextGen as we progress. The FAA believes it has met the intent of this recommendation and requests that it be closed.