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AUDIT REPORT

OFFICE OF AUDITS

NASA COULD IMPROVE ANALYSES AND
COORDINATION IN SUPPORT OF THE JOINT PLANNING
AND DEVELOPMENT OFFICE TO DEVELOP THE NEXT
GENERATION AIR TRANSPORTATION SYSTEM

OFFICE OF INSPECTOR GENERAL



National Aeronautics and
Space Administration

Final report released by:

signed
Debra D. Pettitt
Acting Assistant Inspector General for Auditing

Acronyms

AA	Associate Administrator
ARMD	Aeronautics Research Mission Directorate
FAA	Federal Aviation Administration
FFC	Future Flight Central
FY	Fiscal Year
GAO	Government Accountability Office
IWP	Integrated Work Plan
JPDO	Joint Planning and Development Office
LaRC	Langley Research Center
NPR	NASA Procedural Requirements
NRC	National Research Council
OI	Operational Improvement
OIG	Office of Inspector General
OMB	Office of Management and Budget
PA&E	Program Analysis and Evaluation
PDM	Program Decision Memorandum
R&D	Research and Development
SCAP	Strategic Capabilities Assets Program

OVERVIEW

NASA COULD IMPROVE ANALYSES AND COORDINATION IN SUPPORT OF THE JOINT PLANNING AND DEVELOPMENT OFFICE TO DEVELOP THE NEXT GENERATION AIR TRANSPORTATION SYSTEM

The Issue

In December 2003, Congress authorized development of the Next Generation Air Transportation System (NextGen) in Public Law 108-176, “Vision 100—Century of Aviation Reauthorization Act,” December 12, 2003. NextGen will replace the Nation’s existing air transportation system by 2025 to accommodate an expected tripling of air travel.

NASA has a significant role in NextGen development. Vision 100 named the Agency to the NextGen Senior Policy Committee. The Committee provides policy guidance for NextGen’s plans, identifies resource needs, and makes legislative recommendations for the new system. Subsequently, in 2006 and 2007, NASA reformulated its aeronautics research programs to align with NextGen as directed by the “NASA Authorization Act of 2005,” December 30, 2005.

Vision 100 also established the Joint Planning and Development Office (JPDO) and directed it to develop and carry out an integrated development plan and to oversee research and development (R&D) on the new system. JPDO’s September 30, 2008, comprehensive NextGen development plan defined 203 R&D activities needed to develop the new system. Of the 203 R&D activities, NASA leads 44 (22 percent) and supports 37 (18 percent). Of the 81 total R&D activities that NASA leads or supports, one weather-related support activity is delegated to the Science Mission Directorate¹ and the remaining R&D activities to the Aeronautics Research Mission Directorate (ARMD).

Our overall audit objective was to determine whether NASA was working effectively with JPDO to accomplish NextGen development. Specifically, we determined whether

- ARMD’s program and project management provided adequate control over and accountability for the NASA-led NextGen R&D activities; and

¹ We did not review the one weather-related R&D activity delegated to the Science Mission Directorate. We limited our review to the 44 NASA-led R&D activities delegated to the Aeronautics Research Mission Directorate.

- NASA had sustained aeronautics research capabilities identified as necessary for NextGen development.

Details of the audit's scope and methodology are in Appendix A.

Results

Overall, we determined that NASA had taken some actions to work effectively with JPDO to accomplish NextGen development. NASA implemented an organizational structure to support JPDO R&D activities, assigning responsibility to accomplish NextGen R&D activities to ARMD. ARMD reformulated programs and projects to execute its NextGen responsibilities, developed program and project plans that support JPDO's plans, assigned responsibility and defined supervisory positions to support the accomplishment of those plans, and established project plan milestones and schedules to ensure progress toward NextGen objectives.

However, concurrent with those actions in support of NextGen, when faced with impending budget reductions, ARMD eliminated or reduced three aeronautics research capabilities that JPDO and NRC had identified as critical for achieving NextGen goals. This resulted in delayed or canceled milestones in two NASA-led projects and affected FAA's development of critical NextGen technologies. ARMD may have been able to minimize the impact on NextGen development, had it conducted benefit-cost analyses and coordinated more effectively with JPDO and FAA on the consequences of its decisions. Processes implemented by JPDO in 2008—research transition teams and a Web-based Joint Planning Environment—should improve coordination and management of NextGen technical and schedule risks.

NASA's Participation in JPDO Processes. In 2008, JPDO implemented two processes—an analysis of R&D activities and research transition teams—that allow JPDO to manage the work scope and risk of R&D activities. In March and April 2008, NASA researchers participated in the analysis of R&D activities with JPDO. The analysis identified the scope of work for each R&D activity and allowed the partners to address areas that were not included in NASA or FAA project plans. NASA personnel also serve on the research transition teams with JPDO and FAA personnel. The teams include researchers, planners, and implementers that work to effectively transfer research products from NASA to FAA. Effective transfer of research products lowers the risk that NASA research products will not meet FAA's technical or schedule needs. In May 2008, JPDO implemented a Web-based application, the Joint Planning Environment, that allows JPDO to communicate planning information to NextGen partners, to integrate research products from the partners, and to manage NextGen technical and schedule risks.

NASA's participation with JPDO on the NextGen Senior Policy Committee, the analysis of R&D activities, the research transition teams, and the Joint Planning Environment application provided adequate control over and accountability for the NASA-led

NextGen R&D activities. Therefore, additional control and accountability for NASA-led R&D activities were not needed within ARMD.

ARMD Reduced Aeronautics Research Capabilities without Adequate Analyses or Coordination. We found that NASA’s decision to eliminate or reduce certain aeronautics research capabilities resulted in delayed or canceled milestones in two NASA projects and affected FAA’s development of critical NextGen technologies.

In 2006, ARMD senior management began reevaluating the Directorate’s priorities and restructured ARMD’s programs and projects to focus on long-term, cutting-edge research (i.e., fundamental research) in anticipation of severe budget reductions. The ARMD budget decreased from \$673 million in FY 2006 to \$447 million in FY 2009, a 34 percent decrease.

At the same time that ARMD was reevaluating its priorities, JPDO and the National Research Council (NRC) identified three specific research capabilities as critical for achieving NextGen goals: (1) a Boeing 757 (B-757) aircraft and flight test components of the Simulation-to-Flight Program, (2) wake turbulence research, and (3) the Future Flight Central (FFC). ARMD management recommended, and NASA approved, eliminating the B-757 flight test capability by October 2006, reducing wake turbulence research, and placing the FFC in standby status. However, we found that ARMD did not conduct adequate analyses prior to recommending the changes, despite JPDO and NRC identifying the capabilities as critical for achieving NextGen goals. In light of the competing priorities—NASA’s and NextGen’s—ARMD officials should have conducted a benefit-cost analysis to support their recommendation and should have coordinated more effectively with JPDO and FAA in order to minimize the impact on NextGen development. The research transition teams implemented by JPDO in 2008 are intended to facilitate more effective coordination and management of technical and schedule risks.

Management Action

In our June 26, 2009, draft of this report, we recommended that the Associate Administrator for ARMD establish policy that ARMD conduct and document a benefit-cost analysis regarding NASA’s investment decisions concerning major capabilities that are needed for NextGen. Analyses should be in accordance with Office of Management and Budget Circular No. A-94, “Guidelines and Discount Rates for Benefit-Cost Analysis of Federal Programs,” October 29, 1992, which recommends that a benefit-cost analysis be used as a management tool when considering changes in Government programs or projects. NASA policy should also require ARMD to use JPDO’s research transition teams to coordinate investment decisions regarding major capabilities that are needed for NextGen.

In response to the draft report, the Associate Administrator for ARMD concurred in principle with the recommendation to establish policy or procedures, or both, to ensure that ARMD conducts and documents benefit-cost analyses in accordance with OMB

Circular A-94. The Associate Administrator stated that the scope of a benefit-cost analysis may be limited because “changes may be required in such a short time,” but that “ARMD will document the justification for the change.” We consider management’s proposed action to be responsive. The recommendation is resolved and will be closed upon completion and verification of management’s corrective action.

The Associate Administrator for ARMD concurred with our recommendation to establish policy for using JPDO’s research transition teams to coordinate investment decisions and stated that the process and structure of the research transition teams, which include oversight from both NASA and FAA officials, satisfies the recommendation. ARMD and JPDO have instituted quarterly meetings to discuss strategic issues, and ARMD will use the quarterly meetings as a venue to coordinate ARMD investment decisions. We consider management’s actions to be responsive, and the recommendation is closed. (See Appendix C for the full text of management’s comments.)

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INTRODUCTION

Background

Next Generation Air Transportation System (NextGen) Legislation. Public Law 106-398, “The Floyd D. Spence National Defense Authorization Act for Fiscal Year 2001,” established the Presidential Commission on the Future of the United States Aerospace Industry. The Commission was formed to study the importance of the domestic aerospace industry to our future economic and national security and to identify actions needed to ensure the future health of the industry. The Commission, in its final report dated November 18, 2002, recommended transformation of the existing air transportation system as a national priority.

Public Law 108-176, “Vision 100—Century of Aviation Reauthorization Act,” December 12, 2003, also known as Vision 100, authorized transformation of the Nation’s air transportation system to NextGen by 2025. Vision 100 established the Joint Planning and Development Office (JPDO) to execute NextGen planning and development. JPDO is a joint initiative of the Departments of Transportation, Commerce, Defense, and Homeland Security; NASA; and the White House Office of Science and Technology Policy. The NextGen Senior Policy Committee, also established by Vision 100, provides policy guidance for NextGen development plans, identifies resource needs, and makes legislative recommendations for the new system.

JPDO Plans. On June 13, 2007, JPDO issued the “Concept of Operations for the Next Generation Air Transportation System,” Version 2.0, to provide a common vision of how NextGen will operate in 2025 and beyond. The Federal Aviation Administration (FAA) reported that the existing system would not be sufficient to meet the anticipated demand for air travel or changes in the industry. In 2007, over 700 million passengers used the system, and FAA forecasts over 1 billion passengers by 2015. As JPDO pointed out in various planning documents, NextGen is expected to do more than just increase capacity—enhancements are also envisioned in the areas of security, safety, and aircraft noise and emission reduction.

JPDO issued two development plans. The “Research and Development Plan for the Next Generation Air Transportation System FY 2009 - FY 2013,” August 31, 2007, details requirements for needed NextGen technologies and identifies responsibilities of each agency. The “Next Generation Air Transportation System Integrated Work Plan: A Functional Outline” (IWP), Version 1.0, September 30, 2008, documents the comprehensive NextGen development plan. The Plans include the following elements:

- Operational improvements (OIs). OIs describe a specific operational transformation needed or an improved level of performance. An OI is realized

using the results from one or more research and development (R&D) activities. The IWP states a target completion date for each OI.

- R&D activities for research or technology development. For each R&D activity, the IWP describes the desired outcome and expected completion date, the OI the activity supports, the lead agency, and any supporting agencies. The IWP defines 203 R&D activities, of which NASA leads 44 (22 percent) and FAA and other participating agencies lead 159 (78 percent). NASA is a supporting agency for 37 R&D activities.

Aeronautics Research Mission Directorate (ARMD) Execution of NextGen. The “NASA Authorization Act of 2005,” December 30, 2005, required NASA to align aviation research projects to provide direct support for NextGen goals. Of the 44 NASA-led R&D activities, NASA delegated one weather-related activity to the Science Mission Directorate² and the remaining activities, as well as overall NextGen responsibility, to ARMD. ARMD implemented an organizational structure for executing NextGen that reflects the intent of Office of Management and Budget (OMB) Circular No. A-123, “Management’s Responsibility for Internal Control,” December 21, 2004. Specifically, ARMD took the following actions:

- Reformulated its programs in 2006 and 2007 to align with NextGen.³
- Developed program and project plans that support the Agency’s NextGen objective.
- Defined program and project management positions and assigned responsibilities to those positions:
 - A Program Director oversees program portfolio formulation, implementation, evaluation, and integration of results with other ARMD/NASA programs.
 - A Principal Investigator is responsible and accountable to the Program Director for the technical objectives and content of the project and for the planning and execution of the project.
 - A Project Scientist is responsible and accountable to the Principal Investigator for the technical content, integrity, innovativeness, and long-term vision of the project and ensures that the highest technical standards are exhibited by the project.

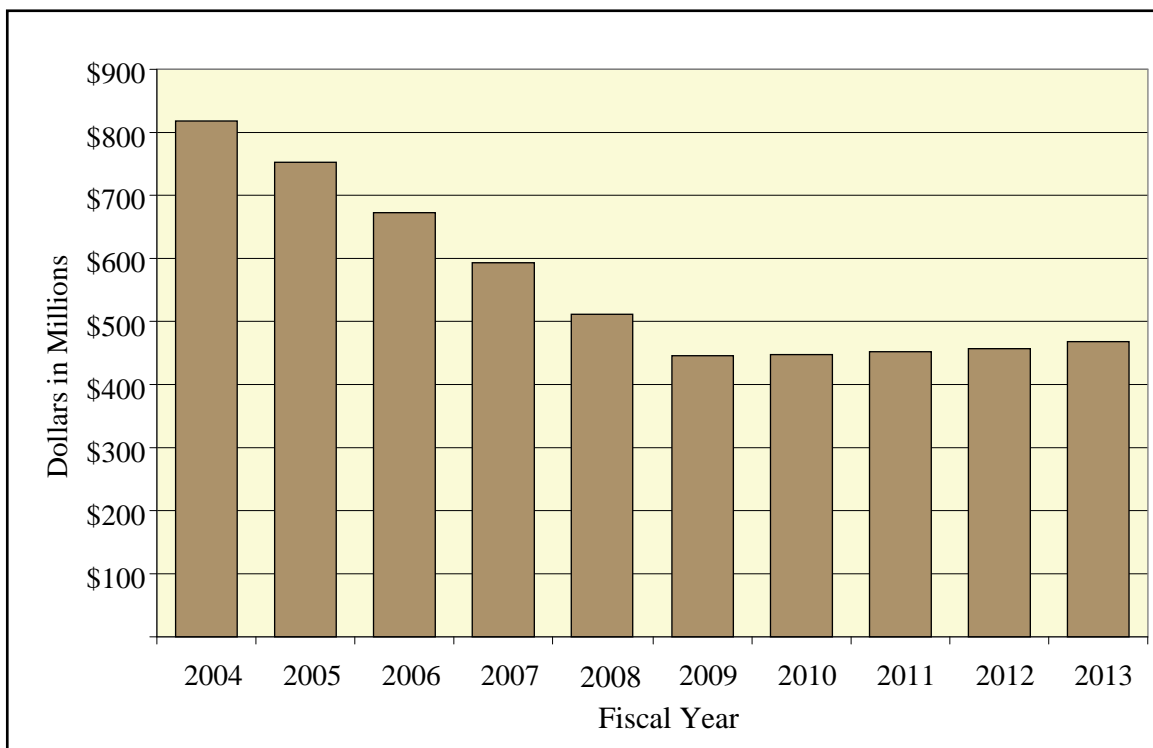
² The audit did not review the weather-related R&D activity delegated to the Science Mission Directorate.

³ According to “A Guide to the Project Management Body of Knowledge, Third Edition,” 2004, published by the Project Management Institute, Inc., which describes project management principles and best practices, a program is a group of related projects managed in a coordinated way to obtain benefits and control not available from managing them individually. The Guide also defines a project as a temporary endeavor undertaken to create a unique product, service, or result.

- A Project Manager is responsible and accountable to the Principal Investigator for developing the project plan and for overseeing the execution of the project with primary responsibility for project fiscal performance.
- An Associate Principal Investigator is responsible and accountable to the Principal Investigator for technical content and task plan contract execution of a specific research topic area.
- Established project plan milestones and schedules. Each research activity is a project plan milestone. The project plan includes a planned completion date, or schedule, for each milestone. Milestones and schedules are regularly reviewed by program and project management.

ARMD Budgets. As shown in Figure 1, ARMD’s budget decreased from FY 2004 through FY 2009. From FY 2009 through FY 2013, ARMD budgets are projected to increase slightly.

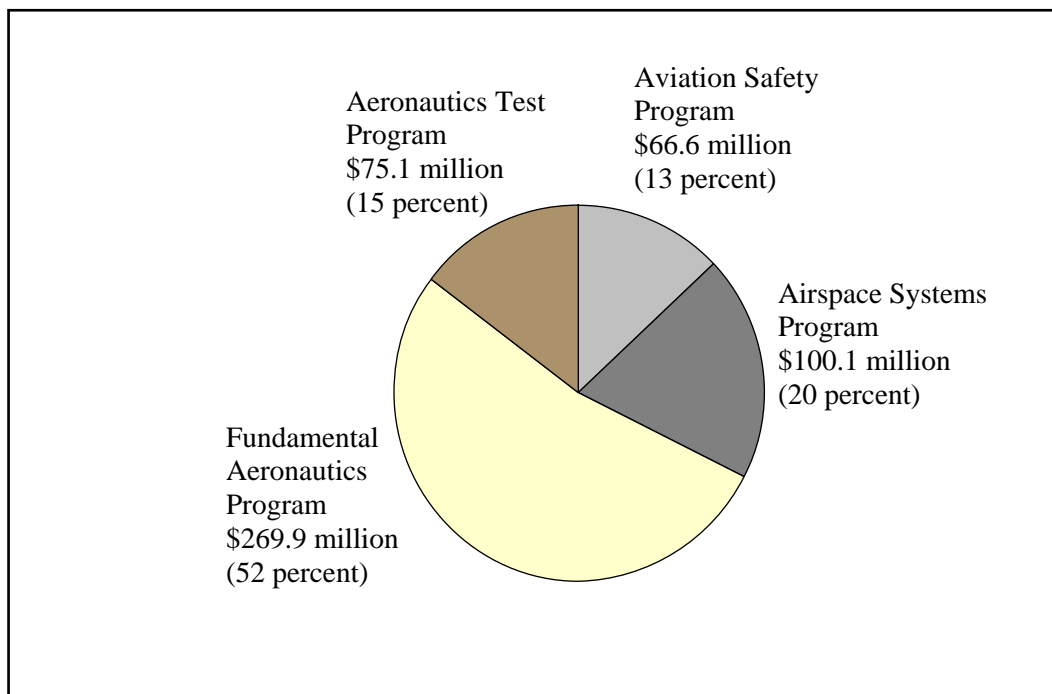
Figure 1. Enacted and Planned ARMD Budgets, FYs 2004 through 2013



Source: Office of Inspector General (OIG) analysis of data provided by ARMD and the President’s Budget for FY 2009

Three ARMD programs provide direct support of NextGen: Airspace Systems, Aviation Safety, and Fundamental Aeronautics. The Aeronautics Test Program provides indirect support to NextGen. Figure 2 shows the four programs' FY 2008 budget, totaling \$511.7 million.

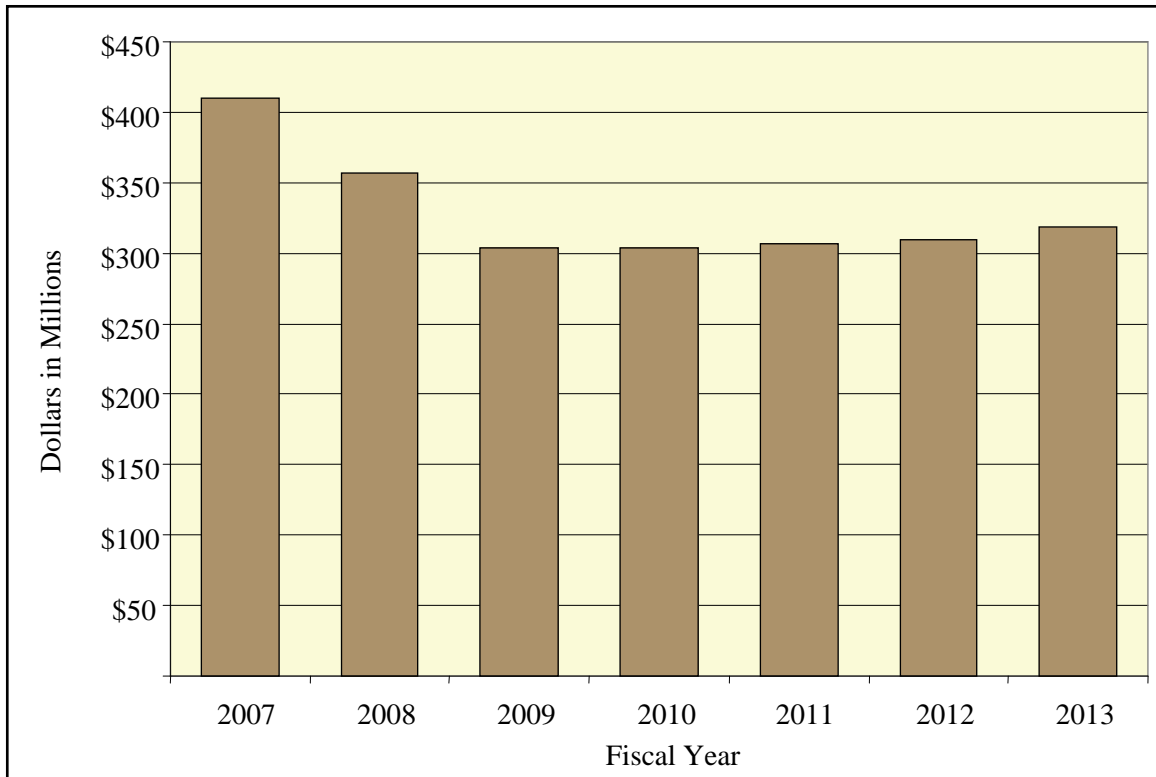
Figure 2. Programs Funded by the FY 2008 ARMD Budget



Source: OIG analysis of the President's Budget for FY 2009

In FY 2007, ARMD reported to FAA that approximately 68 percent of its total budget from FY 2007 through FY 2013 will be expended in direct support of NextGen R&D. Figure 3 displays the dollar amounts reported by NASA to FAA.

**Figure 3. ARMD’s Direct Support of NextGen as Reported to FAA
FY 2007 through FY 2013**



Source: OIG analysis of data provided by ARMD and the President’s Budget for FY 2009

Objectives

Our overall audit objective was to determine whether NASA was working effectively with JPDO to accomplish NextGen development. Specifically, we determined whether

- ARMD’s program management provided adequate control over and accountability for NASA-led NextGen R&D activities and
- NASA sustained aeronautics research capabilities identified as necessary for NextGen development.

See Appendix A for details of the audit’s scope and methodology, our review of internal controls, and a list of prior coverage.

ARMD REDUCED AERONAUTICS RESEARCH CAPABILITIES WITHOUT BENEFIT-COST ANALYSES OR ADEQUATE COORDINATION

From 2006 through 2008, ARMD eliminated or reduced three aeronautics research capabilities: (1) a Boeing 757 (B-757) aircraft and flight test components of the Simulation-to-Flight Program, (2) wake turbulence research, and (3) the Future Flight Central (FFC). We found that NASA's decision to eliminate or reduce these capabilities resulted in delayed or canceled milestones in two NASA projects and affected FAA's development of critical NextGen technologies.

ARMD officials recommended the elimination of the B-757 and reductions in the other two capabilities after reevaluating the Directorate's priorities and restructuring ARMD's programs and projects to focus on long-term, cutting-edge research. OMB recommends that agencies considering program or project changes conduct benefit-cost analyses to ensure well-informed decision-making. However, we found that ARMD did not conduct adequate analyses prior to recommending the changes, despite JPDO and the National Research Council (NRC) identifying the capabilities as critical for achieving NextGen goals. In light of the competing priorities—NASA's and NextGen's—ARMD officials should have conducted benefit-cost analyses to support their recommendations and should have better coordinated with JPDO and FAA in order to minimize the impact on NextGen development. The research transition teams implemented by JPDO in 2008 are intended to facilitate more effective coordination.

ARMD Reevaluation of Directorate Priorities

ARMD senior officials stated that, in 2006 and 2007, they reevaluated the Directorate's priorities and restructured ARMD's programs and projects to focus on long-term, cutting-edge research (i.e., fundamental research) in anticipation of severe budget reductions. The ARMD budget decreased from \$673 million in FY 2006 to \$447 million⁴ in FY 2009, a 34 percent decrease. The reevaluation of priorities resulted in ARMD's recommendations to eliminate or reduce some of its aeronautics research capabilities. Specifically, the elimination of the B-757 flight test capability by October 2006 reduced ARMD's annual operating costs by \$11 million. The reduction in the wake turbulence

⁴ Budget amounts are expressed in "direct equivalent" dollars. NASA changed its accounting methodology during the fiscal years under examination. To make valid budget year comparisons, budgets must be adjusted to equivalent dollars to eliminate the effect of inconsistent accounting methodology. Therefore, we obtained NASA's estimate of "direct equivalent" dollars as the basis for our analyses.

research capability was realized by reducing the number of researchers by 64 percent. ARMD eliminated operating costs of approximately \$10 million annually by converting the FFC from an active to a standby status.

OMB Benefit-Cost Analysis

OMB Circular No. A-94, “Guidelines and Discount Rates for Benefit-Cost Analysis of Federal Programs,” October 29, 1992, recommends, but does not require, that a benefit-cost analysis be used as a management tool when considering changes in Government programs or projects. A benefit-cost analysis is recommended to help meet the goal of promoting efficient resource allocation through well-informed decision-making. The Circular describes four elements of a benefit-cost analysis: policy rationale, explicit assumptions, evaluation of alternatives, and benefit-cost verification. As a best business practice, management should have analyzed the aeronautics research capabilities using the four elements in OMB Circular A-94 and documented the results.

National Needs for NASA Capabilities in Support of NextGen

In 2006, at the same time that ARMD was reevaluating its priorities and aligning its projects to directly support JPDO and NextGen, JPDO and the NRC identified the B-757 flight test capability, wake turbulence research, and the FFC as critical for achieving NextGen goals. They communicated their concerns to ARMD and provided documentation to support NextGen’s need for the capabilities. However, ARMD officials were unable to provide official documentation showing that they had given due consideration to the national needs identified by JPDO. In light of JPDO’s concerns, ARMD needed to ensure that it was making the best decision possible and should have conducted and documented a benefit-cost analysis following OMB Circular A-94 guidelines before deciding to eliminate or reduce NASA’s aeronautics research capabilities.

In addition, ARMD could have improved its communication and coordination with JPDO and the FAA concerning these capabilities in order to minimize the impact on NextGen development. As discussed in the following sections, we found that NASA’s decision to eliminate the B-757, reduce the wake turbulence research capability, and place the FFC in standby status resulted in delayed or canceled milestones in two NASA projects and affected FAA’s development of critical NextGen technologies.

Processes Implemented by JPDO Should Improve Coordination and Management of Risks

In 2008, JPDO implemented two processes—an analysis of R&D activities and research transition teams—that allow JPDO to manage the work scope and risk of R&D activities.

In March and April 2008, NASA researchers participated in the analysis of R&D activities with JPDO. The analysis identified the scope of work for each R&D activity and allowed the partners to address areas that were not included in NASA or FAA project plans. NASA personnel also serve on the research transition teams with JPDO and FAA personnel. The teams include researchers, planners, and implementers who work together to ensure effective transfer of research products from NASA to FAA, which lowers the risk that NASA research products will not meet FAA's technical or schedule needs. In May 2008, JPDO implemented a Web-based application, the Joint Planning Environment, that allows JPDO to communicate planning information to NextGen partners, to integrate research products from the partners, and to manage NextGen technical and schedule risks.

B-757 Flight Test Capability

In July 2006, ARMD senior management officials recommended that the Agency dispose of a uniquely modified B-757 aircraft because ARMD had not identified it as a critical need for any ARMD projects. The Agency agreed with ARMD's recommendation and decided to dispose of the aircraft. However, the decision eliminated a key capability to perform NextGen flight test research, which the Agency did not address in the memorandum that directed disposal of the aircraft.

The B-757 was the centerpiece of the Simulation-to-Flight Program at Langley Research Center (LaRC). The Simulation-to-Flight Program was developed to streamline the transition of advanced new technologies from the simulation environment to the flight environment. The success of the Program relied on the existence of two nearly identical integration laboratories, one for simulation research and one for flight integration. Simulation-to-Flight increased the efficiency and reduced the cost of technology development and validation by using common hardware and software, procedures, and processes for both piloted simulation and flight testing.

NASA purchased the B-757 for \$24 million in 1994 and invested heavily in modifications, the cost of which cannot be fully determined,⁵ to develop the B-757 into a unique platform for testing flight hardware and software in a real-world environment. In addition to the B-757, a team of 58 civil service and 43 contract personnel with specialized skills to plan and conduct flight test research supported the flight test component.

⁵ NASA's cost records did not provide a full accounting of the Agency's investment in the B-757. We found documentation of additional investment in two areas of modification totaling between \$37 million and \$68 million. Specifically, our review of program documents to estimate the cost of the aircraft modifications found documentation of modifications costing between \$24 million and \$55 million for the Aft Flight Deck and \$13 million for data systems and flight control modifications. We were unable to estimate civil service labor costs for designing the modifications. In September 2006, when the B-757 aircraft was transferred to Dryden Flight Research Center, the NASA Equipment Management System reported a capitalized value of \$28.4 million. However, the cost of aircraft modifications made since 1994 were generally expensed as part of each year's annual cost of operations.

On July 19, 2006, the former Associate Administrator (AA) for ARMD issued a memorandum to the LaRC Director explaining the Agency's decision to dispose of the B-757. The memorandum stated:

None of the Aeronautics research proposals identified a need for the B-757 because sufficient capabilities, facilities, and flight research assets already exist elsewhere within NASA, other Government agencies, and industry. Thus, the NASA Aeronautics Program has no identified need for the B-757 in the foreseeable future.

The memorandum further directed that LaRC deobligate any aeronautics funding associated with contractor support of the B-757 beyond September 30, 2006.

In a separate memorandum, also dated July 19, 2006, the NASA Associate Administrator stated that the Agency had considered funding the B-757 and LaRC's overall Simulation-to-Flight capability as part of the NASA Strategic Capabilities Assets Program (SCAP, formerly the Shared Capability Assets Program). However, the Agency concluded that the capability did not meet "SCAP investment criteria because there are no known NASA or national requirements for the capability." The NASA Associate Administrator directed that the B-757 receive no Agency funding in FY 2007 and beyond. The memorandum instructed that LaRC "transition the aircraft into flyable storage at Dryden Flight Research Center as quickly and cost effectively as possible."

ARMD Analyses. ARMD senior management did not adequately document its analysis of the need for the B-757. ARMD's July 2006 memorandum to the LaRC Director explained that the flight test capability was being eliminated because there were no known NASA or national requirements.

However, prior to the final Agency decision regarding disposal, ARMD received the JPDO white paper, "Justification of National Assets," July 12, 2006, identifying the B-757 as a critical asset needed for NextGen. The AA for ARMD stated that the issues raised in the JPDO white paper did not justify maintaining the B-757, but ARMD officials were unable to provide official documentation showing that they had given due consideration to the national needs identified in the JPDO white paper. Instead, ARMD officials provided an undated issue paper prepared by a former Program Analysis and Evaluation (PA&E) analyst near the time of the disposal recommendation. The undated issue paper did not meet OMB Circular A-94 criteria that recommend an evaluation of possible interactions between benefits and costs and other Government activities. The analysis evaluated costs to NASA but did not evaluate the interactions between those costs and the benefits to NextGen development that were stated in the JPDO white paper.

PA&E Analysis. PA&E is responsible for conducting independent studies and analyses in support of NASA policy, program, and budget decisions. On July 21, 2006—2 days after the former AA issued the memorandum explaining the decision to eliminate the B-757 at LaRC—PA&E issued Program Decision Memorandum (PDM) #24, "Eliminate B-757 from the LaRC Simulation-to-Flight Capability." PDM #24 states that "the simulation-to-flight capability at LaRC does not meet Agency/SCAP investment criteria

because there are no known NASA or national requirements for the capability.” However, PA&E did not conduct an independent analysis to support the PDM’s conclusions. The PA&E analyst who prepared the PDM stated that PA&E did nothing to independently verify or validate those conclusions, which were provided by the former AA for ARMD. The analyst described his role as “limited to putting [the former AA’s] conclusions into English.”

An independent analysis would have disclosed the national need for the B-757 and also that NASA project management planned to use the B-757’s capabilities in meeting the Agency’s commitments to NextGen. Draft project plans, which had been reformulated for the Airspace Systems Program, the Aviation Safety Program, and the Fundamental Aeronautics Program in March 2006, included requirements for Simulation-to-Flight and flight test capability. Those requirements were subsequently removed from the draft plans to be consistent with ARMD’s move to fundamental research.

An undated PA&E issue paper, provided to us by ARMD in March 2009, concluded that there were no known NASA or national requirements for the B-757 flight test capability. To determine the validity and reliability of the issue paper, we interviewed the former analyst who prepared the document and a PA&E Deputy Director. The former analyst acknowledged that key conclusions in the issue paper had been provided to PA&E by ARMD officials and the former director of SCAP.

National Need for the B-757 Flight Test Capability. On July 12, 2006, prior to the ARMD memorandum explaining the Agency’s decision to dispose of the B-757, JPDO issued its white paper with recommendations to NASA. JPDO’s cover memorandum (see Appendix B) states that the recommendations are “to ensure no irreversible decisions are made with regard to the National assets concerned or with regard to the talented workforce assembled by NASA to support these facilities.” JPDO’s white paper recommended that NASA retain the B-757 or another appropriate jet transport as part of the larger Simulation-to-Flight capability.

JPDO’s white paper states that “all federal organizations researching new air traffic management concepts, including NASA, will need to evaluate/validate these concepts via experiments on aircraft,” and specified seven areas where flight test validation will be needed.⁶ The JPDO white paper also states that there is no other Federal facility close to replicating ARMD’s Simulation-to-Flight capability. According to the white paper, other Federal agencies have flight research aircraft and research simulators, but those assets are not linked together as seamlessly as ARMD’s Simulation-to-Flight capability. The white paper notes that the B-757’s value is in the capabilities of the research avionics and systems that are installed in the aircraft and their alignment with piloted (i.e., real-time)

⁶ The JPDO white paper specified that validation would be needed for (1) separation assurance between aircraft and the air navigation service provider, (2) validation of aircraft trajectory prediction methods, (3) concepts for reducing separation standards, (4) wake vortex prediction methods, (5) integrated flight deck system concepts, (6) precision flight path management concepts, and (7) integrated vehicle health management.

and “batch” simulators.⁷ The white paper further states that the Federal Government does not have any other single-engine general aviation aircraft used for research to improve general aviation operations in the National Airspace System. The white paper notes that “once such multi-disciplinary teams of highly specialized personnel are dispersed, it will likely take many years to reestablish the competency.”

Impact on NextGen Research. NASA’s July 2, 2008, quarterly review of the Airspace Project (under the Airspace Systems Program) reported one delayed milestone and one canceled milestone because flight test capability was unavailable. The review report stated that one milestone, “Flight test evaluation of an airborne situation awareness-based application,” was delayed for 2 years because NASA aircraft had been removed from service.⁸ The review report also stated that the milestone requiring flight validation of low noise guidance was canceled in 2007 when ARMD removed the aircraft from LaRC.

An official within FAA’s Advanced Technology and Prototyping Group confirmed that ARMD’s actions to eliminate the Simulation-to-Flight capability affected FAA’s development of critical NextGen technologies because FAA had planned to use the capability for testing. FAA officials described the following critical technologies affected by ARMD’s decision:

- required area navigation and required navigation performance technologies, which are critical for quieter descent procedures that burn less fuel;
- satellite-based air traffic control, paired with automatic dependent surveillance-broadcast technology on an aircraft, which are critical for safer, closer separations between aircraft and more direct routing; and
- an electronic cockpit tool that gives pilots a moving map display of their position and is critical for using global positioning systems, which will replace the existing Air Navigation Services.

The official stated that the FAA will develop the technologies since they are critical for NextGen.

Inadequate Coordination with JPDO and the FAA. Although the JPDO white paper specified research areas and articulated why NASA should retain the Simulation-to-Flight capability, ARMD did not adequately coordinate the July 2006 decision to eliminate the B-757 with JPDO or the FAA. Specifically, we found that ARMD did not provide

⁷ A “batch” simulator is an off-line version of the simulation, commonly provided to researchers for their desktop workstation to generate and verify the real-time simulation and to test candidate control laws prior to implementation. The off-line, or batch, version uses identical code as the real-time simulation for the simulation models.

⁸ The Airspace Project subsequently reported that the milestone had been successfully completed, without conducting the flight test, in September 2007. The Milestone Completion Memorandum, dated September 4, 2008, stated that “scheduling and execution of this flight test rests solely with the FAA and Airservices Australia.”

alternative solutions for accomplishing NextGen activities that JPDO reasoned were best suited for the B-757, NASA had not provided an official response to JPDO's concerns, and ARMD had not conducted a credible benefit-cost analysis. The AA for ARMD stated that the Directorate contacted FAA during 2006 to inquire whether FAA would provide direct funding for the aircraft, but documentation provided by ARMD personnel did not specify the date of inquiry or the FAA official contacted. ARMD officials also stated that the Agency identified five alternative aircraft that could be used for flight testing in place of the B-757. This too was not documented.

A documented benefit-cost analysis could have supported the Agency's decision to eliminate the B-757. In addition, better coordination by ARMD with JPDO and the FAA on the Agency's decisions concerning major capabilities needed for NextGen research could have minimized the impact on NextGen development. The processes implemented by JPDO in 2008—the research transition teams and the Web-based Joint Planning Environment—should improve coordination and management of NextGen technical and schedule risks.

Wake Turbulence Research Capability

An aircraft generates wake in its trail as an inevitable product of lift. As the weight of an aircraft increases, the stronger its wake; the greater an aircraft's wingspan, the longer the wake persists. Wake can be a safety hazard when smaller aircraft follow relatively larger aircraft too closely. That hazard, known as wake turbulence, requires aircraft to maintain safe separation distances from other aircraft. The FAA mandates separation distances to minimize risk from wake turbulence.

Researchers conduct wake turbulence research to determine whether FAA separation distances can be safely reduced. Safe reduction of separation distance will increase air traffic capacity—a fundamental requirement for NextGen. To explore minimum safe separation distances between aircraft under different conditions, researchers measure wake vortices and conduct wake vortex modeling. Researchers investigate and develop high-resolution sensors to measure aircraft wake vortices as well as evaluating how changing meteorological conditions affect wake vortices. Wake vortex modeling predicts the basic characteristics of the wake vortices trailing the aircraft as a function of the generating aircraft and ambient atmospheric conditions.

From FY 2005 through FY 2008, ARMD reduced its wake turbulence research capability 64 percent by decreasing the number of wake turbulence researchers in the Airportal Project—from 22 researchers (10 civil service personnel and 12 contract personnel) in 2005 to eight researchers by the end of FY 2008.⁹ The wake turbulence researchers

⁹ On September 30, 2008, ARMD awarded an NRA that included five additional researchers in the proposal, increasing NASA's level of support for wake turbulence research from three to eight researchers.

support six distinct research areas,¹⁰ which support Airportal Project plan milestones related to six NextGen OIs.

ARMD Analysis. Wake turbulence research was reduced to align NASA's research with ARMD's policy for conducting long-term, cutting-edge research. The AA for ARMD explained that wake vortex research was conducted because the Directorate had expertise in that area. However, the AA stated that while ARMD's wake vortex research collected empirical data, it was not advancing cutting-edge research.

In 2006, program and project managers, at the direction of ARMD senior management, revised draft project plans to cut the number of project plan milestones related to wake turbulence research. Those revisions resulted in the elimination of contractors and a reduction in the number of civil service researchers. ARMD officials stated that the former AA for ARMD's decision to shift resources to other research areas was based on an independent assessment of ARMD programs, which noted that ARMD devoted too many resources to wake turbulence research. The officials explained that, if the Directorate had continued the same level of support for wake research, other gaps in NextGen development might have appeared. However, officials had no analysis to show that other gaps in NextGen might appear.

ARMD could not provide a documented benefit-cost analysis in support of its decision to reduce the wake turbulence research capability. Since the analysis was not documented, we cannot substantiate that ARMD followed the Circular A-94 recommendation for an evaluation of the interaction between benefits and costs and other Government activities.

National Need for Wake Turbulence Research. NASA and FAA program officials stated that before the wake turbulence research capability was reduced, ARMD had a robust, system-level wake turbulence research capability. The officials explained that the capability provided a unique interface between the users of wake turbulence research (airlines, pilot unions, FAA regulators) and wake turbulence researchers. The interface provided the researchers an understanding of National Airspace System limitations, which allowed the researchers to address data quality assurance in fundamental research and early designs. The officials said that most of the system-level wake turbulence research capability has been significantly reduced because of reductions to the ARMD capability. A NASA program official familiar with NASA and FAA wake turbulence research stated that NASA's researchers are no longer able to support FAA research efforts that NASA and the FAA agreed to conduct jointly, such as wake turbulence encounter and mitigation at airport arrival.

An FAA wake turbulence program official stated that the wake turbulence research capability being established by FAA would not fully replace the capability formerly provided by NASA in the medium-term research area. The official described medium-

¹⁰(1) Wake turbulence mitigation for departure; (2) wake turbulence mitigation for arrivals; (3) crosswind/reduced separations for departure operations; (4) recategorization; (5) work to establish acceptable levels of wake encounter; and (6) collision risk modeling and analysis capability.

term as research that takes 3 to 6 years to transition “to the FAA systems engineering organization.” The official explained that the interface NASA provided between wake turbulence researchers and the users of that research facilitated technology transfer to FAA in the medium-term research area. The official characterized NASA’s medium-term wake turbulence research as a cohesive force that kept researchers from multiple organizations focused on technology transfer to FAA for introduction into FAA’s systems engineering process.

In “Wake Turbulence: An Obstacle to Increased Air Traffic Capacity,” January 2008, the NRC states that unless the separation distance can be reduced through wake turbulence research, other NextGen technologies will have less of an impact on departure and arrival capacity. The NRC also reported:

The Committee to Conduct an Independent Assessment of the Nation’s Wake Turbulence Research and Development Program found that the wake vortex problem does present a real impediment to increased air traffic capacity, something reflected in most of the documentation that has been drafted to date by the JPDO.

The NRC report, referring to capabilities prior to the staff reductions, noted that NASA expertise was well aligned for conducting medium- to long-term fundamental research, including wake vortex modeling and wake vortex mitigation work. The report also states that FAA did not have the necessary expertise and that no other Government agency appeared to possess the capability or capacity for wake turbulence research. The report recommended that NASA continue to conduct medium- to long-term wake vortex modeling and mitigation work at a level of effort sufficient to achieve NextGen goals.

Impact on NextGen Research. Reducing the wake turbulence research capability has resulted in two effects. First, a research gap will occur because FAA will not fully replace the capability formerly provided by NASA. NRC’s January 2008 report states that Federal investment does not place sufficient priority on wake turbulence research to achieve the results called for by NextGen goals. The report also states that air transportation system capacity could be significantly enhanced by applying the results of robust and focused wake vortex research and development. The report recommended that NASA continue to conduct medium- to long-term research because of its wake turbulence expertise and that operators and controllers be included in evaluating wake turbulence-related changes to the air transportation system. Second, the portion of wake turbulence research assumed by FAA has been delayed by approximately 2 years. This delay occurred in FYs 2006 through 2008 as FAA established its wake turbulence research capability.

Inadequate Coordination with JPDO and the FAA. When NASA reduced its wake turbulence capability from 2006 to 2008, there was not an effective mechanism in place to coordinate wake turbulence research with JPDO and the FAA, which resulted in a 2-year delay to the NextGen research just discussed. Better coordination by ARMD with JPDO and the FAA on the Agency’s decisions concerning major capabilities needed for NextGen research could have minimized the impact on NextGen development. The

research transition teams implemented by JPDO in 2008 should improve coordination among NASA, JPDO, and the FAA.

FFC Capability

The FFC, located at Ames Research Center, is an air traffic control and air traffic management simulation facility designed to help solve the capacity problems of the Nation's airports. The facility can project a 360-degree, full-scale, real-time simulation of an airport for air traffic control and air traffic management tests. The simulation shows how air traffic controllers, pilots, and airport personnel participate to optimize expansion plans, operating procedures, and new technologies. From FY 2001 through FY 2006, NASA used the FFC to test and evaluate aircraft surface movement decision support tools; aviation safety issues, such as runway incursions; and commercial airport design and operations issues. FFC operating costs are approximately \$10 million annually. In FY 2006, the FAA made a one-time contribution of \$2.5 million to share that cost.¹¹

ARMD senior management discontinued NASA's use of the FFC at the end of FY 2006 and eliminated the \$10 million annual operating cost of the facility. In FY 2007, the FFC was converted from an active to a standby status. The conversion reassigned facility personnel with specialized skills to other programs at Ames Research Center. During FY 2007, the FFC operated as a part-time, reimbursable facility with a 40 percent utilization rate. In early FY 2007, a NASA paper, "Programmatic and Other Impacts Associated with Disposition Options," commented on the FFC's low utilization rate: "With the unexpected stoppage of ARMD use of the facility as a research tool, it is understandable why FFC suddenly appears to be underutilized. It is recommended that FFC be given reasonable time to recover its business base." However, FFC utilization fell to zero during FY 2008.

ARMD Analysis. In November 2006, ARMD analyzed FFC operating costs and utilization rates to support its decision to place the FFC in standby status. The analysis stated that neither Ames Research Center or ARMD was aware of FAA requirements for the FFC. However, ARMD's analysis did not follow the OMB Circular A-94 recommendation to evaluate possible interactions between benefits and costs and other Government activities and did not adequately evaluate requirements identified in the JPDO white paper.

National Need for the FFC. In its July 2006 white paper, JPDO states that it is crucial for the Federal Government to retain the FFC's capabilities in airport surface operations models and associated real-time simulation software, as well as the experienced personnel who understand those models and software. The white paper notes that the

¹¹ According to the NASA official responsible for the FFC, FAA contributed \$2.5 million as a one-time contribution in FY 2006. FAA did not provide funding to NASA to operate the FFC after FY 2006.

FFC provides a means to test surface density operations throughout development under conditions similar to an actual airport, adding that achieving critical NextGen goals depends on “significant improvements in the performance of surface operations at the busiest airports in addition to complete integration of surface operations with arrival/departure operations at the airport.” JPDO also notes that NASA is expected to perform key research on surface operations concepts, but does not address funding for this research.

Impact on NextGen Research. Placing the FFC in standby status potentially affects the testing of surface density operations throughout development. In 2006, ARMD senior officials removed research milestones from Airportal Project draft project plans that would have supported basic research of surface density operations identified in the IWP as OI-339, “Integrated Arrival/Departure and Surface Traffic Management for Metroplex.” The OI addresses increasing regional capacity by effectively managing aircraft arrivals and departures, runway use, and aircraft sequencing. Project-level personnel had intended to validate those milestones using the FFC. ARMD senior officials eliminated support for the capability and removed those milestones from Airportal Project draft project plans in 2006. The FFC was placed in standby status after ARMD eliminated its support.

FAA’s research on the air traffic management system may be delayed by the FFC’s status, as the FAA will need to allocate funding to activate the facility. An official within FAA’s Air Traffic Systems Concept Development Group stated that, if the FFC is unavailable for FY 2009, FAA would not be able to test technology during development under airport-like conditions. The official explained that because of the lack of that testing capability, research on the NextGen air traffic management system would be delayed.

Inadequate Coordination with the FAA and JPDO. Although the ARMD analysis included \$175,000 in funding for 2007 from an FAA rudder study, it did not address funding from FAA research initiatives that need the FFC. ARMD’s coordination with the FAA and JPDO did not determine the specific FAA research initiatives described in the JPDO white paper. ARMD should have identified FAA’s research initiatives and planned schedule for using the FFC for NextGen research. That information would have been useful to FFC management in planning future facility usage and revenues. Future coordination and communication will be facilitated by the research transition teams that JPDO implemented in 2008.

Recommendations, Management's Response, and Evaluation of Management's Response

Recommendation 1. The Associate Administrator for ARMD should establish policy or procedures, or both, to ensure that ARMD conducts and documents benefit-cost analyses in accordance with OMB Circular A-94 before recommending the elimination or significant reduction of major capabilities that are needed for NextGen.

Management's Response. The AA for ARMD concurred in principle and stated that ARMD will establish policies or procedures, or both, to ensure that appropriate benefit-cost analyses are conducted. However, the AA also stated that "it is possible for circumstances to exist where there is not adequate time to conduct such analyses." In those cases, the AA stated that "ARMD will document the justification for the change." The AA estimated that policies or procedures would be developed by October 1, 2009.

Evaluation of Management's Response. Management's proposed action is responsive. The recommendation is resolved and will be closed upon completion and verification of management's corrective action.

Recommendation 2. The Associate Administrator for ARMD should establish policy or procedures, or both, to ensure that ARMD coordinates investment decisions regarding major capabilities that are needed for NextGen through the JPDO's research transition teams.

Management's Response. The AA for ARMD concurred and stated that the process and structure of the research transition teams, which include oversight from both NASA and FAA officials, satisfies this recommendation. In addition, ARMD and JPDO have instituted quarterly meetings to discuss strategic issues. ARMD will use the quarterly meetings as a venue to coordinate ARMD investment decisions.

Evaluation of Management's Response. Management's proposed action is responsive. Based on the actions taken and procedures in place, we have closed the recommendation.

Scope and Methodology

We performed this audit from January 2008 through June 2009 in accordance with generally accepted government auditing standards. 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 conclusions based on our audit objectives.

Objective Methodology

Our overall objective was to determine whether NASA was working effectively with JPDO to accomplish NextGen development. In April 2008, we revised the subobjectives to reflect initial fieldwork and discussed the revisions with ARMD management. The revised subobjectives were to determine whether (1) ARMD's program management provided adequate control over and accountability for NASA's NextGen R&D activities and (2) NASA was sustaining aeronautics research capabilities identified as necessary for NextGen development.

Overall Methodology. To gain an overall understanding of NextGen and NASA's role in NextGen development, we reviewed Public Law 108-176 (Vision 100) and the following JPDO planning documents:

- "Concept of Operations for the Next Generation Air Transportation System," Version 2.0, June 13, 2007;
- "Research and Development Plan for the Next Generation Air Transportation System FY 2009 to FY 2013," August 31, 2007; and
- "Next Generation Air Transportation System Integrated Work Plan: A Functional Outline," Version 1.0, September 30, 2008.

We interviewed the JPDO Director; the JPDO Deputy Director; JPDO Division Directors; the AA for ARMD; ARMD Program Directors for the Airspace Systems, Aviation Safety, and Fundamental Aeronautics Programs; and ARMD Resource Managers.

Objective 1 Methodology. We obtained requirements from NASA Procedural Requirements (NPR) 7120.5C, "NASA Program and Project Management Processes and Requirements," March 22, 2005; NPR 7120.8, "NASA Research and Technology

Program and Project Management Requirements,” February 5, 2008; NPR 8000.4, “Risk Management Procedural Requirements,” February 1, 2007; NASA Policy Directive 1000.0A, “Governance and Strategic Management Handbook,” August 1, 2008; OMB Circular No. A-123, “Management’s Responsibility for Internal Control,” December 21, 2004; Executive Order 13419, “National Aeronautics Research and Development,” December 20, 2006; and JPDO’s “NextGen Budget Formulation Guidance—FY 2010,” February 15, 2008. We used “A Guide to the Project Management Body of Knowledge, Third Edition,” 2004, published by the Project Management Institute, Inc., to identify project management best practices.

We evaluated risk assessments and risk management plans for four projects in programs that support NextGen. The evaluation compared project documentation as of July 2008 against requirements. The four selected projects were

- the Airspace Project (Airspace Systems Program),
- the Airportal Project (Airspace Systems Program),
- the Integrated Vehicle Health Management Project (Aviation Safety Program), and
- the Subsonic Rotary Wing Project (Fundamental Aeronautics Program).

We reviewed JPDO IWP 1.0 and determined that NASA leads 44 R&D activities (22 percent) and supports 37 (18 percent) of the 203 total R&D activities. Of the 81 total R&D activities that NASA leads or supports, one weather-related support activity is delegated to the Science Mission Directorate and the remaining R&D activities to ARMD. We did not review the R&D activity delegated to the Science Mission Directorate. We limited our review to the 44 NASA-led R&D activities delegated to the Aeronautics Research Mission Directorate.

We selected four projects to evaluate ARMD’s procedures to manage project risk. We interviewed Principal Investigators, Project Managers, Project Scientists, Associate Principal Investigators, and Resource Managers. We also reviewed program and project plans. We identified delayed or canceled milestones for the four R&D projects from the July 2008 quarterly review reports. We also analyzed crosswalks provided to us by ARMD for the Airspace Systems Program and the Subsonic Rotary Wing Project, January/February 2008. We interviewed FAA program officials at LaRC and FAA Headquarters.

We reviewed three reports by the NRC: “NASA Aeronautics Research: An Assessment” (2008), “Aeronautics Innovation: NASA’s Challenges and Opportunities” (2006), and “Decadal Survey of Civil Aeronautics: Foundation for the Future” (2006). We also reviewed external reviews of the Airspace Systems Program, the Aviation Safety Program, and the Fundamental Aeronautics Program, which were issued in February and March 2008.

Objective 2 Methodology. We identified requirements for NASA aeronautics research capabilities from the JPDO white paper, “Justification of National Assets,” July 12, 2006; “NASA’s Challenges and Opportunities,” NRC, 2006; “Decadal Survey of Civil Aeronautics: Foundation for the Future,” 2006; and “Wake Turbulence: An Obstacle to Increased Air Traffic Capacity,” NRC, January 2008.

We reviewed program and project draft and final plans and quarterly review reports. For the B-757, we also reviewed the President’s Budget for FY 2009 and documentation of NASA’s decision to dispose of the aircraft. Documentation included memorandums from the former NASA Associate Administrator, July 19, 2006, and the former AA for ARMD, July 19, 2006, and PDM #24, “Eliminate B-757 from the LaRC Simulation-to-Flight Capability,” PA&E, July 21, 2006. We interviewed ARMD senior management, ARMD program and project officials, program analysts in PA&E, and the former Director, SCAP. We obtained cost data of the B-757 from the Office of the Chief Financial Officer at LaRC and the B-757 purchase agreement. We inspected remaining assets at LaRC in September 2008. We interviewed the former Director, Flight Research Services Directorate, at LaRC. For wake vortex research, we also reviewed an FAA analysis of wake vortex research gaps and delays, March 2008, and analyzed R&D activities related to wake vortex research. For the FFC, we reviewed NASA’s “ARC Future Flight Central – Disposition Assessment,” November 2006, and analyzed FFC usage rates and resource requirements.

Use of Computer-Processed Data

We did not rely on computer-processed data to perform this audit.

Review of Internal Controls

We evaluated the organization, policies, and procedures that ARMD put in place to support JPDO’s efforts to develop NextGen using OMB Circular A-123 and the Government Accountability Office (GAO) publication, “Internal Control Management and Evaluation Tool” (GAO-01-1008G, August 2001). Circular A-123 defines five control standards and requires management comply with those standards. The GAO tool provides managers guidance to implement the control standards and to determine whether improvements are needed.

Our evaluation found that NASA has taken actions to work effectively with the JPDO to accomplish NextGen development. NASA assigned NextGen responsibility to ARMD, reformulated ARMD program and projects to align with or relate to NextGen, developed program and project plans, defined supervisory positions and assigned responsibilities to those positions, established project plan milestones and schedules, and reviewed project plan milestones and schedules regularly. However, we found that ARMD senior officials failed to follow OMB Circular A-123 control standards or Circular A-94 best practices for benefit-cost analyses. ARMD senior officials eliminated an aeronautics research

capability without documenting their analysis. NASA officials did not follow OMB Circular A-94 and did not ensure that benefit-cost analyses supporting ARMD's decision were documented. ARMD senior officials reduced two other aeronautics research capabilities based on cost analyses but did not evaluate other relevant criteria in accordance with Circular A-94. Documentation and compliance with established procedures are required by Circular A-123 control standard, "Control Activities." Implementation of this report's recommendations should correct the identified weaknesses.

Prior Coverage

During the last 5 years, the GAO, the Department of Transportation OIG, and the NRC have issued seven reports of particular relevance to the subject of this report. Unrestricted GAO reports can be accessed over the Internet at <http://www.gao.gov>; unrestricted Department of Transportation OIG reports can be accessed at <http://www.oig.dot.gov>; unrestricted NRC reports can be accessed at <http://www.nap.edu/>.

Government Accountability Office

"Next Generation Air Transportation System: Status of Systems Acquisition and the Transition to the Next Generation Air Transportation System" (GAO-08-1078, September 2008)

"Next Generation Air Transportation System: Progress and Challenges Associated with the Transformation of the National Airspace System" (GAO-07-25, November 2006)

Department of Transportation Office of Inspector General

"Joint Planning and Development Office: Actions Needed to Reduce Risks with the Next Generation Air Transportation System" (AV-2007-031, February 12, 2007)

National Research Council

"Wake Turbulence: An Obstacle to Increased Air Traffic Capacity" (2008)

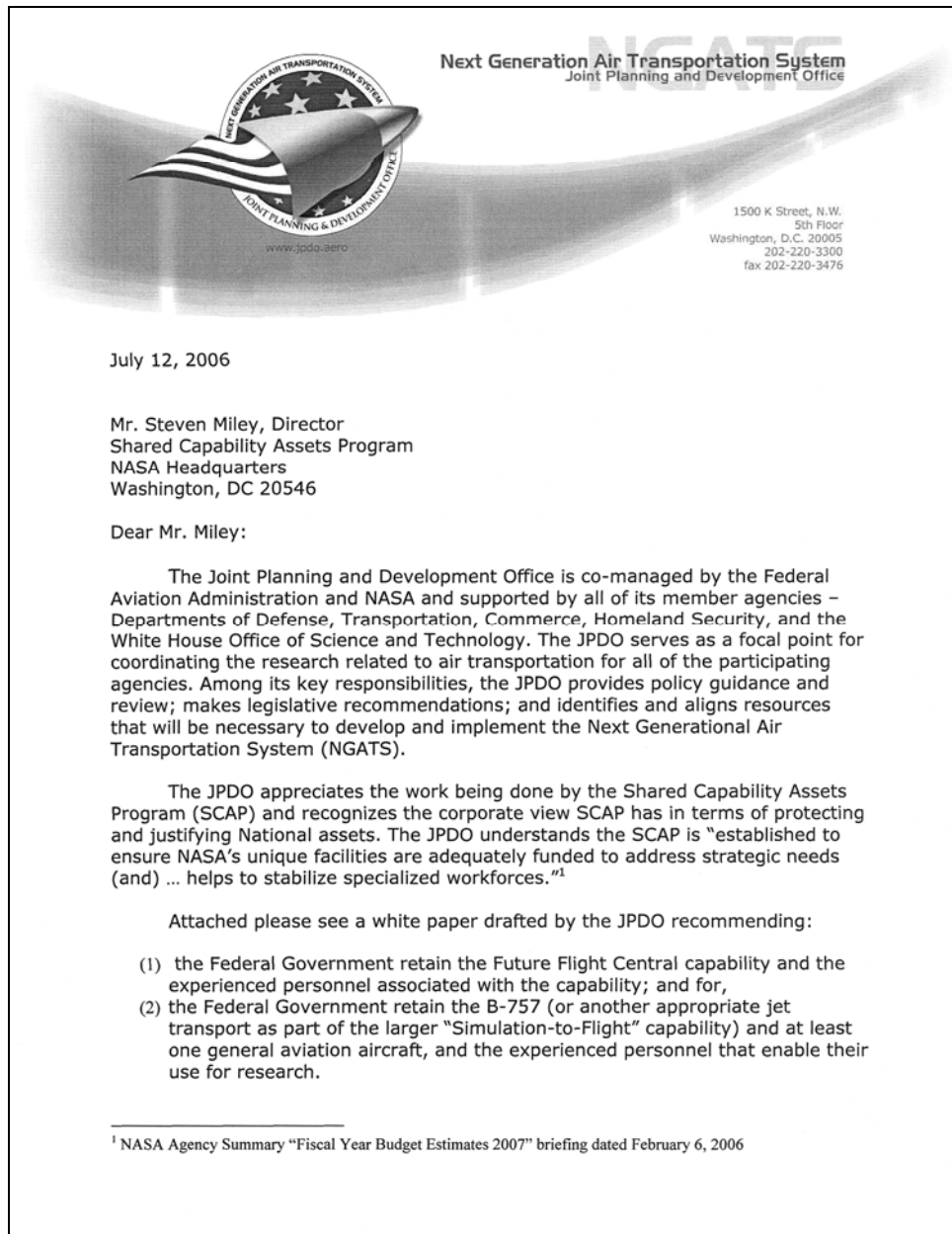
"NASA Aeronautics Research: An Assessment" (2008)

"Decadal Survey of Civil Aeronautics: Foundation for the Future" (2006)

"Aeronautics Innovation: NASA's Challenges and Opportunities" (2006)

JPDO MEMORANDUM

In July 2006, JPDO issued a white paper, “Justification of National Assets,” with recommendations to NASA. The following JPDO cover memorandum accompanied the white paper.



The JPDO hastily conducted its discovery and analysis upon learning funding for these critical NGATS-related programs could be in jeopardy. The attached paper is considered the JPDO's initial analysis as it has not conducted a richer analysis on the cost to maintain and support the programs versus the capability the programs contributes to NGATS.

At this time, the JPDO's recommendations are made to ensure no irreversible decisions are made with regard to the National assets concerned or with regard to the talented workforce assembled by NASA to support these facilities. As the JPDO matures in its planning, we will work with our member Agencies, including NASA, to develop a detailed National perspective on research capabilities required to realize the goals published in the National Integrated Plan and delivered to Congress in December 2004.

I appreciate your consideration of the needs of the Next Generation Air Transportation System (NGATS) and am willing to commit the JPDO in further determining more specifically which shared capability assets of NASA are required to support the future air transportation system.

I am available to discuss this issue with you and may be reached at the JPDO (202/220-3455 or Robert.Pearce@faa.gov).

Sincerely,

Robert Pearce
Director (Acting)
Joint Planning and Development Office

Attachment: Shared Capability Assets Program (SCAP) Next Generation Air Transportation System paper

MANAGEMENT COMMENTS

National Aeronautics and Space Administration
Headquarters
Washington, DC 20546-0001



July 16, 2009

Reply to Attn of: Aeronautics Research

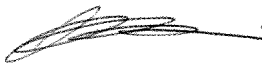
FROM: Associate Administrator for
Aeronautics Research Mission Directorate

TO: Assistant Inspector General for Auditing

SUBJECT: Response to the Report "NASA'S Support of the
Joint Planning and Development Office to Develop the Next
Generation Air Transportation System Could Be Improved"

The Aeronautics Research Mission Directorate (ARMD) provides the following response to the report "NASA'S Support of the Joint Planning and Development Office to Develop the Next Generation Air Transportation System Could Be Improved". Since 2006 ARMD has continued to strengthen the relationship between NASA and the JPDO to provide the advanced research needed to support NextGen. We believe appropriate policies and practices are in place to ensure that this is an effective relationship within the framework and environment established by the Congress and the Administration.

Attachment 1 includes a direct response to each of the recommendations.



Jaiwon Shin
Associate Administrator for the Aeronautics Research Mission Directorate

Attachment 1: Response to Recommendations

The Aeronautics Research Mission Directorate agrees in principle with recommendation number 1, but notes that it is possible for circumstances to exist where there is not adequate time to conduct such analyses:

The AA for ARMD should establish policy or procedures, or both, to ensure that ARMD conducts and documents benefit-cost analyses in accordance with OMB Circular A-94 before recommending the elimination or significant reduction of major capabilities that are needed for NextGen.

As a Mission Directorate, it is ARMD's role to establish research priorities and goals. This is a complex process, especially considering the vast scope of ARMD's research portfolio. ARMD agrees that it is important to document changes to planned research or support to facilities that impact NextGen. ARMD will establish appropriate policies and/or procedures to ensure that an appropriate cost-benefit analysis is conducted if possible. The estimated completion date for the development of these procedures and policies is October 1, 2009. Since the majority of ARMD's portfolio supports NextGen it is likely that any change to the funding profile will have some impact. In addition, there are situations where the funding changes may be required in such a short time that limit the scope of the cost benefit analyses. Even in these cases, ARMD will document the justification for the change.

The Aeronautics Research Mission Directorate agrees with recommendation number 2 with some clarification:

The AA for ARMD should establish policy or procedures, or both, to ensure that ARMD coordinates investment decisions regarding major capabilities that are needed for NextGen through the JPDO's research transition teams.

The most important point is that ARMD should effectively coordinate with the JPDO and FAA on research related to NextGen. NASA and the FAA established the Research Transition Teams (RTTs) to help ensure that NASA research can effectively support FAA needs in specific areas. These teams are co-chaired by NASA and FAA personnel, but the JPDO is also involved because they facilitate coordination.

There are a finite number of RTTs that impact specific research areas. Therefore, ARMD believes that effective coordination involves more than just RTT procedures. Since 2006, ARMD has continued to strengthen its coordination and communication with the JPDO and FAA. ARMD has already established quarterly meetings with the JPDO and FAA and JPDO officials are invited to participate in ARMD reviews. For example, the ARMD research plans that resulted in lack of research needs for the B-757 and Future Flight Central (FCC) were reviewed and endorsed by senior members of the JPDO and FAA in 2006. In addition, recent "gap analyses" conducted by the JPDO indicate that there are

no redundant or extraneous areas of research in the ARMD portfolio. An important consideration is that while ARMD agrees that collaboration on major investment decisions is very important, this does not imply that ARMD will always fund facilities or capabilities that are required by other Agencies. Part of effective coordination relies on the other Agencies to provide resources to support these capabilities if warranted.

ARMD feels that the establishment of the RTT process and structure, which includes oversight from both NASA and FAA officials, satisfies this recommendation. In addition, ARMD and the JPDO have instituted quarterly meetings to discuss strategic issues. This also provides a venue to discuss potential changes that may impact NextGen development. FAA and JPDO officials have been involved in all relevant independent reviews of ARMD programs and projects, which provides another opportunity to coordinate on ARMD investments.

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Major Contributors to the Report:

Raymond Tolomeo, Director, Science and Aeronautics Research Directorate

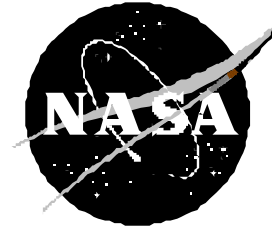
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